International Conference on Mathematics and Science Education

“Promoting 21st Century Skills Through Mathematics and Science Education”

May 5th, 2018

Sekolah Pascasarjana
Universitas Pendidikan Indonesia

http://science.conference.upi.edu/
INTERNATIONAL CONFERENCE ON MATHEMATICS AND SCIENCE EDUCATION (ICMScE 2018)

THEME:

“PROMOTING 21st CENTURY SKILLS THROUGH MATHEMATICS AND SCIENCE EDUCATION”

BANDUNG, May 5th, 2018

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Preface: International Conference on Mathematics and Science Education (ICMScE 2018)

Distinguished Guests, Respected Colleagues, Ladies and Gentlemen.

Welcome to the International Conference on Mathematics and Science Education (ICMScE 2018). On behalf of the conference committee, I would like to welcome all presenters and participants to the conference. The conference is organized by School of Postgraduate Studies and supported by Faculty of Mathematics and Science Education, Universitas Pendidikan Indonesia (UPI). The conference is designed as a forum for researchers, teachers, and students to share their research and experience.

After a thorough review of the paper submitted to the conference, the committee has selected around 585 papers to be presented in the conference. After the conference, these selected papers will be reviewed by internal and external independent reviewers and the selected papers will be submitted to publisher indexed by Scopus.

The organizers are grateful to the authors for their enthusiasm. Additionally, we are thankful for the hard work of all reviewers, who are not only refereeing the submitted papers but also raising the quality standard of the papers that we publish.

Thank you for your participation, have a great conference and enjoy your stay in Bandung! Thank you!

Dr. H. Sufyani Prabawanto, M.Ed.
Conference Chair

Bandung, May 5th, 2018
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Oktamiadi
Henry Saputra
Aufal Kausar
Patra Aghtiar R
Papien Aprisda
## Conference Program

**Saturday, May 5th, 2018**

**Keynote Session**

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<td>08.00-08.05</td>
<td>Welcoming the Audiences and Conference Overview</td>
<td>Central Park of FPMIPA A</td>
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<td>08.05-08.15</td>
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<td>08.45-08.55</td>
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## Parallel Session, ICMScE 2018

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### Note:
- **FPMIPA A BUILDING**
  - R1: 2nd floor, number E.201
  - R2: 2nd floor, number E.210
  - R3: 3rd floor, number S.301
  - R4: 3rd floor, number S.302
  - R5: 3rd floor, number S.303
  - R6: 3rd floor, number S.304
  - R7: 3rd floor, number S.305
  - R8: 3rd floor, number S.306
  - R9: 3rd floor, number E.301
  - R10: 4th floor, number E.405
  - R11: 4th floor, number E.406

- **FPMIPA B BUILDING**
  - R12: 1st floor, number B.106
  - R13: 1st floor, number B.108
  - R14: 2nd floor, number B.201
  - R15: 2nd floor, number B.203
  - R16: 2nd floor, number B.204
  - R17: 2nd floor, number B.205
  - R18: 2nd floor, number B.209
  - R19: 2nd floor, number B.210
  - R20: 3rd floor, number B.301
  - R21: 3rd floor, number B.303
  - R22: 3rd floor, number B.304
  - R23: 3rd floor, number B.305
  - R24: 4th floor, number B.404
  - R25: 4th floor, number B.405

- **FPMIPA C BUILDING**
  - R26: 2nd floor, number IK. 201
  - R27: 2nd floor, number IK. 202
  - R28: 2nd floor, number IK. 203
  - R29: 2nd floor, number IK. 204
  - R30: 2nd floor, number IK. 206 A
  - R31: 2nd floor, number IK. 206 B
  - R32: 2nd floor, number IK.207

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Bandung, May 5th, 2018
LIST OF ABSTRACT

International Conference on Mathematics and Science Education (ICMScE 2018)
[ABS-8]
Testing the Research Abilities of Student Teachers at Pre-Service Training and Education

Murni Ramli and Binti Muchsini
Universitas Sebelas Maret

Abstract
Some academic supervisors claimed the low abilities of pre-service students on conducting a research. This research aims to measure the Research Abilities (RA) of students by developing the instruments to test the knowledge of students on essential components of research, i.e., understandings on the type of research, research design, research problem, hypothesis, variable, type of data, research method, sampling, and data analysis. The instrument is an essay, and multiple-choice test consists of 30 questions divided into four categories, i.e., Research Problems, Hypothesis, and Variables (Q1); Research Method (Q2); Data Analysis (Q3); and Action Research (Q4). About 36 science and non-science students participated voluntarily on the online test, 89% are females, and 14% are science education students. Only 35 data are valid to be analyzed. The result shows that the highest score belongs to a non-science student (24), and the average rating of science students (12.14) is almost equal with non-science ones (12.62). The average score of Q1 is 5.1 of 12, Q2 4.4 of 8, Q3 is 1.1 of 3, and Q4 is 0.9 of 3. The conclusion is students show low performances on RAs components

Keywords: Research abilities, student teacher, pre-service training
Topic: 2. Science Education

[ABS-11]
Examining The Determine of Self Efficacy, Social Conditions, and Scientific Literacy Based on PISA Test like: An In-Vitro Study

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Abstract
This study is aimed to determine the students achievement of scientific literacy with social condition as an independent variable and self efficacy as an intervening variable according as an in-vitro study. This research consist to used quantitative descriptive method and this study is applied on 56 students who are educated at the first grade of SMK Avicena Rajeg in academic years of 2017/2018. The instrument used was a scientific literacy test based on PISA test-like and social condition and self efficacy was a questionnaire. The result of this study showed that the residual regression analysis value of social condition and self efficacy was 0.941, the residual regression analysis value of social condition and self efficacy to scientific literacy was 0.932. The direct influence of exogenous variables in the form of social conditions on endogenous variables is 11.61%, and the effect of self efficacy as an intervening variable is 9.24%. This value was considered means social conditions have a positive effect directly or through the self efficacy of students at the first grade of SMK Avicena Rajeg.

Keywords: Self Efficacy, Social Conditions, Scientific Literacy
Topic: 2. Science Education
The Relationship Between Conceptual Understanding And Student Learning Outcomes Through The Use Of Geometers Sketchpad Software

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Abstract
This study aims to determine the relationship between understanding the concept with student learning outcomes through the use of geometer sketchpad software. This research is quasi experiment research conducted on 88 students class 3 SMA 1 Pasirpenyu Inhu for 7 weeks. Instruments used in this study is the concept of understanding the exam and test results of learning. This instrument has been tested in preliminary studies to determine reliability and validity. Data were analyzed using pearson correlation statistics. There was a significant relationship between conceptual understanding of mathematics and mathematics achievement of experimental group (r = 0.797) and control group (r = 0.721)

Keywords: Conceptual Understanding, Learning Outcomes and Geometers Sketchpad Software

Topic: 1. Mathematics Education

Needs Of Integrated Science Textbook For Junior High School Based On Learning Style (Descriptive Research)

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Abstract
Abstract. One of the factors that determine the achievement of learning objectives is the teaching materials used in the learning. Teaching Materials are all materials (information, tools, and text) that are arranged systematically, which display the whole competencies to be mastered by students[1]. One of the teaching materials that are often used is teaching materials in the form of textbook. Textbooks are typically the main source of learning material for students and the source of information on a specific subject or field [2]. This research is a Descriptive Research that aims to see the urgency of teaching materials in the form of textbooks in integrated science lesson junior high school related to visual student learning style. This research was conducted at Junior High School 29 of Bandung. The data collection instrument used in this research is in the form of teacher and students questionnaire. The answers of teachers and students questionnaire was analyzed descriptively for each item. The results of the questionnaire showed that both teacher and Students prefer textbooks that use more attractive colours, more detailed explanations and more examples related to daily life. The finding of the research suggest that textbook is urgently needed to support learning process mostly for visual learning style.

Keywords: Teaching Materials, Integrated Science, Visual Learning Style, Descriptive Research

Topic: 2. Science Education
[ABS-17]

An Exploration of Talk in Secondary Chemistry Classroom Implementing the Curriculum 2013 in Indonesia

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Abstract
This study investigates the classroom talk occur during chemistry classroom at Madrasah Aliyah. The focus is on the pattern of classroom talk and pedagogical intervention adapted in chemistry lessons that have implemented the new curriculum, often known as Curriculum 2013 in Indonesia. An exploratory case study approach utilised for this research. The study carried out at one Madrasah Aliyah in greater Jakarta. The chemistry lessons in this classroom were observed over the period of three months. The whole class talk that took place during the target lesson were recorded using video recorder, audio recorder and field notes. The data from classroom observation were analysed using thematic analysis. The finding indicates that the pattern of classroom talk mostly adopted traditional triadic movement (Initiation Response Feedback/IRF). In term of pedagogical intervention, the study shows that the teacher employs various techniques to promote talk: direct elicitation, cued elicitation, developing the conceptual line, and literal recap in which the authoritative discourse mostly took place. The study concludes with the implications for the development of teaching practices that promote classroom talk in science education.

Keywords: Dialogic teaching, Classroom Talk, Chemistry Education, The Curriculum 2013, Sociocultural perspectives

Topic: 4. Chemistry Education

[ABS-18]

Analysis of Factors Affecting The Undergraduate Student Quit Study

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Abstract
Many undergraduate students on Faculty of Education University of Muhammadiyah Jakarta who are beginning to fall in their motivation to study and then quit their study. Based on data in 2010 there were 20.22% students quit the study. Many factors that affect students quit their study. This research is expected to contribute to overcoming the problem. The purpose of this study is to determine what factors affect the student quit studying. This research uses Poisson or Binomial Negative regression analysis to know these factors. Both regression models used are equally the fit model to be used, because based on the result of overdispersion study did not occur. Based on the AIC and Log-Likelihood criteria it is concluded that negative binomial model is more fit than Poisson regression models. Wald test results for each parameter in the Negative Binomial regression are only three variables that affect students quit the study. The three parameters are the percentage of Jakarta students (X2), the percentage of male students (X3), the average student age (X4). The three variables have a positive effect, which means that increasing value in X2, X3, or X4 will increase the number of the students who quit studying.

Keywords: Binomial Negative Regression, Count Data, Poisson Regression, Quit Study

Topic: 1. Mathematics Education
[ABS-19]
Improving External Mathematical Connections and Students Activity using Ethnomathematics

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Abstract
Most students repute that mathematics is a difficult subject and has no connections in real life. It makes students external mathematical connections to be low, students less active in learning process, and it affected on the low achievement of students in mathematics. Ethnomathematics is one of the attempts to overcome it. Indonesia is a multiculture country and the people usually do anything in daily life influenced by their culture. Ethnomathematics is an instruction approach that makes a connection between mathematics concepts dan culture. The purpose of this study is to conduct experiment by applying ethnomathematics to the eighth grade students of Junior Secondary School in Tegalluar Village. The method that implemented in this study is experiment. The result of this study shows that students achievement using ethnomathematics is better than their average achievement using direct instruction. Conclusion of this study is ethnomathematics can improve students external mathematical connections and students activity in learning process.

Keywords: External Mathematical Connections, Real Life, Students Activity, Students Achievement, Culture, Mathematics Concepts, Ethnomathematics

Topic: 1. Mathematics Education

[ABS-20]
Random and Match Game for Education Purposes with Model Learning Technology System Architecture

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Abstract
Education in Indonesia still faces various problems and challenges in teaching and learning process both internal and external factors such as props, media and also implementation of information technology. The use of multimedia-based learning media in the learning process will helps students to understand the material to be delivered. Random and match is a game consisting of 4 different games that are addressed to kindergarten children to know the use of technology positively in learning process, and by applying Model Learning Technology System Architecture learning an utilization using computer will be more useful for teacher and kindergarten students.

Keywords: Multimedia Learning, LTSA, Educational Game
Topic: 2. Science Education
[ABS-21]  
How Inclusive School Students Understand Fraction  

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**Abstract**  
This research aims to analyze students ways of understanding when they learn fractions. The respondents were 23 students of the 7th graders in the inclusive school. The research approach was qualitative, with descriptive method. The data were collected through paper and pencil measure, document and media analysis, observation, and interview. The data were analyzed by grounded theory. The results showed four mental acts; those are interpreting, problem solving, explaining, and inferring as well as ways of understanding and ways of thinking that are relevant with those mental acts.  

**Keywords:** fractions learning, students ways of understanding, inclusive school  
**Topic:** 1. Mathematics Education

[ABS-22]  
Logical Framework for Smart Discussion in Learning Process  

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**Abstract**  
Different views on a problem are things that often occur in a discussion. In order to find a good conclusion in the discussion, it is necessary to make logical framework that builds a healthy discussion climate. This article discusses the logical framework in a discussion, which frequently uses common sense and rationality as the main pillar in the conclusion making process. This study applied a qualitative analysis approach that originates from the observation and interview with the class X students at the International Standard Boarding School of Amantul Ummah who attended learning process with discussion method. The number of respondents covers 24 students. Research finding shows that discussion method in a learning process will work well when it has problem identification mechanism, factual argument, cause-effect analysis, and good communication pattern. Moreover, this research recommends ethical behaviors in the process of discussion learning activity as an important part in the discussion.  

**Keywords:** Discussion; logical framework; decision making  
**Topic:** 6. STEM Education
[ABS-23]
The Implementation Of Chordophone Enrichment Book As An Essential Factor To Create Meaningful Learning

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Abstract
This study aims to discuss the implementation of chordophone enrichment book as one of the essential factor to create meaningful learning for students. An Enrichment book called Chordophone Enrichment Book was developed to comprehend sound and waves unit in physics materials for junior and high school students. In this study, the instructional design is based on the principal of meaningful learning. With a quasi-experiment Pre-Test and Post-Test Control research design, a meaningful learning scale research instruments, and a valid meaningful learning questionnaires, this study is utilized. The research findings show that the students in the experimental group apparently had a higher learning achievement than the students in the control group, with notable differences. Through pre-test and post-test, the values obtained in the control class are 47.02 and 62.34 with a gain value is 0.29 (low improvement). While the value of pre-test and post-test in the experimental class are 46.88 and 71.79, with gain value obtained for 0.47 (medium improvement). Through the questionnaire, students in the experimental group highly regarded that their learning is meaningful with an average percentage score of 84.75%. These research outcomes hopefully can be used by teachers and educators for designing materials and provide educators with a reference for implementing enrichment book as a meaningful media material design.

Keywords: Enrichment Book, Meaningful Learning, Sound and Waves, Physics
Topic: 3. Physics Education

[ABS-24]
The Development of Assessment for Learning Model with Goformative and Pen Tablet

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Abstract
This research aims to obtain the development of Assessment For Learning (AfL) model in mathematics learning using technologies in the forms of website goformative and writing tools such digital pen or pen tablet. Goformative and Pen Tablet are used to create more optimal time in using the AfL model. As we know, AfL is important to be applied in learning process, but there is an obstacle about time so that teachers rarely use it. The method used in this research is modification of ten research and development stages proposed by Borg & Gall grouped into three stages namely (1) preliminary study, (2) development, (3) evaluation. Results of research show that the application of this new model provides higher achievement compared with former learning model conducted by teachers as well as teachers think that there is more optimal application time of AfL model in the learning process. Based on the research results, it is concluded that this AfL model is easy to be applied; there is also more optimal implementation time and it leads to better students learning achievement compared with the ones do not apply it.

Keywords: Assessment For Learning, Goformative, Pen Tablet, Learning Achievement
Topic: 1. Mathematics Education
Mathematical Problem Solving and Mathematical Connections Abilities of Students with Accelerated Learning Cycle

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Abstract
This quasi experimental research examines the abilities of mathematical problem solving and mathematical connections through the application of Accelerated Learning Cycle. The samples of research were 63 students of seventh grade students in Riau Province, which were divided into an experimental group and a control group. The research instruments were mathematical problem solving and mathematical connection abilities test, and the data were analyzed using Mann-Whitney and two ways ANOVA test. The results of this study indicate that there was a significant effect of Accelerated Learning Cycle on the overall students mathematical problem solving and connection skills (p = 0.000; p <0.050) and in all categories of KAM, except both of two categories on mathematical connections ability, high (p = 0.349; p <0.050) and middle (p = 0.100; p <0.050), did not significantly differ. In the problem solving and mathematical connections abilities of students, there was no difference between the categories of KAM and there was no interaction between learning and mathematical ability.

Keywords: mathematical problem solving ability, mathematical connection ability, accelerated learning cycle

Experience in Nuclear Reactor Physics Laboratory Exercises Using Kartini Research Reactor

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Abstract
The experience in using Kartini nuclear research reactor for reactor physics laboratory exercises is presented. The effectiveness of nuclear reactor physics laboratory exercises using Kartini reactor is discussed. The method used is through comparative references study with the similar activities at other institutions. Software packages and procedural guides have been developed and used for reactor power and control rod worth calibrations, criticality experiment, experiments to study the xenon stability, neutron flux measurement, reactor start-up/ shutdown operations, etc. For illustration, a computer simulation for reactor criticality experiment is described and result from practical experiment is presented. In conclusion, it has been demonstrated that the implementation of reactor physics laboratory exercises using Kartini reactor has a good performance and it was an important role in developing human resources in nuclear reactor field for the country. It is hoped that in the future, Kartini reactor will contribute to regional nuclear education and training programs.

Keywords: Kartini, nuclear, reactor physics, laboratory exercises, education

Topic: 3. Physics Education
The Ability Of Scientific Reasoning Of Students With Drawing Based Modeling

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Universitas Pendidikan Indonesia

Abstract
This study aims to determine students scientific reasoning using Student Activity Sheet based on Drawing-based Modeling approach in Biology Education Study Program of Muhammadiyah University of Bengkulu. This study included the type of experimental research. The research design used is Research and Development (R & D) design with 4D model (define, design, develop, disseminate). The subjects of this study were 31 students of Biology Education Muhammadiyah University of Bengkulu. The data collection of scientific reasoning skill is taken by giving multiple choice questions before and after learning and assessed by the rubric of scientific reasoning. Analysis of scientific reasoning data using Anatest version 4.0.9. The results showed the percentage of students achievement in each category of reasoning, low, moderate, high. It is generally seen that students reasoning ability is in high category, that is 78% of students get high score. The lowest percentage of students reasoning ability achievement is found in justification reasoning that is 22%, while the percentage of students achievement reasoning achievement is the highest in reasoning synthesis, as much as 78%. The results of this study provide a conclusion that the Student Activity Sheet based on Drawing-based Modeling can improve students scientific reasoning ability.

Keywords: Scientific Reasoning SKill, Drawing-based Modelling
Topic: 5. Biology Education

Conceptualizing Mathematical Knowledge For Teaching Of Indonesian Teacher In Teaching Number Sense To Early Childhood

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Abstract
This paper discusses about Mathematical Knowledge for Teaching (MKT) of Indonesian teachers in teaching number sense to early children, reviewed from Subject Matter Knowledge and Pedagogical Content Knowledge. The subjects of this research were three kindergarten teachers in Depok, West Java, Indonesia. The research method was qualitative method while the data was collected by observation, study of documentation, and interview. The result showed that the respondents had not understood well the number sense, teaching strategy and the early childhood level of achievement. However, in regard to the pedagogical ability, the respondents had conducted the teaching process well. The respondents were able to arrange a proper plan and strategy for the teaching process; able to know the characteristic of the children; and able to utilize the teaching evaluation which was beneficial for the stakeholder and themselves.

Keywords: Matematical Knowledge for Teaching, Number Sense, Early childhood, Teacher
Topic: 1. Mathematics Education
Profile of Metacognition of Mathematics Education Students in Understanding the Concept of Integral in Category Classifying and Summarizing with Regard Gender Differences

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Abstract
This study describes the metacognition profile of female and male mathematics education students in understanding the concept of integral calculus in the category of classifying and summarizing. The metacognition profile is a natural and intact description of a person's cognition that involves his own thinking in terms of using his knowledge, planning and monitoring his thinking process, and evaluating his thinking results when understanding a concept. The purpose of this study was to produce the metacognition profile of female and male mathematics education students in understanding the concept of integral in the category of classifying and summarizing. This research method is an explorative method with the qualitative approach. The subjects of study are 1 female and 1 male of mathematics education students who have studied integral calculus. The main data collection of this research was obtained by using Interview technique. The results of this study are as follows: there is no difference of metacognition profile between male and female mathematics education students in understanding the indefinite Integral concepts in category classifying and summarizing. There is a difference of metacognition profile between male and female mathematics education students in understanding the definite integral concepts in category classifying and summarizing.

Keywords: Metacognition, Understanding the Concept of Integral, Classifying and Summarizing, Gender

PBL-Team Teaching To Improve Vocational School Students Mathematical Disposition

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Abstract
This research aims to determine the interaction that occurs in the process of learning mathematics process. In general, this research is about improving the ability of mathematical disposition of vocational high school students. The learning took place in 2 schools with different levels. This research was quasi-experiment research. The data analysis techniques performed by using the Gain test and ANOVA test. The result shows that there was an increase of students mathematical disposition ability in the class using PBL model and PBL-Teaching Teachers for both middle and low-level schools. At a medium level, improving the mathematical disposition of students with PBL-Team Teaching methods is better than PBL and conventional models. There is a significant interaction between mathematical disposition abilities based on the schools level and the use of learning models. There is no interaction between mathematical disposition ability and the use of learning model when viewed from Mathematical Preliminary Ability.

Keywords: PBL, Team-Teaching, Vocational High School, Mathematical Disposition

Topic: 1. Mathematics Education
[ABS-34]
Promoting Coupled-Inquiry Cycle Through Shared Curricular Integration Type To Enhance Students Argumentation

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Abstract
Systemic changes in key aspects of curriculum are essentially important because the challenges of emerged 21st century are growing rapidly. The changes made by the Indonesian Government in the 2013 curriculum, in line with such issue, are closely associated with scientific approach, student-centered learning, developing students thinking and collaboration skills, attitudes, exploring communication, and integrated learning. There are many schools teaching science partially. Not surprisingly, such obvious premises are leading to some overlapping subject materials among physics, biology, chemistry and inefficiency amount of time in classroom activities. Apparently, teachers have lots of difficult to design and integrate the science learning. To investigate the matter, the researchers are therefore interested to promote curricular integrated type employed by teachers in classroom, familiarly called as shared curricular integration. This type can be supported by coupled-inquiry cycle because it enables students to explore their argumentation. Moreover, the students argumentation activities can be supported through two fundamental investigations popularly called as experiment and communication through discussion. The methods of acquiring data were in regard to student argumentation tests and observation. The result of data analysis which is conducted with one sample t-test was coupled-inquiry cycle through shared curricular integration can enhance the students argumentation skills.

Keywords: Coupled Inquiry Cycle, Shared Curricular Integration Type, Students Argumentation Skill
Topic: 2. Science Education

[ABS-37]
Improving Academic Performance of Learners in Science Through Differentiated Instruction

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Abstract
All classrooms contain diverse groups of learners. This situation continues to exist as a challenge in providing quality education among the educators. Differentiated instruction in terms of learning styles and level of readiness of individual learner can address the problem on the class diversity. The main concern of this study is to improve the academic performance of the learners in Science by equipping the teacher with skills in using differentiated instruction. One group pretest and posttest research design was employed in conducting the study and purposive sampling method was used in selecting the respondents who were the learners from the last section of Grade Four. It was conducted at Sapad Central Elementary School specifically on the second quarter of the school year 2017 to 2018. Body Organs Questionnaires in Science, checklist on differentiated instruction, and learning styles inventory were the instruments used in collecting data of the study. The selected Science teacher was trained with skills on using differentiated instruction using the checklist adapted from Tomlinson (2006) and the said Science questionnaires together with its Table of Specification had undergone assessment for validity and reliability purposes. This was followed by having the Science teacher use differentiated instruction in teaching Science lessons and having the respondents answer the questionnaires in pretest and posttest. Appropriate statistical tools such as frequency and percentage, arithmetic mean, and paired t-test were then utilized to analyze the data gathered. The results of the study revealed that there is a significant difference between the pretest and posttest scores of the respondents and they have better performance in the posttest compared to pretest because of employing differentiated instruction in the classroom teaching. This concludes that differentiation of learners is effective in improving the academic performance of Grade Four learners.

Keywords: differentiated instruction, science, academic performance, diversity of learners
Topic: 2. Science Education
The Process of Schematic Representation in Mathematical Problem Solving

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Abstract

Representation plays an important role in solving mathematical problems, but not a few students who create difficulties in shaping it. Therefore, this study aims to reveal the process of formation of schematic representation by students during the realization of the word problem. The subjects involved in this study were 54 Junior High School students. See the schematic representation process in this research using the think aloud technique. In addition, task-based interviews were also conducted. The results obtained in this study are a schematic representation that can be formed as long as the students understand the problem. By establishing a scheme, students can solve problems so that students can receive the information contained in the problem. Schematic representation process begins with: a) read the problem repeatedly, b) identify the problem by forming a schematic, and c) create a schematic drawing. This schematic representation process is very effective in helping students understand the problem. Students success in understanding the problem affects the next stages of resolution so that students can solve the words problem well.

Keywords: representation, schematic representation, problem solving

Mathematics Teachers Supporting Higher Order Thinking Skill of Students Through Assessment as Learning in Instructional Model

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Abstract

The Curriculum 2013 revised in 2017 emphasizes the implementation of higher order thinking skills (HOTS) questions in learning and it is required for teacher to employ kind of evaluation such as assessment in students learning. The teachers as a supporter of both mentioned aspects needs to be given attention due to the difficulty of applying assessment as learning (AaL) and hots in mathematics learning. This is due to the unfamiliarity with the type of HOTS questions. AaL is a reflective learning based on obtaining feedback for both teachers and students. The current study is an experimental research aiming at assessing AaL in facilitating students solve HOTS problems. This mentioned aspect is the potential point helping teachers to assist their students learning and being successful learners. The subjects of this research are students of 7th grade in Sleman, Yogyakarta. The findings of this study are 1) an improvement has been found to happen after the integration of AaL in instructional model, and 2) The teachers succeeded employing portfolio for learners to facilitate HOTS in mathematic learning. Teachers used the portfolio with conceptualization and characteristic of AaL bases portfolio with problems of HOTS type.

Keywords: Teacher, Higher Order Thinking Skill, Assessment as Learning, Instructional Model

Topic: 1. Mathematics Education
[ABS-41]
Biochemistry Course Achievement Of Pre-Service Chemistry Teachers At One Of Islamic Institution Of Teachers Training Program In Bandung

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Abstract
The aims of this research was to analyse the achievement of Islamic institution of teachers training preservice chemistry teacher on biochemistry theory course and biochemistry laboratory course. It was a qualitative research with case study. The instruments used includes the documentation study of students academic grades for the last three years, interview guides, and students learning difficulties questionnaires of biochemistry. The analysis result of biochemistry theory course of the students in 2012, 2013 and 2014 shows that the grade of the students was distributed in the grade of C, except in 2013 that was in the grade of B. This findings different from the biochemistry laboratory course that was distributed in the A grade. Students categorize that biochemistry theory course and biochemistry laboratory course in the difficulty category (33.1%). Biochemistry theory course and biochemistry laboratory course were placed in the same semester, but not done in an integrated manner. Biochemistry laboratory course has been done after the students completed the biochemistry theory course test. It is suggested biochemistry course should be conducted in an integrated manner, therefore lectures on biochemistry theory course and biochemistry laboratory course were mutually supported in learning.

Keywords: biochemistry course, achievement, pre-service chemistry teachers

Topic: 4. Chemistry Education

[ABS-44]
Schistosomiasis: Knowledge, Attitude, and Practices Among School - Aged Children

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Abstract
Sapad is one the four municipalities in the province of Lanao del Norte which have Schistosomiasis infestation. The said disease can be acquired by having contact with infested water. This study aimed at gathering information about the knowledge, attitude, and practices of the school-aged children on the issues of Schistosomiasis. The method used was descriptive-correlational research design and employed lottery method in the selection of 100 respondents. Results revealed that the respondents appeared knowledgeable about Schistosomiasis; on the importance of using proper toilet when urinating or defecating; on the signs and symptoms of the disease; strongly agreed that taking Praziquantel is effective in treating Schistosomiasis; and always used footwear, drank safe water, and made sure their environment is clean; and never touched snails whenever they see them. It was concluded that there was no significant relationship between the academic performance of the respondents and their self-reported knowledge, attitude, and practices about Schistosomiasis as well as to their gender, source of income, residential location, and monthly family income. However, there was significant association between their academic performance, age and grade level. It is recommended that residents of Municipality of Sapad may work hand in hand in protecting the young ones from the disease and raise awareness of everyone about it.

Keywords: Social Science, Education, Schistosomiasis, Environmental Awareness, Health Education, Descriptive-Correlation Study, Sapad, Lanao del Norte, Philippines

Topic: 2. Science Education
[ABS-45]  
The Critical Thinking Effect Of The Computer Simulation In The Physics Teaching And Learning  

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Abstract  
Critical thinking skills (CTS) are essential learning outcomes. The development of computer simulation applications that are so fast, it needs to be utilized in learning for improving CTS. This study aims to see the effect of computer simulation, in this case, PhET simulation of CTS skill in physics learning for the subject of Work and Energy. This study was conducted on 8th-grade high school students in Yogyakarta, Indonesia. The research method used is pretest-posttest controlled group design. The control class and treatment class consisted of 32 students each. Learning is done in the form of a practicum using PhET simulation for 10 hours conducted in 5 meetings. CTS is measured with essays covering five questions that have been tested for different power, the degree of difficulty, validity, and reliability. The analysis technique used is paired sample t-test with error limit of 5%. From the results of this study shows that learning by using computer simulation tends to increase CTS (gain = 0.138) compared with conventional learning (gain = 0.015).  

Keywords: computer simulation, critical thinking skills, PhET simulation, physics learning  
Topic: 3. Physics Education  

[ABS-46]  
A Computer Based Learning Resource to Support Students to Learn Gas Law and Kinetic Theory of Gas  

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Abstract  
Physics is a subject that closely related to nature and being a basic for the development of technology. To give students a real experience, it is suggested to deliver the concept of physics through observation and hands-on experiments. However, some experiments are difficult to be carried out in the classroom. Carrying the experiment on gas law and kinetic theory of gas to the classroom may be challenging. Moreover, in the kinetic theory of gas, microscopic model of gas cannot be observed directly. In this study, we have developed a computer-based learning media that allow students to investigate the ideal gas law through computer simulations. The microscopic model of gas based on theory kinetic gas is also visualized in this computer-based learning media. Students can use this learning resource to help them study gas law and kinetic theory of gas by themselves. The computer-based learning resource is equipped with simulation of experiments, explanation, exercise, and quiz.  

Keywords: physics, kinetic theory of gas, gas law, computer-based learning resources  
Topic: 3. Physics Education
**Biology Modules with POGIL Approach to Enhance Students Analytical Thinking Ability**

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**Abstract**

POGIL (Process Oriented Guided Inquiry Learning) approach for learning is important to be developed for high school since it can enhance students analytical thinking ability. This research aimed to determine feasibility and effectivity biology module with a POGIL approach to increase student analytical thinking ability. The module development was done by generates purposes, raises questions, uses information, utilizes concepts, makes inferences, makes assumptions, generates implications dan embodies a point of view. Data collection was questionnaire and test performed pretest and posttest with control group design. Two classes were selected randomly as samples consist of 30 students in each group. Descriptive data analysis was used to analyze the module feasibility and t-test was used to analyze the analytical thinking ability. The results showed that the feasibility of the module development has very good results based on an assessment of the experts, practitioners, and peers. Based on the t-test results, there is a significant difference between control class and experiment class (0.004), n-gain score of control and experiment class respectively 0.50 (medium) and 0.60 (medium). It shows that the module is more effective than the textbook. It is able to improve students analytical thinking ability and worthy to used in learning.

**Keywords:** Biology Modules, POGIL, Analytical Thinking

**Topic:** 5. Biology Education

**Revitalizing Students Activities In Reading And Writing In Science: An Investment In Educational Improvement**

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**Abstract**

A literate science-information-technology people in the future cannot be prepared if based only on facts and concepts of the content areas that students acquired during school years. In a scientific literacy curriculum, reading and writing can serve as dynamic vehicles for learning science meaningfully. The role expectation for teachers must change from dispensers of knowledge to developers of self-regulated learners, thinkers, and problem solvers who know to use reading and writing to learn. Our real challenge is teaching children how to read, write, and to think about science. This article described briefly some published literature, numerous research results, meaningful and practical strategies on reading-writing to learn in science and presented their examples as well. It concludes that reading-writing to learn should be developed together throughout the school years. Improving the quality of reading and writing actually improve the quality of thought and, therefore, can be assumed as an investment in educational improvement.

**Keywords:** reading-writing to learn, reading technique, expository writing, expressive writing, graphic organizer

**Topic:** 2. Science Education
[ABS-52]
The Development And Validation Of Critical Thinking Skills Test On Photoelectric Effect For Pre-Service Physics Teachers

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Abstract
Critical thinking (CT) is one aspect of higher-order thinking skills emphasized in 21st century learning. CT skills are important to be trained and assessed through learning. Therefore, a test instruments capable of measuring students CT skills is needed. Unfortunately, there has not been much writing that informs the results of the development of CT tests on the physics domain, especially for advanced physics concepts. In this study developed CT test in photoelectric effect called CTPE test. Aspects of CT used in CTPE test are reasoning, hypothesis testing, argument analysis, likelihood and certainty analysis, and problem-solving and decision making. Each aspect is represented using two specific domains of CT on photoelectric effect concept. The validity of CTPE test is obtained through expert judgment (N=3). The CTPE test were then piloted on the students (N=32) to determine the reliability of the test instrument. The results of data analysis shows the value of the instrument reliability coefficient of 0.71, this means that CTPE test have a high degree of reliability. Based on the results, it can be concluded that CTPE test can be used to measure students CT skills on the concept of photoelectric effect

Keywords: Critical thinking skills test, Photoelectric effect
Topic: 3. Physics Education

[ABS-53]
The Development Of Cooperative Problem Solving Physics Laboratory Model On Simple Pendulum Concept

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Abstract
This study aims to develop a model of laboratory activity based on problem solving, called cooperative problem solving physics laboratory (CPSPL) model. The research was conducted at a university in Bengkulu, Indonesia. This research uses research and development method with 3D model consisting of define, design, and develop stage. The define stage contains a preliminary study aimed at exploring conditions that encourage the development of the CPSPL model. The design stage contains the design activities of the CPSPL model in formulating and defining the model syntax and experimental worksheet. The development stage contains the activities of realizing a conceptual framework in the form of a CPSPL product. At this stage the CPSPL model is validated by expert lecturer (N=3) and implemented to pre-service physics teachers (N=40) which has previously been grouped into three initial problem solving abilities, namely high, medium and low level. After implementation, a final problem solving skill test is performed. Based on the data analysis found that the improvement of students problem solving skills in the three groups are in good category and not significantly different. It can be concluded that the CPSPL model can be used to improve the problem solving skills of pre-service physics teachers.

Keywords: cooperative problem solving physics laboratory, Simple pendulum
Topic: 3. Physics Education
[ABS-54]
Pre-Service Mathematics Teachers Self-Concept Who Gets a Pedagogic Approach Suggested by APOS Theory and Direct Learning: A Comparison

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Abstract
The aim of this study was to investigate the difference between pre-service mathematics teachers self-concept who gets a pedagogic approach suggested by APOS theory and direct learning as a comparison in terms of students overall and their mathematical initial ability group. The pedagogic approach is Activity-Discussion-Exercise (ADE) teaching cyclic. This study used a quasi-experiment method with posttest-only control design. The research subjects were 120 pre-service mathematics teachers from two universities in Palembang, Indonesia. They were divided into experiment and control class. 62 students were placed in a learning atmosphere that applied ADE teaching cyclic, whereas 58 of them were given direct learning. Instruments that used in this study were self-concept questionnaire, observation, and interview. Data analysis tests used in this study were t-test, Mann-Whitney U test, and two ways ANOVA. The results of data analysis descriptively showed that pre-service mathematics teachers self-concept in experiment and control class are categorized very positive in terms of students overall and their mathematical initial ability group. From inferential statistic analysis, the result showed that 1) there is no significant difference between pre-service mathematics teachers self-concept who gets ADE teaching cyclic and direct learning in terms of overall and mathematics initial ability group, and 2) there is no significant interaction between learning factors (ADE teaching cyclic and direct learning) and mathematics initial ability group (high, average, and low) toward pre-service mathematics teachers self-concept. Based on the result, we concluded that ADE teaching cyclic and direct learning influent pre-service mathematics teachers self-concept very positively and not significant difference in this study.

Keywords: self-concept; ADE teaching cyclic; APOS theory
Topic: 1. Mathematics Education

[ABS-59]
Implementation Of Science Learning With Local Wisdom Approach Toward Environmental Literacy

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Abstract
Science learning related to everyday life including society traditions believed since ancestor, known as local wisdom. The aim of the study was to determine the effect of implementation science learning with local wisdom approach toward students environmental literacy. The research design was a matching-only pretest-posttest control group design. The population and sample were 7th-grade students of SMPN in Limapuluh Kota regency numbering 46 people. Data collection used environmental literacy instruments containing three components that are knowledge, competencies (cognitive skill) and affective. The results showed that data was normal and homogeneous so that based on t-test result showed that there was a significant difference in students environmental literacy between control and experimental class. The conclusion of the study that implementing science learning with local wisdom approach influenced students environmental literacy. The implication of this research is teachers should use local wisdom context on relevant science materials to reinforce the concept that students learned.

Keywords: Local Wisdom, Science Learning, Environmental Literacy
Topic: 2. Science Education
[ABS-60]
The Effectiveness of Problem Based Learning (PBL) Model With Cooperative Type Think Pair Share (TPS) in Terms Of Self Regulated Learning And Student Achievement Result

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Abstract
This research aims to describe the problem-based learning model with the cooperative type of think pair share in terms of self-regulated learning and student learning preservation. This research is a quasi-experimental research with quantitative approach. Instruments used to collect data include student achievement test and self regulated learning questionnaire. The results of research at the level of significance 5% indicates that the model of learning-based learning problems with cooperative set type think pair share effective review of self-regulated learning and student achievement. This is indicated by the t test value of self regulated learning of 3.95 and the value of t test for student achievement of 9.29, which is greater than t table of 1.64.

Keywords: Problem Based Learning (PBL); cooperative type Think Pair Share (TPS); self regulated learning; student achievement result

Topic: 1. Mathematics Education

[ABS-61]
How To Use Metacognitive Strategy In The Open-Ended Approach?

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Abstract
Mathematical thinking ability of elementary school students is still less than expected. The students need mathematics learning which could encourage them to think mathematically, one of the alternative is open-ended approach. Open-ended approach is an instruction that provide an opportunity for the students to solve the open-ended problems. During the students solve open-ended problem, they need to set their mind using metacognitive strategy. This study aims to explain the use of metacognitive strategy that could be used by the teacher in open-ended approach. The method of this study is literature study which summarizing and analyzing the result of various research that has been done. Using metacognitive strategies will encourage the student to solve the open-ended problem and think mathematically. It is because the students think about their way of thinking in solving the problem through the questions, journal, and mind map. The impact is the metacognitive strategies could be applied in open-ended approach.

Keywords: open-ended approach, metacognitive strategy

Topic: 1. Mathematics Education
Briquettes Production As Teaching Aids Physics For Improving Science Process Skills

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Abstract
The aim of this research is production briquettes as teaching aids in order to improve students science process skill. Research design used in this study was using experimental methods. One of the learning methods that can be used to equip students science process skill is the experimental method. In this study, students utilize agricultural waste and plantations around the school. Then they make the briquettes from the waste. This research used waste rice husk waste, durian leather and coconut fiber. After that, the results of briquettes will be assessed as the feasibility of teaching aids. The results of students affective and psychomotor ratings show excellent results. Among them are: classical affective average value for group 1 is 82.80; group 2 is 87.20; and group 3 is 85.20. While the classical average psychomotor value for group 1 is 82.80; group 2 is 86.20; and group 3 is 84.20.

Keywords: Briquettes, Teaching Aids, Process Science Skills
Topic: 3. Physics Education

Analysis Of Students Mathematical Reasoning Ability Materials Quadratic Equation On Selected Topics Subject Of Secondary School

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Abstract
The purpose of this research is to know the students mathematical reasoning ability in solving on the concept quadratic equation on Selected Topics Subject of Secondary School in terms of initial students mathematical ability. This research uses qualitative approach with descriptive research type. Sources of data used in this study is a sixth semester students of Mathematics Education FIP UMJ. Technique of collecting data through written test and interview. Based on the result of the research, it can be concluded that First, students with high initial ability categories have a tendency to use inductive and deductive reasoning elements well. Students can solve the problem of quadratic equations in the form of story problems in accordance with the steps of problem solving. Second, students with the medium initial ability categories have a tendency to use inductive and deductive reasoning elements well, but are less able to determine other ways to find answers. Third, students with low initial ability categories have a tendency to use inductive and deductive reasoning elements less well. Students are less able to solve the problem of quadratic equations according to problem solving steps and unable to determine other ways to find answers.

Keywords: Mathematical Reasoning Ability, Quadratic Equation, Selected Topics Subject of Secondary School
Topic: 1. Mathematics Education
Effective Practical Learning Model for the Subject of Basic Information Technology

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Abstract
Learning process requires students to have the ability to use computer as a means of life. A learning that utilizes technological devices entails special treatment in its process, including practice pattern usage. This article reveals the concept of technology learning process based on students perspective. The research applied a facts disclosure method of technology learning based on the observation and interviews with the X class students at the International Standard Boarding School of Amanatul Ummah, Mojokerto, on learning introduction of MsWord as word processor software. The research finding shows that the effectiveness of technology learning process is influenced by the adequate facilities; teacher competence; learning modules; student motivation; and learning atmosphere. As a part of technological learning, the effective practical technology-based learning process should: explain the benefits that students will gain; the ease of technology device usage; the access and availability of technology devices; the facilitation for students knowledge sharing; and using of multimedia in the learning process.

Keywords: effective, learning, practice
Topic: 6. STEM Education

The Influence Of Adversity Quotient On Students Mathematical Understanding Ability

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Abstract
The objective of this article is to describe the influence of Adversity Quotient (AQ) on mathematical understanding ability from students who is a candidate for the math teacher. The study was correlational research in the form of experiments. Population in this research is mathematics teacher candidate residing in Cimahi City, West Java, Indonesia, while samples are 55 mathematics teacher candidate specified purposively then determined randomly. Based on the results and discussion, it is concluded that AQ gives positive influence to students mathematical understanding ability with the coefficient of determination equal to 51,4%

Keywords: Mathematical Understanding; Adversity Quotient
Topic: 1. Mathematics Education
Metacognition in Successful Mathematical Problem Solving

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Abstract

Problem solving has become the 21st century core value in learning mathematics, but improving ones capability in succeeding in it is a continuing quest. In response to this need, the study aimed to determine possible presence and interrelationships of the metacognitive processes in successful mathematical problem solving (MPS). It sought to describe the qualities of the metacognitive solutions that led to the right solution, identified factors that contributed to the emergence of these qualities, and determined the stages of problem solving that required the said metacognitive processes. Guided by a post-positivistic perspective, the constructivist researcher found the covert cognitive phenomenon from 11 key informants. Corbin & Strauss (1998) grounded theory approach was utilized to guide and attain the purpose of this study through interviews, document analysis, and observation. Ethics requirements were addressed. Experts participation from the fields of mathematics, psychology, and education ensured the validity and reliability of the methodology. Findings resulted to seven metacognitive processes themes, namely: 1) metacognitive knowledge of the typology of mathematical problems; 2) metacognitive knowledge of the nature of mathematical problems; 3) metacognitive awareness of mathematical knowledge and thinking; 4) metacognitive knowledge of personal strengths; 5) metacognitive knowledge of MPS emotions and attitude; 6) metacognitive knowledge of thinking associated with bodily motion experiences; and 7) metacognitive solution qualities. The metacognitive solution qualities are the ten micro-metacognitive processes found to be regulating the first six metacognitive processes influencing the emergence of the three macro-metacognitive stages in successful MPS: 1) metacognitive understanding process; 2) the metacognitive conceptualization of mathematical strategy; and 3) metacognitive execution of the strategy. Furthermore, findings sifted six propositions of the emerging theoretical framework grounded within conditions set by this research. Implications and recommendations emphasized teaching-learning integration of metacognitive thinking strategies, metacognitive affect and bodily motion, micro and macro metacognitive experiences, curriculum review, and conduct of further studies and local researches.

Keywords: Metacognition/Metacognitive Processes, Metacognitive Problem Solving Stages, Successful Mathematical Problem Solving

Topic: 1. Mathematics Education
[ABS-68]  
Development of Student Worksheet For Enhancing of Graphical and Mathematical Construction of Physical Phenomenon of Pre service Mathematics Teacher in Basic Physics Lecture  

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Abstract  
The pre service mathematics teacher needs to have the competence of his mathematical literacy. According to NCTM (2014) the competence of mathematician teacher candidates must have problem solving abilities, communication, logic inference reasoning, connections and representations. Basic physics courses can be providers to equip the ability of graphical and mathematical representation of a physical phenomenon for math teacher candidates. Unfortunately, physics lectures for mathematics teacher candidates have been viewed more as a form of knowledge than as a form of thinking or a method of investigating in mathematical literacy. This is what causes the results of physics lectures have not shown significant significance to the competence of math teacher candidates. The researcher develops the structure of lectures, teaching materials, student worksheets, appropriate instruments and lecture methods to equip the graphic and mathematical representation capabilities of a physical phenomenon for mathematics student candidates. The method to be used in this research is mixed methods method with Embedded experimental model design. This method emphasizes the collection of development data by involving quantitative and qualitative data processing conducted simultaneously during the development process. The steps taken in this study include 5 steps, namely preliminary study, literature study, preparation, implementation and ending with analysis of results and preparation of reports. In this paper the researcher will describe the achievement of the development stage of the student worksheet which is oriented to the ability of construction of graphic and mathematical representation of a physical phenomenon in basic physics lecture for prospective math teacher. The Student Worksheet is developed for experimental activities by understanding the construction of mathematical graphs of a physical phenomenon for linear, quadratic and trigonometric functions  

Keywords: Physics Education, Construction Mathematical graphs, Preservice Mathematics Teacher  
Topic: 3. Physics Education

[ABS-69]  
Development of 7E Model Lesson on Earth Systems: A Lesson Study  
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Abstract  
The study aimed to develop a 7E model lesson on Earth Systems and implement it through the lesson study approach. The developed lesson was based on the standards provided by the Department of Education in the K to 12 Basic Education Curriculum Senior High School where it underwent a series of validation, revision and evaluation for further improvement prior to its implementation. The study tested the effects of the developed 7E model lesson on the conceptual understanding of the respondents. The developed 7E model lesson was implemented through lesson study approach to the three class sections of Grade 11 STEM of Iligan City National High School, School Year 2017-2018. Achievement test was conducted to the respondents. The result of the study shows that respondents exposed to the developed 7E model lesson had significant higher test scores in the post-test as compared to the pre-test. Result implies that there is a positive significant impact of the 7E model lesson on the conceptual understanding of the respondents on Earth Systems.  

Keywords: 7E Model Lesson, Development, Lesson Study, STEM  
Topic: 2. Science Education
[ABS-70]
Error Analysis in Solving Mathematical Communication Problem of Junior High School Students

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Abstract
This research was a descriptive qualitative research. This research aims to analyze students error in solving mathematical communication problem on circle topic. Population in this research was all students studying in the 9th grade of SMP Negeri 3 Lembang Bandung Jawa Barat. The sample was 39 students (22 female and 17 male) that was chosen by purposive sampling technique. Data was collected from students through essay test. The data was analyzed with descriptive way. The results of this research indicate that percentage of error in using circle area formula was 5.1%, error in linking concept is 25.6%, and error in understanding the meaning of the problem was 17.9%. Students error in solving mathematical communication problem was caused by many factors, such as students were not used to solve mathematical communication problem, less accuracy, and less conceptual understanding of mathematics. Based on the result, the researcher suggest to: 1) increase students understanding of formula rather than memorize it, 2) increase students understanding of problem, and 3) give students more exercise related non-routine problem.

Keywords: students error, mathematical communication
Topic: 1. Mathematics Education

[ABS-72]
Elephants Toothpaste: Review of Exciting Chemistry Learning in Senior High School

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Abstract
Innovative and creative learning can be done through simple demonstrations to strengthen the understanding of chemical concepts. One simple demonstration is Elepanths Toothpaste experiment which can train students to apply knowledge in investigating and explaining the effect of temperature, pH, enzyme concentration, substrate concentration on reaction rate with catalyst. The purpose of writing is to provide a reference in teaching chemistry with fun methods. The Elepanths toothpaste experiment undergoes a hydrogen decomposition reaction into water and oxygen gas by yeast or potassium iodide which is the source of the catalase enzyme. Yeast or potassium iodide acts as a catalyst by decreasing the activation energy, so the reaction is easy to occur. Foam is formed by the reaction between oxygen and detergent in water, which increases in number as the concentration and strength of the catalyst increases. Implementation of elephants toothpaste experiment in school can be done with problem-based learning model, where students are taught to further improve concept understanding with problem solving. The existence of chemistry learning with elephants toothpaste experiments is expected to improve understanding of chemical concepts and create enjoyable learning.

Keywords: elephants toothpaste, fun learning, chemistry
Topic: 4. Chemistry Education
[ABS-73]
Attitudes of Teachers Towards ICT and their Perceptions about the Factors that facilitate ICT Integration

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Abstract
This study was conducted to teachers of Pagayawan Integrated School. The purpose of this study is to assess the respondents attitudes, as well as their perceptions about the factors that facilitated ICT integration. This study is quantitative and qualitative in nature. Questionnaire was used in gathering data. The results of the study shows that majority of the teachers have accessed to computer and internet at home and at school, have attended basic ICT trainings and integrated ICT mostly in teaching Science. Furthermore, teachers perceive themselves as competent towards ICT integration and they hold positive attitude towards it. Statistics shows that there is a significant relationship between years of service with their level of competency and attitudes towards ICT integration. Moreover, gender, highest academic qualification, access to computer and internet at home and in-service training have a significant relationship with teachers attitudes towards ICT integration. It is then recommended to integrate the use of ICT in their teaching to improve their efficiency and develop learners skills. Administrators may also monitor teachers ICT integration to ensure the application of ICT skills in the classroom setting.

Keywords: Education, ICT Integration, Attitude toward ICT, Perception toward ICT, Quantitative and Qualitative Research, Lanao del Norte, Philippines

Topic: Other Relevant Fields

[ABS-74]
Metacognitive Therapy For Mathematics Disorder

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Abstract
Mathematics disorder is a learning disability that severely affects a person mathematical ability. This study is a descriptive qualitative research. The participants of this study were two university students of the department of mathematics education, Universitas Islam Malang. This paper describes Metacognitive therapy (MCT) for students who have mathematics disorder. MCT therapy is done by asking metacognitive questions, namely: comprehension questions, connection questions, strategic questions, and reflection questions. The goals of MCT are to first discover what students believe about their own thoughts and how their mind works about mathematics, then show the students how these beliefs lead to unhelpful responses to thoughts that serve to unintentionally prolong or worsen symptoms, and finally to provide alternative ways of responding to thoughts in order to allow a reduction of symptoms. It is necessary to further research whether the result of metacognitive therapy is only temporary or not.

Keywords: mathematics disorder, metacognitive, therapy

Topic: 1. Mathematics Education
Analysis of Prospective Teachers Mathematical Problem Solving Based on Taxonomy of Reflective Thinking

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Abstract
Reflective thinking is a mental activity that produces changes in viewpoint through the process of re-interpretation which involves the process of analysis and decision-making about what has been done. Reflective thinking in solving problems plays an important role in the next problem solving process. It is because the students are able to realize and think about what they have done and they can use it for solving the next problems. One way to see how far reflective thinking has been used in problem solving is taxonomy of reflective thinking. This study aims to describe taxonomy of reflective thinking of teachers to be in problem solving. The subject of research is a student majoring in math education at Universitas Muhammadiyah Makassar. The results showed that subject met the six levels of reflective thinking starting from level (1) remembering, (2) understanding (3) applying, (4) analyzing, (5) evaluating and (6) creating. The conclusion provides ideas about the taxonomy of reflective thinking that describes the depth of reflective thinking in solving mathematical problems. Each level illustrates the skill characteristic to use mathematical knowledge. Teachers are expected to have awareness to teach students to think reflectively up to the highest level

Keywords: Prospective Teacher, Mathematical Problem Solving, Taxonomy of Reflective Thinking

Topic: 1. Mathematics Education

CAI And Conventional Method For Retention Of Mathematics: An Experimental Study

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Abstract
An experimental study was conducted to compare the effectiveness of Computer Assisted Instruction (CAI) and Conventional Method (CM) for retention of Mathematics in Higher Education. Instructional and measuring tools were developed for five units of Matrix Algebra, two units of Calculus & five units of Numerical Analysis. Pilot study was also conducted to examine reliability and validity of tools. Ninety undergraduates participated in final study. Pretest Post test Equivalent Groups research design was used. SPSS was used for data analysis. Findings supported efficiency of CAI for retention of basic mathematical concepts. Administrators should encourage faculty members to develop Computer Assisted Instructional Material (CAIM) for retention of basic Concepts of Mathematics in Higher Studies.

Keywords: CAI, CAIM, CM, Retention

Topic: 1. Mathematics Education
[ABS-78]
Exploring Informal Inferential Reasoning: The Study On Comparing Two Data Sets Problem

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Abstract
Informal inferential reasoning as part of statistical reasoning is extremely important in learning. However, this reasoning has not been widely studied in Indonesia. This article explores informal inferential reasoning of students in solving comparing two data sets problem. This qualitative research was involved 118 junior high school students in Mataram West Nusa Tenggara. Instrument in this study is Assessment of Informal Inferential Reasoning (AIIR) which was modified and validated by mathematics and mathematics education experts. Student responses are classified based hierarchical cognitive framework. The findings showed that the existing levels was still relevant for the students of junior high school in Mataram. However, there were subjects which could not be classified in the levelling. The characteristic reasoning of the subjects are tends to ignore the variability and distribution aspects of the data in making predictions, but they can indicate significant value differences between two groups of data. They encountered an error in certain aspects, but they are able to produce an almost right conclusions. This study recommends the need for a new levelling to assess informal inferential reasoning of junior high school students by considering the ability of local and global view of data.

Keywords: informal inferential reasoning, comparing two data sets problem, local and global view of data

Topic: 1. Mathematics Education

[ABS-79]
Characteristics Middle School Students Generalization Of Pattern

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Abstract
Much research on generalization of Algebra, but related to the generalization of the pattern is still lacking. In this study we characterizing middle school students generalization of pattern. The participants were 40 students grade 8 took the test with instruments that have been developed and analyzed students working. The findings indicate that students showed the three characterizing in generalization of patterns that: (1) Factual, (2) Symbolic. Possible reason are discussed and suggestions for teaching with generalization of patterns are presented.

Keywords: Generalization of pattern; Factual; Symbolic
Topic: 1. Mathematics Education
Critical Thinking of Extrovert Boys in Problem Solving

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Abstract

The purpose of this research is to know the ability of critical thinking of Extrovert Boys in Problem Solving. This research used qualitative descriptive that conducted at SMP Muhammadiyah 8 and the students of VII grade as subject and the object is critical thinking skill in problem solving. It used Eysenck Personality inventory-A (EPI-A) test for the instrument which conducted in the first meeting to all students, problem solving test was given to 6 extrovert boys and interview. Problem solving strategy used to know critical thinking skill by giving personality EPI-A test in the first meeting on students of VII grades to find respondents, 6 extrovert boys. After finding the respondents, the next step is giving problem solving test. The researcher interviewed the result of respondents. Findings showed that: 1) High critical thinking of extrovert boys were not success in strategy step, only in alternative solution; 2) Moderate critical thinking of extrovert boys were not success in strategy step, only in alternative solution, and 3) Low critical thinking of extrovert boys were not success in inference and strategy step.

Keywords: Critical Thinking Skill, Problem Solving, Boys, Extrovert

Learning Models Based Sundanese Local Wisdom: Is it Effective to Improve Students Learning Outcomes?

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Abstract

Local wisdom is a potential that can be integrated in developing learning models in schools. In West Java, Sundanese culture local wisdom has a particularly high diversity of folk games. This research is focused on developing biology learning model by integrating local wisdom in the form of Sundanese ethnic folk games. This study aims to determine the effect of the learning model that integrates Sundanese local knowledge in improving students learning outcomes. The method used is quasi experiment with quantitative descriptive design. Research subjects consist of students from various levels of education, ranging from elementary school, junior high school and senior high school. The results showed an increase in learning outcomes at all levels, the highest increase in primary school (average Ngain = 0.6), Junior High School (average Ngain = 0.37) and Senior High School (average Ngain = 0.39). Based on the results of this study it can be concluded that the model of biology learning by integrating local wisdom in the form of Sundanese folk games can improve students learning outcomes. A high increase occurred in elementary school students. Based on the results of interviews with elementary students, they still love learning through the game.

Keywords: learning model, local wisdom, Sundanese folk games, learning outcomes

Topic: 5. Biology Education
[ABS-82]
Analysis Of Students Mental Model Of Salt Hydrolysis Concepts At Klaten, Central Java

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Abstract
This paper describes students mental model of salt hydrolysis concepts. The subjects of this study were the best science class of public senior high school at Klaten, Central Java. This research employed ethnography as a research methodology. Data were collected through in-depth interview, classroom observation, and reflective journals. The result showed that students built their mental model based on their understanding and experience that influenced by their ethics and values. The values of politeness, empathy communication, and respectful influence their classroom interaction. The students mental model in salt hydrolysis concepts were divided into understanding and misconceptions. Students misconceptions were the concept which states that salt hydrolysis is the salts decomposition in water. Students were not consider about dissociation and equilibrium of acid and base to explain about salt hydrolysis. In addition, the students also determined salts characteristic of acid and base by the origin of ions in the salts, not based on hydrolysis reaction of the salt. Teachers understanding of students mental model will help the teacher to developing meaningful learning experiences.

Keywords: Mental Model, Ethnography, Salts Hydrolysis
Topic: 4. Chemistry Education

[ABS-83]
The Development Of Android-Based Chemistry Learning Media Oriented Towards Generic Science Skills

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Abstract
This study aims to describe the production stages and the eligibility value of Android-based learning media oriented towards students generic science skills on the concept of colloids. This study uses Research and Development method with three stages, namely analysis, design, and development. Analysis stage produces conceptual connectivity and generic science skill indicators in concept presentation strategies. Design stage produces flowchart and storyboard, and development stage produces Android-based learning media with conceptual characteristics presented through materials and directional questions to develop generic science skills, equipped with visualization in the form of videos, pictures, and texts. The result of validity test conducted by chemists and media experts is declared valid with the value of rhitung = 0.8-0.9. The result of limited trials conducted to chemical education students shows that 90.76% of them agree and 9.24% disagree. These results indicate that Android-based learning media oriented towards generic science skills is feasible to use in learning the concept of colloids.

Keywords: android, generic science skills, colloids, learning media.
Topic: 4. Chemistry Education
Solubility Equilibrium Learning Suported by PhET SS

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Abstract

Learning materials about solubility and solubility products tend to discuss the calculation aspects only. Therefore, it requires media able to describe the dissolution process in sub-microscopic and symbolic, namely using computer-based simulation. A learning using inquiry model supported by simulation media, PhET-SS, is required in order to make students capable of mastering the concept and to improve learning effectiveness in the classroom. This study aims to analyze the improvement of students mastery on the concepts of solubility and solubility products after learning using inquiry model supported by PhET. The method used in this study is pre-experimental method with one group pre-test and post-test design. The subject of this study consists of 38 science students at senior high school. The research instrument used is in the form of mastery test on the concepts of solubility and solubility products. The result data is tested using N-Gain. The results show that the application of inquiry model supported by PhET-SS can improve the students mastery on the concepts of solubility and solubility products. It can be seen form the number of students experiencing increased mastery of the concept in high, medium and low category with average N-Gain in the medium one.

Keywords: Inquiry, Equilibrium, Salt Solubility, PhET
Topic: 4. Chemistry Education

The Use of Video Laboratory Report to Develop Presentation Skills in Science Teacher Education Students.

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Abstract

As the information technology growing so fast, the students in today science classroom is a digital natives student. Science Teacher Education Program in the university is facing the challenges to adapt the situation in order to prepare future science teachers that having the skills to teach those students. The skills for future science teacher are acquired through the pre-service science teacher education program at the university. One of the most important for science teachers skills is presentation skills using information technology. This study tried to explore the use of video laboratory report to develop pre-service science teacher presentation skills using information technology in Science in Daily Life Course provided by one of the undergraduate teacher education program. From this study, pre-service science teachers indicated that the use of video in reporting laboratory activity, supported by feedback from the lecturers and YouTube as the media to upload and share their video had enhanced their skills to do laboratory activity presentation in the form of video.

Keywords: video laboratory report, presentation skills, science teacher education
Topic: 2. Science Education
Competency Indicators of Integral Calculus in Scientific Debate Strategies Based on Student Education Background

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Abstract
Middle schools in Indonesia are one of the educational levels pursued by Indonesian children informal learning. This stage is a strategic and critical stage for the development and future of Indonesian children. This study aims to analyze the influence of students education backgrounds that are: SMA, MA, and SMK towards increasing the integral concept competence with Scientific Debate. The research was an experiment involving 200 college students. Enhancement of competence data is calculated using normalized gain. Value categories use Standard Reference Benchmark. The influence of educational background on the competence enhancement was analyzed using One Way ANOVA and Kruskal Wallis. The results showed that average of competence enhancement was the medium category. Competence indicator average with education background of SMA includes the concept understanding good; procedure fluency good; strategic competence enough; adaptive reasoning enough and productive disposition excellent. MA includes an understanding of concepts enough; procedure fluency enough; strategic competence enough; Adaptive reasoning enough and productive disposition good. SMK includes an understanding of concepts enough; fluency of procedure enough; strategic competence enough; Adaptive reasoning less and Productive Disposition good. The educational background of the college students does not have a significant influence on the increase in Integral Calculus competence.

Keywords: Competency Indicator, Scientific Debate Strategy, Educational Background, One Way ANOVA, Kruskal Wallis

Effectiveness of Science Learning Materials Based Guided Discovery Model to Improve Science Process Skills

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Abstract
The curriculum 2013 is developed with the refinement of teacher centered learning into student centered learning. The learning design in the curriculum 2013 is emphasized on the application of science process skills. Based on premilinary study in junior high school, the science process skills of the students is weak. Therefore, teacher must practice science process skills to students with suitable learning model. One of learning model that suitable to practice science process skills is guided discovery model. The purposes of this research is to describe the effectiveness science learning materials based guided discovery model to improve science process skills. The effectiveness of learning materials is reviewed from science process skills of the students and student response. The development research method using 4D model. The process of developing science learning material starts from defining step, the process of designing the learning material developed based on information obtained from the step of early analysis, learners, materials, tasks that support then done the design step or design, then the last step is the development step. Based on the result of the research, it is found that science process skills of the students are improved and the students gived a positive response after learning with the learning material based guided discovery model. It is conclude that, science learning materials based guided discovery model is effective to improve science process skills.

Keywords: learning materials, guided discovery, science process skills

Topic: 2. Science Education
Guided Inquiry Based Worksheet Development To Improve Science Process Skills In Junior High School Students

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Abstract
This development research aims to produce a suitable (valid, practical, and effective) guided inquiry based-worksheet in the topic of energy to drill student science process skills. This research is developed using three stages of 4D (four D models) which consists of define, design, and develop. The developed worksheet is tested to 12 students of grade VII SMPN 5 Pamekasan. The data collection uses validation method, observation, test, and questionnaire. The data analysis technique applies qualitative descriptive analysis. The research result shows that: 1) the developed worksheet is categorized valid, 2) the worksheet practicality seen from the lesson plan implementation using guided inquiry model is categorized good, 3) the worksheet effectivity, seen from the N-gainscore, student science process skills is categorized high and the student response to the worksheet is considerably positive. Based on the research result, it can be concluded that the developed worksheet is valid, practical, and effective to improve student science process skills.

Keywords: student worksheet; guided inquiry model; science process skills

The Influence of Problem-Based Learning Model Application on the Improvement of Students Problem Solving Ability in Learning Mathematics

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Abstract
This study aims to determine the effect of Problem Based Learning model on student problem solving abilities in learning mathematics class X in SMA Bait Al-Quran. The study was conducted in the odd semester of the academic year 2017/2018. The type of research used is true experimental design with experimental design used in the form of random, pre-test, post-test design. The sample of this study was class X of Palestine as experimental class and class X of Yemen as control class. The learning process in the experimental class gets treatment with the PBL model and in the control class is taught by conventional learning. Data collection using essay-type test technique is five questions to measure student problem solving abilities. Based on hypothesis test by using t-test at significant level alpha = 0.05. Based on the analysis of t-test the final test data is obtained value of Sig. (2-tailed) of 0.00 < 0.05 then according to the basis of decision-making in the T-Test can be concluded H0 rejected and Ha accepted. Thus the hypothesis proposed in this study proved, that there is a significant influence PBL model on the ability problem-solving mathematics students class X SMA Bait Al-Quran Kayuagung

Keywords: learning mathematics; problem solving; Problem Based Learning

Topic: 1. Mathematics Education
The Importance Of Using Socio-Scientific Issues In Biology Learning For Preparing Students As A 21st Century Society

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Abstract
The purpose of 21st Century Education is to prepare students as societies by empowerment high order thinking skills, such as constructs arguments and decision making based on the evidence of Socio-scientific Issues (SSI). However, most teachers have limited experience in teaching SSI in their classes. Research learning through SSI to help limited experience in the teaching SSI has grown in various countries by raising issues related to learning materials in the society case. Literature review studies about SSI in biology learning research are needed to provide recommendation SSI approach in biology learning for preparing students in 21st Century societies.

Keywords: socio-scientific issues (SSI), innovative biology learning
Topic: 5. Biology Education

Development of Critical Thinking Instrument of Electricity for Senior High School Students

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Abstract
Teaching and learning in 21th Century is recommended to achieve higher order thinking skills (HOTS), such as critical thinking skills. However, the availability of instruments of critical thinking skills at senior high school level is very limited. This paper discusses the development of a critical thinking skills instrument on the topic of electricity, dynamic electricity and static electricity for senior high school students. The development procedure consisted of seven stages. The subjects in present study consisted of three experts for content, construct, and language assessment, three students for readability test, and 70 high school students for validity and reliability tests. From the results of Pearson correlation coefficient and Cronbach alpha value, there were 4 indicators (out of 6 indicators) with 32 items were valid and reliable. Thus, the critical thinking instrument of electricity topic may be used to measure students critical thinking skills at senior high school level.

Keywords: critical thinking, development, electricity, instrument test
Topic: 3. Physics Education
[ABS-94]
The Using of Handbook PBL Oriented in Introductory and Laboratory Techniques Course

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Abstract
Development of handbook Problem Based Learning (PBL) oriented in the introduction and laboratory techniques course have been done and obtain very valid results. Therefore, this research is continued in practical test phase. The purpose of this research is to develop the handbook in associated to problem-based learning approach in introductory and laboratory techniques course at practical stage. This research is a development research. The research models and procedures use 4-D (four-D models) development model consisting of 4 stages: define, design, develop, and disseminate. The research data of handbook is obtained from the questionnaire of practicability. Practicality data obtained from the questionnaire by 2 lecturers and 69 students. The result of practicality assessment by the lecturer was 90% (very practical), and the result of the students practicality assessment was 76% (practical). It can be concluded that the result of PBL-oriented handbook practice in introductory and laboratory technique, obtaining very practical value from lecturer and practical from student.

Keywords: Introductory and Laboratory Techniques, Practicality, Handbook

Topic: 5. Biology Education

[ABS-95]
Junior High School Students Strategy In Partial Formal Correspondence Relationship Generalization

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Abstract
Partial formal correspondence relationship generalization is general rule that described the correspondence relationship of the pattern. Symbolic statements were obtained through relating, searching and extending process by paying attention to the parts of the image on the problem partially. The purpose of this research was to describe junior high school students strategy in partial formal correspondence relationship generalization. This research was a qualitative research with data collection method by using think aloud and interview. Subjects in this research there were two students selected from five students who were included in the category of partial formal correspondence relationship generalization. The results showed that the strategies undertaken by students in partial formal correspondence relationship generalization was a contextual strategy. In relating process, the subject observed and they were given the image partially and they connected the parts that existed in the picture. In searching process, the subject found the same pattern or procedure based on the information obtained from the image contextually. Then in extending process, the subject applied the pattern or procedure obtained while searching for a more general case.

Keywords: contextual strategy, partial formal, generalization

Topic: 1. Mathematics Education
Implementation Skill of Disruptive Innovators (SDI) to Improve Creativity Through Science Learning On Green Biotechnology Conceptions

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Abstract
The purpose of this study is to identify the development of creativity in the concept of green biotechnology. To simplify the learning process, this concept can be divided into two sub-concepts: 1) fermentation and 2) preservation. This research was conducted by the pre-experiment method with the design of one pretest-posttest group. Respondents involved in this study were 82 pre-service elementary teachers (PSET) 5th graders at Universitas Sebelas Maret. The process of improving the PSET creativity is examined based on a normalized gain analysis of the pretest and posttest values for all sub-concepts. The results showed that creativity dramatically increased by 47% (moderate) in fluency; 43% (moderate) on flexibility, 70% (high) on novelty. This result makes clear that the implementation of SDI utilizing science learning can improve the overall creativity at a moderate level.

Keywords: fluency, flexibility, novelty, pre-service elementary teachers
Topic: 2. Science Education

Perception of Primary Mathematics Teachers on STEM-oriented Teaching and Learning

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Abstract
This study aims to examine the perception of primary school mathematics on STEM-oriented teaching and learning. The main focus of the study was on teachers perceptions towards STEM teaching and learning from aspects of general perception, training, implementation and STEM teaching information. Secondly, to identify the challenges faced by teachers during the implementation of STEM in the classroom. Samples of the study consisted of 40 primary school teachers randomly selected using the google form. The data were analyzed using descriptive analysis. The findings show that early perception of STEM teachers is positive and teachers are prepared to face STEM teaching and learning process. Despite the challenges faced by the respondents, they are still working to teach in accordance with the curriculum prepared by the Ministry of Education Malaysia.

Keywords: Perception, STEM Education, primary mathematics school teachers
Topic: 1. Mathematics Education
The Importance Of Teaching Materials Based Local Potential Mangrove Ecosystems: Introduction Study

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Abstract
Local potency-based learning provides knowledge, skills, understanding of the state of the environment and the needs of local communities in accordance with the values or rules that apply to learners. This study was a introduction study on the used of local potency-based teaching materials by SMK N 1 Legonkulon Fisheries adjacent to damaged mangrove forests. The method used in this research was descriptive-qualitative method. Preliminary data regarding the importance of application of teaching materials were explored through interview instruments for teachers and students. The subjects were 2 teachers and 15 students from SMK N 1 Legonkulon. The results showed that 100% of students did not study the mangrove ecosystem in learning and did not know about the relation of mangrove existence to the fish population. Teachers claimed only teach the ecosystem in general and did not convey the subject matter about the mangrove ecosystem due to not having the teaching materials associated with the mangrove ecosystem. Based on preliminary study it was deemed necessary to apply local potential-based teaching materials so that students better understand and care about the environment, and better understand the concept of ecosystems to gain useful learning.

Keywords: Local Potential, Teaching materials, Mangrove Ecosystem
Topic: 5. Biology Education

Scientific Approach in Developing Mathematical Analogy and Communication Ability of Junior High School Students in Remote Areas

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Abstract
This study aims to determine the ability of mathematical analogies and communication ability of students in remote areas through a scientific approach. The research method is quantitative with pretest and posttest design in the experimental class. The subjects were 117 students consisting of 29 students of class VII, as many as 43 students of class VIII, and as many as 45 students of class IX. The results showed that through the scientific approach, the mathematical analogy ability of grade VII students increased with the low category, while class VIII and IX increased by medium category. Mathematical communication ability of grade VII and VIII students increased with the high category, and class IX increased with the low category. Students are actively involved in observing problems, asking questions, trying strategies, solving problems, and concluding concepts. Students are good at getting involved to help less-clever students. Students in remote schools have the potential to develop analogy and mathematical communication skills, although parents awareness in developing students mathematical abilities is low.

Keywords: Scientific Approach, Mathematical Analogy Ability, Mathematical Communication Ability
Topic: 1. Mathematics Education
[ABS-100]
Mathematics Writing Ability Based On High Self-Efficacy

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Abstract
The purpose of this research is to describe how students with high self-efficacy are able to write mathematically. Write mathematically is an activity that is rarely done by students when solving a problem. Writing mathematically means how students writing the problem-solving coherently, completely, and systematically. The students always only do calculate without regard to other variables in the problem and write the solving mathematically. It because the math is considered a very difficult lesson, so many students who are not really to solve the problems even students do not believe in their ability. Students self-confidence in their ability to solve math problems is closely related to self-efficacy. This research method is a qualitative descriptive with purposive sampling. The subjects are three students in the 9th grade of SMP Negeri 1 Plaosan Magetan East Java with a high category of self-efficacy. Data obtained from the results of written problem solving and interviews. The results of this research shows that students do not describe the illustration of the problem will be solved. So it can be known that students with the high category of self-efficacy have not been able to get all mathematical writing indicators in write the problem solving.

Keywords: mathematics writing, self-efficacy

Topic: 1. Mathematics Education

[ABS-101]
Edmodo-based Blended Learning on Mathematical Proving Capability

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Abstract
This study aims to learn the differences in terms of mathematical proving capability achievement of students using Edmodo-based blended learning model according to the levels of prior mathematical knowledge (high, medium, low), compared to those with conventional model, and the students attitude towards mathematics learning using Edmodo-based blended learning model. This study uses quasi-experimental method. The subjects of this study are the second graders of junior high school. The research instrument consists of tests and non-test. The results of this study show that: there is a difference in terms of mathematical proving capability improvement between students using Edmodo-based blended learning model and those using conventional model; there is also a difference in terms of mathematical proving capability achievement between students using Edmodo-based blended learning model and those using conventional model based on the levels of prior mathematical knowledge (high, medium, low); Students show a positive attitude towards mathematics learning using Edmodo-based blended learning model. Edmodo-based blended learning has implications for teacher activeness by using technology for education and student self-reliance in the learning process.

Keywords: edmodo-based blended learning, mathematical proof, prior mathematical knowledge

Topic: 6. STEM Education
Implementation Of Cooperative Learning Model Group Investigation To Improve Students Self-Efficacy And Learning Achievement On Statics Fluid

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Abstract
Learning physics requires complex aspects of the students, not only the skill for achieving a task but also their beliefs of about their ability in overcoming the difficulties in achieving the purposed targets. In this case, students self-efficacy takes an important role in determining their success to improve their learning achievement. This research aimed to improves students self-efficacy and learning achievement with cooperative learning GI on statics fluid. A one group pre-test- post-test design was implemented to the sample of 75 students with three-time replications. This research was conducted at Senior High School 3 Singaraja in the odd semester of the academic year of 2017/2018. Research data were collected by using questionnaire, observation, and test. The N-Gain score and qualitative descriptive analysis were applied to analyze data. The results indicate that: (1) there is an increase in students self-efficacy with a high N-Gain score, (2) there is an increase in students learning achievement with a high N-Gain score and (3) the students response is positive to the learning activity. The conclusion is that the implementation of cooperative learning model GI can facilitate students to improve their self-efficacy and learning achievement on learning physics, especially for statics fluid.

Keywords: group investigation, learning achievement, self-efficacy

[ABS-103]
Improving Students Science Process Skills Through Inquiry Model On Material Elasticity

Subjects
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Abstract
This study aims to improve science process skills of high school students through inquiry model on material elasticity subject. The experimental design of learning applied by using one group pretest posttest design tested on XI MIA5 and XI MIA4 classes with a total sample of 30 students. The data collected includes science process skill data, observation data, and student response data. Data analysis techniques used include; 1) qualitative descriptive analysis of skills of science processes, students activities and responses. 2) parametric statistical analysis of normality test, homogeneity test, and t-test. The result of the research indicates that: 1) there is a significant improvement of science process skill in every indicator of students science process skill including determining variables, interpreting, summarizing, formulating problems, and formulating hypotheses. 2) experiment is the most prominent students activities, and 3) The students response after taught using the inquiry model is very positive, with the highest percentage of student response is with teacher guidance when working on the students worksheet. Based on the results of this study, inquiry model can improve science process skills of students of SMAN 5 Ambon on the subject of elasticity material.

Keywords: Science process skill; Inquiry model
Topic: 3. Physics Education
The Development Of The Problem-Based Learning Module To Facilitate Students Mathematical Reasoning

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Abstract

The instructional materials which are distributed in schools are not developed to facilitate the students abilities, instead of only consisting of concepts with suitable formulas and the questions without solutions. Based on the problem, the aim of the research is to develop an instructional material in the form of the module which can facilitate the students mathematical reasoning. The research used the development model design of Dick and Carey consisting of nine steps. The module was developed with problem-based learning model in the circle lesson and was evaluated in the validity test. The validity test was examined by four validators dealing with content, construct, language and technique. The module was evaluated in two stages consisting of small and big group tests by students of Senior High School 10 Pekanbaru. After having learned with the developed module, students were tested to solve the problems to know their mathematical reasoning. The results were that the developed problem-based learning module is valid (94.21%) and practical (88.85%), and the students reasoning test is high (88.97%). So, it is concluded that the developed module can facilitate the students mathematical reasoning.

Keywords: Learning Module, Problem-Based Learning Model, Mathematical Reasoning

Implementation Of Comic On Linear Program Material To Increase Mathematical Understanding For Students of XI Grade Senior High School

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Abstract

The purpose of this study is to determine the results of educational comic implementation that has been developed in linear program material. The data were collected on students of XI grade selected by purposive sample. This research uses quantitative descriptive approach. Data collection is done through observation of learning, test and questionnaire of student learning interest after using educational comic. The results showed that educational comic can improve students mathematical understanding ability with N-gain value = 0.48 including high quality improvement. Students interest in following learning using educational comic media of 77% with high interest criteria. So educational comic media has been appropriate in its development because it can improve students mathematical understanding ability and student interest in learning.

Keywords: comic education, linear program, mathematical understanding ability

Topic: 1. Mathematics Education
[ABS-110]

**Improve Students Creative Ability In Discrete Mathematics Course With Approach Open Ended Assisted Visual Basic Application For Excel**

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**Abstract**

Students are the future generation to develop the technology. Keep in mind, that technology and information is always something to do with mathematics. Difficulties faced today about mathematics is the problem of proof, and it takes the students are led to creative ideas tailored to the definitions and theorems that have been proved. But for the student takes an overview of definitions through mathematical algorithms can be realized and understood by students. One of the subjects relating to proofs is discrete mathematics. The aim here students can understand the integer, number operations, the mathematical logic which is not memorizing but understanding math concepts meaningful based on the development of the student creative process. So that their findings can be a rewarding experience and may be able to develop more extensive utilization of evidence, therefore, researchers Open-Ended approach. To help overview of definitions is needed as delivery tools more effective mathematics which props. Props are used should be Appropriate to the use and purpose of learning, the role of ICTs is needed to convey the image that is associated with VBA for Excel mathematics is an application, the usefulness of affecting data processing.

**Keywords:** Creative Ability of Students, Open Ended Approach, Visual Basic Application for Excel.  
**Topic:** 1. Mathematics Education

[ABS-111]

**Exploring Of Mathematics Classroom Goal Structures In Senior High School: An Engaging In Academic Work For Student**

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**Abstract**

This study aimed to investigate classroom goal structures based on the teachers learning objectives for students in the mathematics classroom. The study used survey methods with involved 319 students at senior high school level. Data analysis based upon Rasch model as the framework of modern psychometric approach. The internal consistency and psychometric properties for quality of instruments, was appropriate. The results of this study showed that students tend to refuse to labeling as embarrassment behavior if any student who cannot answer or do math problems in the classroom. The students argue although answering math problems properly is a pride or achievement; but, create a judge poor students in mathematics should not occur in the classroom because typically all students are still in the learning stage. Another interesting side of this research findings is that male and female students have differences in looking at the learning climate of mathematics in relation to engaging in academic work. In the context of teacher-student interaction in the classroom, it is vital to consider that a constructive classroom situation and solid learning experienced can avoid to declining students academic motivation and achievement.

**Keywords:** goal structure; mathematics classroom; rasch measurement; student academic work  
**Topic:** 1. Mathematics Education
[ABS-112]
The Analysis Of Students Reflective Thinking Ability Viewed By Students Mathematical Ability At Senior High School

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Abstract

The reflective thinking ability is the students ability to actively think through the rules they know with caution to solve the problem. The reflective thinking ability is also one of the higher order thinking skills (HOTS) demanded of learners. Through applying the newest national curriculum, the Indonesian government wants students to master the 20th century skills. The types of skills are communication, collaboration, critical thinking and problem solving, and creativity and innovation. This study used the qualitative method with the descriptive design. Data collection used instruments of test and interview. Subjects in this study were three students of class XI at Senior High School. The research subjects, based on the mathematical ability, were divided into three categories, that are high, medium and low. While the reflective thinking ability is divided into four stages: habitual action, understanding, reflection and critical reflection. The results showed that the student with the high level is at the stage of reflection, the student with the medium level is at the stage of understanding, and the student with the low level is at the stage of habitual action. It can be concluded that students reflective thinking ability is not yet developed optimally.

Keywords: Reflective thinking, mathematical ability

Topic: 1. Mathematics Education

[ABS-113]
Inquiry Instructional Model Infused Blended Experiment: Helping Students Enhance Critical Thinking Skills

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Abstract

Critical thinking skills (CT) are pivotal elements in teaching and learning physics. Training CT skills can be carried out using diverse approaches in learning process. However, infusing blended experiment is rarely conducted to facilitate students to achieve CT skills. This study examined implementation of an inquiry instructional model infused blended experiment to enhance CT skills. The research method used in this study was quasi experiment with non-equivalent pretest posttest design. The participants of this study were 81 students in one private senior high school in Indonesia. They were divided into three groups (27 students each group) to be given diverse treatments: an inquiry instructional model infused real, virtual, and blended experiment. The CT skills of students were photographed by an instrument test developed in specific topic in physics (i.e. electricity). In addition, normalized gain was used to analyse the enhancing of CT skills and analysis of variance (ANOVA) was expended to investigate the difference of normalized gain significance. Result of this study depicted that the infusing blended experiment through an inquiry instructional model was the most significant treatment among all treatments. This was portrayed by average of normalized gain achieved namely blended (0.44), virtual (0.32), and real experiment (0.31).

Keywords: Inquiry instructional model, blended experiment, critical thinking skills

Topic: 3. Physics Education
[ABS-116]
The Improvement Of Students Mathematical Understanding Ability Influenced From Argument-Driven Inquiry Learning

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Abstract
The aim of this study was to examine the role of Argument-Driven Inquiry (ADI) learning toward the improvement of the mathematical understanding ability of mathematics teacher candidate students. The population of this study is students of mathematics teacher candidate in Cimahi City, while the sample is 270 students of mathematics teacher candidate determined purposively and then randomly to be included in experiment and control class. The results show that (1) the mathematical understanding ability improvement of students who received Argument-Driven Inquiry (ADI) learning is better than those who studied using direct learning viewed on the whole; (2) There is a difference in the improvement of mathematical understanding ability of students with Argument-Driven Inquiry (ADI) learning which is better than those who learn by direct learning in terms of PAM (High, Moderate and Low) factors; (3) There is no interaction effect of Learning Factor and PAM on improving students mathematical understanding ability.

Keywords: Argument-Driven Inquiry; Mathematical Understanding

Topic: 1. Mathematics Education

[ABS-120]
Measuring of Student Learning Performance Based on Geometry Test for Middle Class in Elementary School Using Dichotomous Rasch Analysis

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Abstract
Understanding of geometry concept properly and precisely can stimulate students to representing and expressing the world around in orderly order. This study was designed to measure students ability in answered geometry exam. The study involved 186 students in elementary school. Data collected based on the results of midterm examination; conducted in March 2018 and analyzed using dichotomous Rasch model approach. The results of this study show that overall the students ability in identifying the number of sides in geometry image is fascinating. Unfortunately, students get it difficult to work on narrative test in geometry. It is clearly recognized that students experience difficulties in explaining and determining the circumference and square area, rectangular and triangular and second-rank relations with square roots. Furthermore, there are excellent students taking on geometry questions on certain competency requirements; and there are students failed to finish geometry exam properly. The quality of tests applied to students in mathematics exams is also a substantial issue into the discussion on this article. The findings of this research can be a substantial input for classroom teachers in developing suitable geometry learning methods and dealing with the issues linked to students ability to learn geometry in elementary schools.

Keywords: geometry test; students ability; dichotomous rasch model; elementary school

Topic: 1. Mathematics Education
[ABS-121]
Assessing Use of PowerPoint by Teacher Candidates in Teaching Mathematics

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Abstract
The use of PowerPoint technology in the classroom has become very popular today because it is considered to enhance teaching quality. However, its use is not free from criticism with the emergence of phrases such as PowerPoint is Evil and Death by PowerPoint. Mathematics and teaching-learning mathematics have certain characteristics, therefore, the creation and execution of presentation in the class with PowerPoint format requires certain handling as well. This study intends to explore students perceptions and teachers judgments on the use of PowerPoint in mathematics learning by teacher candidates. Participants in this study were 14 teacher candidates, 5 math teachers, and 421 students in two vocational high schools. The student questionnaire result shows that with PowerPoint presentations, in general, students: (1) are motivated and helped to learn math, (2) value the management of slide shows quite well, but (3) tend to only listen to the teacher during the learning process, and (5) feel that sometimes lessons are easier with PowerPoint, sometimes not. Teachers observation result shows that most of the presentations of the teacher candidate are good enough in terms of material suitability and arrangement aspects, the use of mathematical language and symbols, animation, and student involvement.

Keywords: Microsoft PowerPoint, teacher candidate, teaching mathematics, students perceptions, teachers judgments

Topic: 1. Mathematics Education

[ABS-122]
Re-thinking of Student Skills to Handling Basic Computer Practice in Junior High School

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Abstract
This study aimed to evaluate students skills in basic computer practice in junior high school. We evaluate the students skills to work with basics of Microsoft office software (Excel and Power Point) according to competency standards and school curriculum. The study involved 173 students who received the computer practice exam on March 2018. Data analyzed using Rasch model approach. The results of this study showed that Microsoft Excel and Power Point practice exams are simply to be passed by 57 students. In general, the skills in setting up tables in Microsoft Excel have the highest difficulty level for students. Meanwhile, basic skill in locating information for Power Point objects is the easiest exam material for students. Unfortunately, although the quality as the exam material is good enough, but the material for computer practice exam is insufficient as to separate out the students skills. Several measurement property assessments also presented to enrich the information from the findings of this study. A further implication from this research is that educators require to reconsider the test material led to students. In addition, it also takes into history the experience of students in operating the computer, and perform computer exam procedures.

Keywords: computer practice; ms. excel; ms power point; rasch measurement; student skills

Topic: 6. STEM Education
The Development Of Higher Order Thinking Virtual Laboratory On Photoelectric Effect

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Abstract

Higher order thinking skills (HOTS) are potentially developed through physics lab activities deliberately designed to train these skills to students. This study aims to develop higher order thinking virtual laboratory (HOT-VLab) model on photoelectric effect concept to train critical thinking skills (CTS) and creative problem solving skills (CPSS) of students. The research method used is research and development with ADDIE model. Validation of HOT-VLab model is done through expert review by physics learning expert (N=3). Implementation of HOT-VLab model was conducted for a number of pre-service physics teachers (N=35) at a university in Bengkulu, Indonesia. The CPS and CPSS tests were performed both before and after the HOT-VLab model implementation to determine the CPS and CPSS enhancements obtained by the students. The results of the test data analysis showed that the CTS and CPSS score of students increased with N-gain of 0.61 and 0.74 with high category for CTS and medium category for CPSS. In addition, it was found that the pretest and posttest scores of both types of tests differed significantly. It can be concluded that HOT-VLab model can be used to improve HOTS of students.

Keywords: Higher order thinking virtual lab, HOT-VLab, Photoelectric Effect, Pre-service physics teachers

Topic: 3. Physics Education

Ethnomathematics Study: Revealing Mathematical Aspects in Determination of a Good Daily Activities in Indigenous Societies of Paseban and Cikondang West Java

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Abstract

This study is an attempt to show the relationship between culture and mathematics. Students paradigm nowadays considers that Mathematics is an abstract concept; as a result they do not like the subject. In fact, indirectly within a culture or group. The aim of the study is to determine the existence of mathematical aspects in determining a good day of daily activities in indigenous societies of Paseban and Cikondang villages. This study uses a qualitative approach with ethnography method such as observation, interviews, documentation, and field notes. The research is conducted in two places namely Paseban Tri Panca Tunggal Cigugur Village, District Cigugur, Kuningan regency, West Java and Cikondang, Lamajang Village, District Pangalengan, Bandung regency, West Java. The results of the study show that there is the presence of mathematical aspects in determining good day of daily activities in indigenous societies of Paseban and Cikondang villages. This study recommends that mathematics is closely related to culture due to the existence of ethnomathematics.

Keywords: ethnomathematics, qualitative, ethnography, Determination Good Day Activities Every day, Paseban Indigenous Society, Kampung Cikondang Indigenous society.

Topic: 1. Mathematics Education
Design of Interactive Teaching Materials Based On A Scientific Approach To Support Junior High School Students Learning: Line And Angles

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Abstract
This research is motivated by the need of teaching materials that can support the implementation of Curriculum 2013. It is known that one of the emphasis in the Curriculum 2013 is the use of a scientific approach in the learning process. The purpose of this research is to develop the interactive teaching materials based on scientific approach (ITMSA) that can support the learning process for junior high school students, especially on the topics of line and angles. The method used is research and development (R&D) consisting of 10 stages, namely: 1) Research and information collecting, 2) Planning, 3) Develop preliminary form of product, 4) Preliminary field test, 5) Main product revision, 6) Main field test, 7) Operational product revision, 8) Operational field testing, 9) Final product revision, and 10) Dissemination and implementation. The results concluded that: 1) the ITMSA obtained a total score 87.50% from mathematics expert, 88.67% from mathematics education expert, 86% from multimedia expert, and 89.36% responses from students, and 2) students mathematical concept understanding who learn by using ITMSA better than student who learn without ITMSA. From these results concluded that the ITMSA is considered feasible and can be used in learning mathematics in the schools.

Keywords: Interactive teaching materials, Scientific approach, Lines, Angles

Chromotherapy: an alternative treatment for mathematics anxiety among elementary students

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Abstract
Mathematics is often a frightening subject for students. Such conditions are caused by a stressful learning atmosphere, mathematics subjects that create anxiety. Anxiety experienced by students in learning mathematics has the potential to cause depression conditions on the mathematics. Based on this, a chromotherapy treatment was used to reduce the anxiety of elementary school students to mathematics. Chromotherapy is a treatment designed with the foundation that any color contains healing energy. The effect of color affects the work of sympathetic and parasympathetic nerves and improves mood. Chromotherapy provides an element of relaxation, which from various studies found to reduce anxiety in individuals. This research uses single-subject design to five students of elementary school with high anxiety. Instruments used Mini Mathematic Anxiety Scale (MMAS) and observation. The results show that chromotherapy provides relaxation and reduces anxiety among students. Based on such things this therapy can be one alternative treatment in helping elementary school students cope with anxiety to the subjects of mathematics.

Keywords: chromotherapy, mathematics, anxiety, elementary students
Topic: 1. Mathematics Education
Can Smartphones be used to support learning?

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Abstract
Smartphone technology is growing very rapidly equipped with features that are increasingly sophisticated. Currently, almost all peoples have a smartphone as it can help us to get information in various forms. In education, a variety of information is required to support the learning process. However, can the smartphone be used to support learning? This study aims to describe the use of smartphones among students. Using survey method, this study involved 133 prospective biology teachers. The results showed that the use of smartphones is for social media (32.14%), games (27.39%), music (32.06%) and learning (8.40%). These results indicated that the use of smartphones to support learning is the lowest compared with other purposes. Regarding these, most students argued that the limitations of the screen become a constraint using a smartphone to support the learning process. In the future, we must think how smartphones can be maximized to support learning.

Keywords: smartphone app, smartphone for learning, smartphone usage

The effectiveness of collaborative strategy based on multiple intelligence in chemistry learning to improve students problem solving skills and multiple intelligence

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Abstract
This research aims to reveal: (1) the feasibility of collaborative learning strategy (CLS) based on multiple intelligences (MI) in chemistry; (2) the effectiveness of CLS based on MI (CLS-MI) to improve problem solving (PS) skills, multiple intelligences/MI (interpersonal, visual spatial, and mathematical logic), and students achievement in chemistry. This research applied R & D method using 4 D model. As many as 210 students from 3 public schools in Banjarmasin were involved in this study. The effectiveness of the strategy was evaluated using pre-test-post-test control group design. The experimental group implemented CLS-MI, while the control group used conventional strategy. The data was collected using test, observation, & questionnaires, and was analyzed using descriptive and t-test. The results indicated that (1) the CLS-MI is feasible to be used in Chemistry with the practicability score 51.5 (practical); (2) Students PS skill and MI in the experimental group improve higher. Three categories of students PS skill exist in experimental group; develop (25%), develop well (47.2%) and develop very well (27.8%). Interpersonal, mathematical logic and visual spatial intelligences improve respectively by 17.8%, 8.3%, and 3.8%. (3) Students in experimental group achieve better in learning chemistry with the N-gain 0.77 (high).

Keywords: collaborative learning; multiple intelligence; problem solving skills

Topic: 4. Chemistry Education
The Interface, Algorithm and Learning Features: A Validation Toward STEM Based E-Module for Learning Integrated Science

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Abstract
The purpose of this study was to develop STEM Based e module that is a learning software for improving secondary school students interest in STEM field. Four questions are addressed to unpack the feasibility of e module that is used for integrated science teaching. The questions are 1) How is the interface of STEM Based e module 2) How is the performance of e module algorithm 3) How are the learning features presented in e module 4) How are STEM aspects performed in e module. Data were obtained by exploring the view of three experts in STEM education fields. Instrument used was a rubric consisting 29 questions and open questions about e module strength and weakness as well as the experts recommendation. The study reveals that the interface, algorithm, learning features and STEM aspects of e module were categorized into excellent, fair, excellent and excellent respectively. STEM aspects presented in e module are appropriate for secondary school STEM based teaching. This finding showed that feasibility of e module implementation in secondary school setting is highly recommended. Nevertheless, an experimental study is necessary to validate the e module quantitatively.

Keywords: Electronic module, STEM based Learning, Integrated Science

Etho-morphology Using Smartphone Apps to Identify Aves

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Abstract
Identification skills are indispensable in field activities. With the approach of etho-morphology assisted smartphone application makes it easier for students to identify Aves in Zoology Vertebrate course. We developed i-bird applications in smartphones that are used to identify the Aves based on their morphology on field activities. The purpose of this research is to describe the ability of student identification in field activity of the course. Using quasi experiment, this research involved 93 prospective Biology teachers which were conducted at Bandung Zoo. The results showed that the identification skills of prospective biology teacher were in sufficient category (2.78). The results of the analysis of several indicators of identification skills indicated that the highest identification is in indicator 1 (I-1 = 3.33) that is to write the morphological characteristics of each species based on morphology. The lowest identification skills indicator was found in indicator 5 (I-5 = 2.49) that is making a simple determination key. The identification skills of prospective Biology teachers are in sufficient category, therefore it needs to be improved in the future with various appropriate approaches or methods. Through questionnaires we found that low ability of students to make simple determination keys due to limitations of camera resolution. This probably becomes a constraint when identifying the characteristics of each species of the Aves.

Keywords: etho-morphology, smartphone application, i-bird, field trip, zoology vertebrata

Topic: 5. Biology Education
Students inquiry skills and Learning Achievement in Plant Anatomy Practical Work Using Open Guided Inquiry

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Abstract

The important of inquiry based learning (IBL) had been investigated, but not the inquiry skills as fundamental skills for students, especially prospective teachers. This descriptive study was carried out to get illustration about the inquiry skills and their knowledge from practical open-guided inquiry in plant anatomy practical works. A number of prospective biology teachers in second semester was involved as participants (n=23). Data were collected through the use of certain instruments to detect inquiry skills and concept mastery got from IBL practical activities. Research results show that the prospective biology teachers can achieve score on inquiry skills as well as concept mastery above the minimum score determined previously (75). IBL laboratory experienced by prospective biology teachers can debrief their inquiry skills and help them in constructing knowledge they need in science instruction.

Keywords: inquiry skills, learning achievement, open-guided inquiry
Topic: 5. Biology Education

Perceptions of pre service elementary teachers (PETs) following the professional education program (PEP) on science learning that accelerates disruptive era

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Abstract

Education is a complex services community in which quality to define. Disruption in the education space requires better services that are built around improved educational program quality. Professional PETs are expected to have the ability to educate in the disruptive era (DE). This study aims to determine the perception of participants of professional education programs about appropriate science learning in the DE. The qualitative descriptive method is used to obtain data. The data for this research was collected through questionnaires and open-ended questions related to science learning that accelerate DE given to 42 PETs at Elementary School Teacher Education Program, Universitas Sebelas Maret. Based on the analysis of the questionnaires, and open-ended questions which related to the science learning that accelerate DE, it can be concluded that PETs perceptions are limited and inadequate about the perception of science learning in DE. Based on the findings, it can be recommended that it is necessary to develop an appropriate science learning support framework in the DE. Implications for teacher education are discussed.

Keywords: PETs, PEP, Science Learning, Disruptive Era
Topic: 2. Science Education
Algebraic visualisation: difficulties of students at junior high school
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Abstract
Algebra has been considered as a key aspect in forming the base to courses in advanced Mathematics and Science coursework in Secondary and Post-Secondary Education. Failure for students in algebra has become a big barrier for students to proceed with education. We argue that for students to be successful in secondary school algebraic topics such as equations and functions, and in post-secondary courses such as Calculus and Algebra, they need to overcome difficulties that they have in the basic aspects of algebraic operations. The study aimed to explore and describe difficulties that students have in algebraic operations at junior secondary school. This study used descriptive case study and sampling is purposeful. 30 students were given test on algebraic operations. Their work was analysed by identifying the difficulties students have when they factorise and simplify algebraic expressions. Results showed that students have difficulties in visualising algebraic forms and applying the associativity and distributive properties of algebraic expressions when they factorise or simplify algebraic terms. We conclude that algebraic visualization is a key aspect for success in Mathematics. Teachers are encouraged to investigate on difficulties of students in algebraic operations and provide instructional material that help students overcome certain learning obstacles.

Keywords: Algebraic visualization, difficulties of students, algebraic operations

[ABS-136]
Smart Mathematics: a Kindergarten Student Learning Media Based on the Drill and Practice Model
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Abstract
Teachers still face difficulties in catching up to new teaching methods, especially the kindergarten teachers. The problem is their inadequate application of relevant advanced learning media technology. This should have been done by integrating learning and playing, in an enjoyable atmosphere, to stimulate the creativity of children. This research aimed to enhance kindergarten cognitive ability of children in understanding general knowledge, general science, and the concepts of shape, pattern, size, and color using the drill and practice model, and identify effectiveness application of interactive multimedia on the learning outcome of students. This development of interactive multimedia application was storyboard-driven and employed the Hannafin and Peck methodology. During the research, 30 Islamic kindergarten student all over Batam was involved. The interactive multimedia application evaluation included pre-test and post-test. The data from these tests were then analyzed using the quantitative descriptive method. The evaluation consisted of the functional and significance test. Based on the pre-test and post-test results, the significance test resulted in Sig. (2-tailed) < 0.05, which indicated the effectiveness of the interactive multimedia application.

Keywords: cognitive ability, interactive multimedia, drill and practice

Topic: 1. Mathematics Education
The Ability of Students Visual Thinking in Solving Integral Problems

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Abstract
Problem solving is a high-level mental activity visualization has been an area of interest for a number of researchers concerned with mathematics education. Visual thinking is an important part of mathematical thinking. The purpose of this study will describe the ability of students visual thinking in solving integral problems. This research uses descriptive qualitative method by using purposive sampling technique. The results of this study show that there are three level of visual ability. The first, the student in a non-visual are unable to representing and interpreting problems (concepts) graphically, however be able algebraically but incomplete. The Second, the student in a local-visual are able to generating specific information from diagrams, however unable to drawing and using diagrams in problem solving. The third, the student in global-visual are able to understanding algebra and geometry as an alternative language and they indicate complete competence in problem solving.

Keywords: visualisation, integral, problem solving

Topic: 1. Mathematics Education

An action research on enhancing grade 10 student creative thinking skills using argument driven inquiry model in the topic of chemical environment

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Abstract
A goal of the 21st century education is to enhance student creative thinking skills as the basis for construction of innovations for developing countries. Generally previous teaching tradition, teacher-centered approach, used in many classrooms, however, fails the goal. Therefore, this study aims to promote Grade 10 Thai students creative thinking by implementing Argument-Driven Inquiry(ADI) through three cycles of action research. There are 31 students participated in the study. The student data are collected using learning journals, artifacts and informal interviews then analysed with content analysis and method triangulation. The findings indicate that the students have progression in creative thinking. They can develop skills of curiosity, originality, fluency, imagination, elaboration and flexibility respectively. As recommendation, it is necessary that teaching for that success needs integrations among chemical environment, geography and art.

Keywords: Creative thinking skill; Argument-driven inquiry; Action research
Topic: 4. Chemistry Education
Designing Solar System Material through Science Domino Game and Booklet

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Abstract
Teaching and learning activity of science lesson in elementary school is considered less interesting due to the use of monotonous and memorizing methods. Solar system is a common topic which taught by applying these methods. In order to anticipate boredom and monotony, supporting learning media which trains students to be active, creative, and have better understanding is required. This study aims to find out the role of science domino game and booklet in improving the sixth grade elementary school comprehension of students on basic concept of solar system topic and generating a learning trajectory on solar system topic. It used design research which consists of preliminary design, teaching experiment, and retrospective analysis. Therefore, it described how science domino game and booklet enhanced ability of students in grasping basic concept on solar system topic and how the learning media yielded a learning trajectory in learning activity on solar system topic.

Interview, observation, and documentation were used to collect the data. The data were analyzed by using pretest and posttest in essay form which aim to find out the improvement of comprehension of students on concept of solar system.

Keywords: Solar system; domino science game; booklet; design research

[ABS-142]

Critical thinking skills of prospective biology teacher on the chromosomal basic of inheritance learning through online discussion forums

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Abstract
Critical thinking skill (CTS) are 21st century skills, need to be trained on prospective teachers as stock of life in the future. With online forum discussion apps, prospective teachers apply multifunctional smartphones to help the learning process and practice their critical thinking skills. The role of online discussion forums is studied to investigate students perceptions of the use of smartphones in supporting the learning process. Nevertheless it is rarely used to investigate the level of CTS of prospective teachers. A quasi experiment study to investigate the level of CTS of students through online discussion forum was conducted on prospective teachers who take Genetics course with 37 prospective teachers selected by purposive sampling as participants. This research focus is implementing online discussion forums through smartphone-assisted applications short message. Problem-based online discussion forums with three different cases are applied on Chromosomal Basic Inheritance Learning. Data acquisition of CTS of prospective teachers is obtained through the participants responses in responding to problems in the online discussion forum and then analyzed to determine the level of CTS of prospective teachers according to the Facione CTS assessment tool. The prospective teachers critical thinking skill level increases on the basic of chromosomal inheritance learning properties through online discussion forums.

Keywords: critical thinking skill, online discussion forum, genetic course

Topic: 5. Biology Education
Abstract. The aims of this research were improving the understanding of concepts and exhaustiveness of student learning outcomes on science lesson using online learning. It was a classroom action research that using Kemmis and Mc Taggart model. Subject of this research were student of mathematics education program on even semester. Data collection techniques include tests, observations, and questionnaires. It was analyzed descriptively qualitative. From this research founded that student's understanding concept on the first cycle is 70.1%, and the second cycle is 91.5%, the average of student learning outcomes in cycle I is 65 and the second cycle is 83.5. Based on those findings, it could be concluded that the implementation of online learning can increase understanding of concepts and exhaustiveness of student learning outcomes on science lesson.

Comparative Study of Learning Models Example-non-Example and Picture-and-Picture on Natural Science Subjects

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Abstract

The research aims to investigate the difference of natural science learning outcomes between sixth graders in primary school taught using the models example non example and picture and picture. This experimental research employed a test as the data collection technique. Furthermore, data analysis techniques were the homogeneity test and the independent sample t-test. The criterion for hypothesis acceptance is that if tcount > ttable, therefore H0 is accepted and Ha is rejected. Based on the results and data analysis, it is evident that the example non example and picture and picture learning models have improved the learning outcomes of students of Grade VI. It is demonstrated from the pretest and posttest average scores of Grades VIA and VIB that experienced an increase from 53.06 to 78.56 and from 17.47 to 66.09 respectively. The independent sample t-test shows the significance value of tcount is 0.005<0.05, therefore H0 is rejected and Ha is accepted. Conclusively, there are some differences in natural science learning outcomes using the example non example method in Grade VIA and the picture and picture method in Grade VIB and natural science learning outcomes using the example non example learning model is better than the picture and picture one.

Keywords: Example non example model, picture and picture models, independent sample t-test

Topic: 2. Science Education
[ABS-145]
Exploring of mathematics learning difficulties for students based on heterogeneous group and cognitive style in elementary school

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Abstract
Students with mathematics learning difficulties (MLDs) are heterogeneous. They can grow from various socio-economic groups or based on specific district areas. Cognitive style is likewise worked as a reference to perform grouping of children into certain sub-type MLDs. This study aims at exploring sub-types of MLDs in elementary school students by gender, district area, and cognitive style. This study involved 153 elementary school students in Buleleng Regency, Bali. The students tested their underlying of mathematical abilities for numerical understanding, geometry, and measurement materials. The cognitive style was determined to utilize the Children Embedded Figures Test (CEFT). Data were analysed using Rasch Model. There are 137 students have a problem with mathematics based on MLDs test. The female students and the dependence from an urban or suburbs school have a most serious problem in mathematics learning. These findings have means for the intervention of MLDs based on specific gender groups, district areas and cognitive styles.

Keywords: Cognitive style, MLDs, field dependence independence, mathematic learning difficulties, student learning difficulties, elementary school, Rasch model.

Topic: 1. Mathematics Education

[ABS-146]
The Role of Conjecture via Analogical Reasoning in Solving Problem based on Piagets theory

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Abstract
This study aims to reveal the role of conjecture through analogical reasoning in learning. Uncover the role of conjecture via analogical reasoning; Students are given open analogy problem. Researcher exploration to 52 students of seventh grade; who can to conjecture via analogical reasoning correctly. To unravel the thought process; Researchers use Think out loud method. Results of problem solving studied based on Piagets theory and level of thinking of Krulik. The results are obtained; the level of student thinking is variation among others; critical thinking, approaching creative thinking and creative thinking.

Keywords: conjecture, analogical reasoning, critical thinking, creative thinking

Topic: 1. Mathematics Education
Learning Trajectory of Three Dimensions Through Analytical Geometry Approach

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Abstract
The purpose of this research is to create a learning trajectory of the distance, angle, and angular measure concept in three dimensions. The underlying problem of this research was the discovery of obstacles in learning trajectory which was built in the Euclidean geometry approach that already existed, such as the lack of spatial sense of students, capability of teachers, and the habit of learning activities. The method used in this research is a qualitative research, particularly prospective analysis part of the didactical design research through observational learning, literary studies of materials related topics, and interview. Based on the results of research and discussion, the vector topic learning activity was too emphasized on the algebra, so the learning trajectory that was recently compiled through analytic geometry approach, required an emphasis on exploration of the vector geometric representation. The new learning trajectory, i.e. through analytical geometry approach, that has been formed can be useful to address the problem of learning trajectory before. For future research, we consider to develop a didactical design with this learning trajectory as the main learning framework.

Keywords: Learning trajectory, analytical geometry, didactical design research, three dimensions, vector

Topic: 1. Mathematics Education

Exploration of students quantitative reasoning in solving mathematical problem: a case study of field-dependent (FD) cognitive style

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Abstract
Quantitative reasoning plays a key role in the problem-solving process. This skill ensures that understanding a problem will be more effective, so the problem-solving process will be more productive. Many educators and mathematics teachers around the world are trying to develop a relationship between mind and real-life problems of students that can be mathematically solved. Therefore it is necessary to develop students concepts of quantity through calculation based on the nature of an object. The effort made to achieve that goal is to develop students ability to use the quantitative reasoning in solving problems. This study aimed at identifying the students quantitative reasoning in solving mathematical problems. The type of this research was explorative research with qualitative approach. The subject of this research was eighth grade student who was male and had Field-dependent (FD) cognitive style. The main data of this research was obtained by interview technique. Time triangulation was used to generate credible data. Data were categorized from interview and task result, reduced, analyzed and interpreted to make conclusions. The results of this study indicate that the quantitative reasoning in solving mathematical problems. The type of this research was explorative research with qualitative approach. The subject of this research was eighth grade student who was male and had Field-dependent (FD) cognitive style. The main data of this research was obtained by interview technique. Time triangulation was used to generate credible data. Data were categorized from interview and task result, reduced, analyzed and interpreted to make conclusions. The results of this study indicate that the quantitative reasoning of subjects in the problem-solving process focuses on quantity. During the interview process, the subject demonstrates the ability to identify and interpret quantities, determine relationships among the quantities, represent all the quantities and their interrelationships. The results of this study are important as input materials for teachers and the development of mathematics education. In this case developing and utilizing the quantitative reasoning that students have in the learning process.

Keywords: Quantitative Reasoning; Cognitive Style; Problems Solving

Topic: 1. Mathematics Education
Enhancing Problem-Solving Skills of Students through Problem Solving Laboratory Model

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Abstract

Problem-solving skills are one of the skills needed to prepare the student to face the development of science that can support the world of work. This study aims to determine the improvement of problem-solving skills after applied Problem Solving Laboratory (PSL) model on the dynamic fluid topic. The method used was pre-experiment design with one group pretest-posttest design. The population of this study was students of class XI IPA SMAN 27 Bandung. The sample was chosen by purposive sampling technique amounted 30 people. Problem-solving skills were obtained through an essay test and student activity sheet as supporting instruments. The result of the research shows that the average N-Gain value of 0.60 indicates there is an increase in problem-solving skills of the moderate category. Based on paired sample t-test where tcount (26,2) > ttable (2,04) indicate there is difference improvement in problem-solving skill. Thus, the PSL model can be used as an alternative learning model that can improve the problem-solving skills of a student on the dynamic fluid topic. Finally, PSL can be implemented in other subject learning and could be used to improve another higher order thinking skills

Keywords: Problem solving skills, problem solving laboratory

Profile of students scientific literacy in application integrated science on the theme of air pollution

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Abstract

The function of this research was to describe the scientific literacy of junior high school students in integrated science on the theme of air pollution. The method used in this research is descriptive method. Population and sample are junior high school student in Bandung. The instruments are used scientific literacy test, attitude scale and student response questionnaire. The results showed that the average achievement of student scientific literacy as a whole was 72% (enough category). The achievement of scientific literacy is in the process science domain for indicators identifies scientific issues is 76%, explains scientific phenomena is 74%, and uses scientific evidence is 66%. The achievement of scientific literacy on content science domain for acid rain is 78%, environmental contamination is 80%, change of matter is 74%, global warming is 68%, substance characteristics is 72%, and acid base is 70%. The scientific literacy on students attitude domains toward science as a whole achieves is 76.3% (good category). For indicators to support science inquiry and students interest in science achieve is a good category outcomes, while for indicators of responsibility for resources and environment achieve sufficient category achievement. Students respond positively to integrated science learning on the theme of air pollution.

Keywords: scientific literacy, junior high school students, integrated science, theme of air pollution

Topic: 3. Physics Education

Topic: 2. Science Education
21st Century Physics Learning in Senior in Senior High School Through Interactive Computer Simulation to Enhance Students Achievement

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Abstract
This study aims to harness interactive computer simulation on physics concept that have been developed to improve students achievement by determining the differences in physics learning outcomes of students who were taught using computer simulations with students who were taught using conventional media and also evaluating students activity and their perception. The research type is true experiment with Posttest-Only Control Design. The research instrument used is the test of physics learning result of 20 questions in the form of multiple choice test which has valid on "Fluid" subject. Data analysis techniques used in this study is descriptive statistics and hypothesis testing. The results of descriptive analysis showed that the average score of physics learning outcomes of learners who were taught using a computer simulation is 13.5 and the average score of physics learning outcomes of learners who were taught using conventional media is 10. The results of hypothesis testing showed that there are significant difference in physics learning outcomes between learners who were taught using computer simulations with learners who were taught using conventional media. The percentage of students activity and their perception are above 85% that indicate students were active and agree on physics learning through interactive computer simulation.

Keywords: Interactive Computer simulation, True Experiment and Physics Learning Result
Topic: 3. Physics Education

How to develop SETS-based colloidal system teaching materials?

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Abstract
This study aims to develop SETS-based colloidal system teaching materials through 4S TMD method to develop students creativity. Research method in this study was Richey s and Klein s development research consisting of design, development, and evaluation. This study was conducted until the step of design and development. The procedure used in the development step was the 4S TMD method at the selection and structuring steps. The selection step consisted of curriculum analysis, indicators development, international textbooks analysis, and identification of values or aspects of SETS integrated into the teaching materials of the colloidal system. The structuring step had been developed concept maps, macro-structures, and multiple representations. The results of the selection and structuring steps had been reviewed and validated by expert lecturers in chemistry education. The results showed that the teaching materials developed were in accordance with the curriculum, scientifically correct, there were skills developed, and the SETS aspects was in accordance with the phenomenon presented.

Keywords: teaching material, colloidal system, SETS, 4S TMD
Topic: 4. Chemistry Education
The profile of Science Process Skills of Junior High School Students in Lembata

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Abstract
This preliminary study aims to obtain data on the extent to which the science process skills (SPS) has been developed in the process of science learning in one of the private junior high school in Lembata, which later taken as a consideration for promoting a SPS-oriented learning. Data were collected through questionnaires filled out by students and interviews with science teachers. Based on the results of the analysis, it is known that science learning in schools has not been fully able to bring up the skills expected; for the average score of aspects of observing, designing and making, predicting, measuring and calculating, hypothesizing and communicating, only reached less than 65%. This low achievement is due to the applied methods, models and learning strategies, which tend to lead students having conceptual understanding, while the procedural, factual and other basic understanding of science are poorly trained. Based on this case, it is necessary to do further research in the form of application of a method and learning strategy that is able to enhance students SPS.

Keywords: Science Process Skill, Science Learning Process

Topic: 2. Science Education

Preconception Analysis of Evolution nn Pre-Service Biology Teachers Using Certainty of Response Index (CRI)

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Abstract
Preconception of students about evolution often related to knowledge got from environment and resource surrounding without scientific base. Therefore, it was needed badly to detect misconception on students before the courses so as to determine the direction to overcome it. This qualitatively descriptive study was conducted to get clear picture of student conception in evolution before the course held. And also the probability of misconception. A number of students from Islamic University in Cirebon was involved as participants (n=54). The instrument used consisted of 10 multiple choice with certainty of response index (CRI) and individual interview to analyze the reasons or the causes of misconception. Research results show that the percentages of understand concept (UC), not understand concept (NUC), guessing (G) and misconception (M). It was also found that the percentage of misconception among the students is relatively high (35.7%) from the whole answers given to the test items tested. The highest misconception detected was in Phylogenetic topic. Based on the individual interview it was detected that they have difficulties in certain concepts in sequent: phylogenetic (50%); the origin of living things (24%), natural selection (3.7%) and evolutionary theory (16.6%).

Keywords: Evolution, Misconception, preconception

Topic: 2. Science Education
[ABS-158]
The construction of student thinking transformation from simple connectivity to productive

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Abstract
The purpose of this study was to identify the process of transforming students thinking from simple to productive connectivity at the time of reflection for maximize the mathematical connections that students have constructed in the problem solving process. The construction of students thinking transformation process from a simple to productive connectivity was observed based on the completeness of the connective thinking network, which was built on the problem solving process using Thosio scheme. The purposive sampling technique was used to select three students who had a tendency to transform simple connective thinking to productive. Worksheets and think aloud recording of three students were analyzed by qualitative descriptive approach. In the process of students constructive transformation construction thinking, from simple to productive, it could be described construction process done by the students which were repairing errors of connection formed in network of simple connective thinking, and build connection not yet complete in network of simple connective thinking so as to form student thinking transformation from simple to productive connective. By and large, there were two construction processes in the transformation of simple connective thinking to productive at the time of reflection.

Keywords: Transformation, simple connectivity, productive connectivity, errors of connection, connection not yet complete

Topic: 1. Mathematics Education

[ABS-159]
Exploring the elementary students learning difficulties risks on mathematics based on students mathematics anxiety, mathematics self-efficacy and value beliefs using Rasch measurement

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Abstract
The learning process sets up the individual differences during material transfer. In mathematics subjects, these changes point to student struggles in following the movement of the material and raise the learning obstacles. However, the identification of the mathematics learning difficulties condition is done after the final test, instead through the study of students who have learning difficulties risks. This study examines the compromise of learning difficulties in mathematics in terms of several aspects that can trigger it, which are mathematical anxiety, self-efficacy mathematics, and value beliefs. This preliminary study consisted of 127 elementary school students from 3rd to 6th grades. The result of this study shows that students are more dominant to experience cognitive anxiety towards mathematics, especially when working on issues with high difficulty levels. In addition, students are at compromise of learning disabilities if they have low self-efficacy levels, especially if it concerns to the circumstantial use of mathematics. The risk of learning difficulties is also dominant experienced by students who do not spend time effectively in learning mathematics. The attention of the learning difficulties risks on mathematics is essential to ward off the failure of students to optimize their potential in the learning process.

Keywords: learning difficulties risks (LDR), mathematical anxiety, mathematics self-efficacy, value beliefs, rasch models analysis, elementary school students

Topic: 1. Mathematics Education
The Influence of Problem-based Physics Learning using guided inquiry toward scientific attitude

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Abstract
The process of physics learning should be carried out by scientific investigation or discovery, in order to grow the ability to think critically and be scientific so that it can solve the problem. This study aims to determine the influence of guided inquiry method on scientific attitude. This research is experimental research that is experiment class using problem solving method and control class using lecture method. The number of samples taken 60 respondents from a total of 120 respondents. Data collection techniques using questionnaires and hypothesis test research using t test. From the results of research indicate that there is influence of guided inquiry method toward scientific attitude, because t test shows t-count = 5.994 and t-table = 2,004.

Keywords: learning of physics, guided inquiry, scientific attitude

[ABS-161]
DESIGN VALIDATION OF THE MOODLE-BASED MOBILE LEARNING MODEL IN HIGHER EDUCATION

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Abstract
The rapid technological developments bring about changes in the field of learning. The impact of technological development is the use of technology as a learning medium such as mobile learning (m-learning). The purpose of this study is to produce a m-learning product based on Moodle that has passed the stage of expert validation. This study is part of a large study that lasted for 3 years. In the first year, research is limited to only the eighth stage of the Dick and Carey learning design model, which is formative evaluation for expert validation. Expert validation involved are material experts, media experts, and design learning experts. Technique of collecting data using questioner with data analysis done by simple descriptive statistic. The subjects of the study are the students of Elementary School Teacher Education Program of Jakarta State University. The results of research in the form of products that have been through the validation stage of experts and ready to be tested into the subject of research to be conducted in the second year of research. This research has implications on the discovery of conceptual model of Moodle-based m-learning design for learning in universities.

Keywords: mobile learning, moodle, instructional

Topic: Other Relevant Fields
[ABS-162]  Students ability of mathematical representation on statistics topic in elementary school

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Abstract

Mathematical representation is the ability to represent a mathematical problem in the form of symbols, images, manipulative objects, and other mathematical ideas. Most of previous research have described about mathematical representation ability in the middle schools. So this research aims to describe the mathematical representation ability including visual representation, symbolic representation, and verbal representation in statistics topic especially in elementary school. This research employed qualitative research using descriptive method and conducted in 35 students of 5th grade in one of elementary schools in Bandung, Indonesia. The instruments used mathematical representation test and interview. The result showed that (1) 20% students can draw a bar chart based on the known data and use the bar chart as a visual representation to solve the problems, but 80% students have difficulties in using visual representation, (2) 31% students can use mathematical expression or symbols to solve problems appropriately, but 69% students have difficulties in using symbolic representation, and (3) 34% students can answer question using verbal representation, but 66% students can not answer question using verbal representation. This result can be a reference for teachers to develop the learning process so that it can improve mathematical representation ability of elementary school students.

Keywords: Students Ability; Mathematical Representation; Statistics; Elementary School

Topic: 1. Mathematics Education

[ABS-165]  Student Difficulties in Word Problems of Derivatives: A Multisemiotic Perspective

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Abstract

This study aims to describe findings on students difficulties in solving derivatives word problems from the perspective of multiple semiotic systems. A test in the form of word problems was constructed, validated to mathematics expert, and then given to 69 students of grade 11. Their works were analyzed from the perspective of multiple semiotic systems by classifying each obtained case into six sub-features, i.e. transforming symbol into visual representation, visual representation into symbol, language into symbol, symbol into language, language into visual representation, and visual representation into language. It was found that transforming language into visual representation was the most found sub-feature of difficulties. This study concludes that the difficulties due to multiple semiotic systems are real. Students faced these difficulties during word problem solving of derivatives in diverse cases involving transforming meaning from one system to another.

Keywords: multiple semiotic systems, mathematics word problems, derivatives, difficulty

Topic: 1. Mathematics Education
The effectiveness of OR-IPA model in improving students critical thinking skills on senior high school physics subject

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Abstract

OR-IPA Teaching Model is a learning that has been developed specifically to improve students critical thinking skills on senior high school physics subject. The objective of this research is to analyse the effectiveness of OR-IPA Teaching Model towards the alteration of students critical thinking skills on senior high school physics subject. This research used one group pre-test and post-test from 150 students of the first grade of Cerme State Senior High School in 2017/2018 academic year which divided into 5 groups. Students critical thinking skill has been measured using Critical Thinking Skills Assessment Sheet (CTSAS) with critical thinking skill indicator. Wilcoxon test, n-gain, and Kruskal-Wallis tests are the techniques to analyse the data. The results of this research verified that: 1) There was an improvement in students critical thinking skills on $\alpha = 5\%$; 2) The average score of n-gain students critical thinking skills is .83 (high category); and 3) There was no significant difference (there was consistency) of n-gain students critical thinking skills on senior high school physics subject in all groups. Therefore, OR-IPA Teaching Model has proven its efficacy to improve students critical thinking skills on senior high school physics subject.

Keywords: critical thinking skills, OR-IPA, senior high school

Topic: 3. Physics Education

Identification Of Junior High School Students Misconceptions on Solid Matter And Pressure Liquid Substances With Four Tier Test

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Abstract

Abstract. Misconception is understanding of students about particular concept in which student strongly believed but it is not appropriate with scientific theory. However the student did not aware of this inappropriateness. This study aims to identify students misconceptions of junior high school by using a four-tier test, the sample was grade 9 junior high school student have studied pressure on the substance and liquid topic, with a total sample of nine students. Sampling technique used is purposive sampling. The data obtained through a written test in form of 17 items of four-tier test and interview. Misconceptions were identified using a combination of analysis techniques on a four-tier response test developed by Caleon and Subramaniam. Identified that not all students were found experienced misconceptions, most common misconceptions on item number 12 about pascal principle as much as 6 students. From the interview it is also revealed that the same student misconception on pascal principle. This indicates that the identification of student misconceptions using four tier test analysis is used effectively. Factors that lead to students misconceptions are students come from the students themselves and from the learning environment of students, especially classmates.

Keywords: Misconceptions, four tier test, pressure substance

Topic: 2. Science Education
[ABS-170]
Exploring High School Students Argumentation Structure Through Ecology (A Case Study)

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Abstract
Ecology is an important part of Biology that addresses all the interactions between living things and the environment. This case study research aims to reveal the structure of written and oral argumentation in grade X students in one of high school in West Java Indonesia on ecology. Research subjects were 42 students and 1 teacher with length of research for 2 months. The referenced argumentation pattern is by Toulmins Argument Pattern (TAP). The results showed that students written argument ability are in average structure of claim, data, and warrant pattern. The quality of written argument is quite good with the addition of counter-claim and rebuttal argument counterparts to a particular group in support of the claim. Oral argument capability also shows similar Toulmins argument structure as written, with no additional structures of qualifier, counter-claim, and rebuttal. The comparison between the two shows that a higher quality is owned by a written argument.

Keywords: Argumentation Structure, Ecology, High School Students
Topic: 5. Biology Education

[ABS-175]
Task forms understand the integral concepts based on Blooms Taxonomic Theory

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Abstract
The purpose of this paper is to produce a task in understanding the concept of integral based on Blooms Taxonomy theory. Understanding the concept according to Blooms Taxonomy theory consists of seven categories: Interpreting, Modeling, Classifying, Summarizing, Concluding, and Explaining. This assignment has 7 questions each containing the concept of infinite integral and certain integral concepts. This task was tested legibility by two students and validated by 3 mathematics education experts. The results of the task readability test to understand the concept of Integral is good. The result of the task validation test is feasible to be used to track students understanding in understanding the integral concept. The result of the content validation test on the students understanding of the task of understanding the Integral Concept is good.

Keywords: Task form, Understanding Concept of Integral, Blooms Taxonomic Theory
Topic: 1. Mathematics Education
Advisability of integrated science teaching Material on the Topic of Environmental Pollution to Increase Environmental Literacy and Critical Thinking of Junior High School Students

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Abstract

This research aims to produce integrated science teaching material on the topic of environmental pollution and to obtain empiric factors about the advisability of integrated science teaching material to increase environmental literacy and critical thinking. The research method used was the Research and Development (R&D). The object of this research was the integrated science teaching material on the topic of environmental and the implementation in Junior High School Student. While the subjects of this research were Junior High School Students grade VII in Bandung. The textbooks development method used the model for the process of writing instructional materials. This research used instrument assessment of textbook quality and the readability for of their main ideas instrument. Draft I of teaching material was tested in limited field of Junior High School using the readability for of their main ideas instrument, this draft was also validated by 3 lecturers and 10 Junior High School teachers using assessment of textbook quality. Sampling technique used in this research was qualitative. The results of teaching material development showed high quality percentage of 80,24% with excellent criteria, even though, the readability for of their main ideas test showed percentage of 89.1% with high criteria (independent category).

Keywords: Critical Thinking Skill, Environmental Literacy, Environmental pollution, Integrated Science, Teaching materials

Recognizing students abilities to work through synthesis organic pathways

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Abstract

Student usually using organic synthesis organic pathways to completing the synthesis organic problems. It is important to the student to follow the role each pathways in synthesis organic compound. This study aims to recognize students abilities to work through synthesis organic pathways. This research is using descriptive method. The respondents of this research were 14 students from chemistry education department. The study used essay test to recognize each steps of organic synthesis. Data was from percentage of students answers in each steps. We use the non parametric differentiation statistics in this research to know the differences for each synthesis organic compounds. The result showed students used pathways of aldol condensation, acylation of benzene, and amine primary benzene is the same level of confidence. The result found that students a highest used steps in identify the structure of the compounds in synthesis organic and the lowest in the steps where students have to find the right reagent and conditions for the reaction, write a mechanism reaction, show the complete synthesize as the lowest used.

Keywords: recognizing, students abilities, synthesis organic pathways

Topic: 4. Chemistry Education
[ABS-178]
The influence of treffinger learning model on critical thinking ability of students in vocational high school

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Abstract
This research aims to determine the influence of treffinger learning model against critical thinking ability of students in vocational high school. This research is a quasi-experimental research design with post-test only non-equivalent group design. Sampling in the form of purposive sampling technique obtained a sample of 64 learners which divided into experiment and control groups. In experimental group apply treffinger learning model while control with discovery learning model. This study was conducted for 8 meetings. Analysis of test data using t-test with SPSS 21 program. The result of the hypothesis analysis of t-test obtained $t$ count $> t$ table is $3.350 > 1.999$ and the $P$ value is $0.01 < 0.05$ then $H_0$ is rejected. This research thus shows that the critical thinking ability of learners different significantly between the experimental group with the control. The conclusion that there is a difference between the average critical thinking ability of learners in both learning models.

Keywords: Critical Thinking Ability, Treffinger Learning Model
Topic: 6. STEM Education

[ABS-179]
Implementation of Board Game Based on Pisa Framework in Exploring Highschool Students Scientific Literacy Skills of Digestive System

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Abstract
This study aimed to apply learning with board game based on PISA (Programme for International Students Assessment) Framework to explore the ability of high school students scientific literacy of digestive system using quasi experimental research design. The quasi experimental research design that used was the pretest and post test non randomized control group. These two classes were taken and divided into experimental and control group. The sample was taken by cluster random sampling technique in experimental class (n= 31 students) and control class (n= 29 students) with the population of 11th grade students in a high school in Bandung. Students scientific literacy skills was explored by scientific literacy test with PISA frameworks in the form of 20 multiple choices. Based on the analysis of the Students scientific literacy, the normalized gain in experiment class is $0.695$ and control class is minus $0.048$. Therefore, the result showed that board game based on PISA is effective because students in experiment class have higher normalized gain than control class. Teacher can use board game based on PISA framework as teaching media to improve students scientific literacy skills.

Keywords: board game, scientific literacy, PISA, digestive system, quasi-experimental research
Topic: 5. Biology Education
How to Improve Student Skill on The Concept Dynamic Electricity?

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Abstract
Dynamic electricity is a concept with variety of issues and knowledge that requires understanding, reasoning, and verification. This study aims to describe increasing of understanding ability and argumentation skills student in dynamic electricity by implementation of model based inquiry with multi representation. The research method is quasi experiment with randomize pretest posttest control group design. The sample of data in 10th grade in senior high school at Tangerang Selatan. Technique of collecting data was done by understanding ability test, argumentation skills test, and questionnaire. The results of this study shows that there was significant increase of understanding ability and argumentation skills student which group of implemented model based inquiry with multi representation and group of implemented model based inquiry without multi representation. Students response of it is good. Based on the result, it can be concluded that implementation model based inquiry with multi representation can exercise the students understanding ability and propose scientific argumentation.

Keywords: model based inquiry; understanding ability; argumentation skills

Topic: 3. Physics Education

Project Based Learning Application to Develop Entrepreneurship of Preservice Teacher

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Abstract
The aim of this study is to see the effect of Project Based Learning through innovative food preservation practices on entrepreneurship attitude and entrepreneurship motivation of preservice teacher. The research used quasi experimental method. Sample was taken by cluster random sampling, where the experiment group were treated by Project Based Learning through practice in laboratory and the control group used conventional practice method. Data obtained from postest using questionnaire of entrepreneurship attitude and entrepreneurship motivation scale. The results showed that the level of entrepreneurial attitude of the experimental class are in the good category and the entrepreneurship motivation are in the high category. Hypothesis testing using independent t test showed a significant difference between the experiment group and the control class. Implementation of Project Based Learning through the practice of preservation of foodstuff, requires students to be actively involved learning so that students have expertise in the field of utilization of food preservation technology that can be a business opportunity. It can develop entrepreneurial attitude and student entrepreneur motivation.

Keywords: Entrepreneurship Attitude, Entrepreneurial Motivation, Project Based Learning

Topic: 5. Biology Education
[ABS-182]
Mapping the reasoning skill of the students on pressure concept

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Abstract
Reasoning skill is one of the high order thinking skill which is needed to accomplish the problems in a logical and coherent way. To measure this skill, the researcher adapted the Lawsons Classroom Test Scientific Reasoning (LCTSR) on pressure concept. There are six aspects related to the reasoning skill that were measured. They are conservation reasoning, proportional reasoning, controlling variables, probabilistic reasoning, correlational reasoning, combinatorial reasoning. The aim of this study is mapping the reasoning skill of the students on answering the test of pressure concept. The research method chosen in this study is descriptive method. This test consist of 12 pairs multiple-choice questions with the pressure content and the reason. The test was employed to 60 students at VII grade of junior high school the academic year 2017/2018. The findings of this study showed that 60% of the students achieved level 1 (concrete operational), 33.3% achieved level 2 (transitional operational) and only 6.7% of them achieved level 3 (formal operational). It means the reasoning skill of the student was low. In order that, mapping the reasoning skill of the student can support the educators to prepare and implement teaching effectively.

Keywords: reasoning skill, LCTSR, pressure

Topic: 2. Science Education

[ABS-183]
Cognitive Obstacle On The Topic Of Integral Among Mathematics Education Students

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Abstract
Obstacles are part of a students knowledge at a time that is generally reliable in solving a particular problem but this knowledge is then inadequate when dealing with a new problem. Obstacles are the knowledge that a person possesses and are generally sufficient in solving a particular problem, settling in the mind, but when faced with a new problem this knowledge is inadequate and difficult to adapt. Obstacles arises from the fact that certain concepts have a degree of complexity and necessary to recognize them in a particular order. For example, fractions are more complicated than all numbers, the student experience with operations on integers leads to the implicit nature that multiplications make numbers larger leading to a cognitive obstacle when encounter multiplications fractions less than one. Cognitive obstacles seem to be ontogenetic, epistemological, didactic and even cultural, according to their origins and the way they develop. Cognitive obstacles of Mathematics Education Students of Universitas PGRI Semarang were found when subjects solved the finite integral problem and assumed that the integral was integrable, whereas if the function in the integral is a function that can not be integrated.

Keywords: Obstacle, Cognitive Obstacle, Concept, Finite Integral

Topic: 1. Mathematics Education
What is The Student Response on Using The Weblog For Learning Resources?

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Abstract

The utilization of the internet on learning is growing rapidly including on physics learning at every levels. The aim of this research is to develop the weblogs to facilitate more various and easier learning resources. The weblog development used 4D method (define, design, develop and disseminate). The test of the product response was applied on 22 students. The questionnaire covered 4 aspects which were language, the subject matter content, layout, and the benefits. The response items were measured using Likert scale of 1 to 4 scale. The analysis technique was descriptive statistics. Results of analysis in the aspect of 3.09, 3.14, 3.21, and 3.28 from scale 4 respectively. Overall the result of student response analysis indicates that this weblog is good (3.18 out of 4) for use in learning. The further research should study on the impact of this media to the learning performance.

Keywords: weblog, e-learning, learning strategy, learning technology, physics education.

Topic: 3. Physics Education

Contribution of Statistical Anxiety to Student Learning Outcomes: Study In Universitas Negeri Padang

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Abstract

The purpose of this study is to describe the statistical anxiety contribution to student learning outcomes. The sample of the study was 368 students of Universitas Negeri Padang, who attended Statistical courses in the semester of January-June 2018. Statistical anxiety data were collected through statistical anxiety rating scale (STARS) which analyzed descriptively. The results showed that there was a statistical anxiety contribution to the student statistical learning outcomes, with a contribution value of 10.4 %. Implications are discussed further for learning process in higher education.

Keywords: Statistical Anxiety, Learning Outcome, Statistical Course, Guidance and Counseling

Topic: Other Relevant Fields
[ABS-186]
Are there statistical anxiety differences between male and female college students?


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Abstract
This study aims to describe the differences in college student statistics anxiety based on gender (male and female). The sample of this study was 325 students of Universitas Negeri Padang, who attended the Statistical courses in semester of January - June 2018. The result of research indicates that there are differences in statistical learning anxiety on the gender aspect (male and female college students). Implications are discussed further for learning statistic course and intervention statistics anxiety in higher education.

Keywords: Male Statistic Anxiety, Female Statistic Anxiety, Guidance and Counseling Intervention, Higher Education

Topic: Other Relevant Fields

[ABS-188]
Integrated Science Teaching Materials Oriented on Critical Thinking Skills and Information Literacy

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Abstract
Critical thinking and information literacy are skills that need to be developed to deal with the challenges of the 21st century. This study aimed to produce integrated science teaching materials oriented on critical thinking skills and information literacy. The research method used was Development and Research (R&D) that be limited to preliminary test. Development of teaching materials used the Model for the Process Writing Teaching Materials. There were two kinds of instruments applied in this research, quality questionnaires and comprehension test. The quality of teaching materials assessed by 3 experts and 10 science teachers. The comprehension test was conducted by 30 ninth grade students. All data were analyzed qualitatively. The results showed that the quality of integrated science teaching materials developed in good category with 88.81% and the comprehension of main idea in high category with the percentage of 88.08%, therefore it was feasible to be used in improving critical thinking skills and information literacy of junior high school students.

Keywords: Science teaching materials, critical thinking skills, information literacy

Topic: 2. Science Education
The creative thinking process of teachers in designing mathematical tasks

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Abstract

Students have different backgrounds and abilities. Because of that, teachers must be smart in choosing and giving math tasks to their students. The aim of this study is to reveal the process of creative thinking of teachers in designing mathematical tasks. A participant in this study was Bibah (it is a fake name) based on the functional position of the teacher (focusing on the beginner teacher) elementary school teachers in the Pangkep district of South Sulawesi. This study uses a qualitative approach, with data collection methods using task-based interviews. From the results obtained, we find the biblical thinking process following the sequence of the synthesis stage of ideas, building ideas, planning the implementation of ideas, synthesizing ideas, planning the implementation of ideas and application of ideas.

Keywords: creative thinking; mathematical tasks; beginner teacher

Topic: 1. Mathematics Education

Physics learning module integrated islamic values to support character education in school

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Abstract

The main objective of the Indonesian National Education is the development of the culture and the positive character of the nations generation. Because character education is part of the development of the soul to create a generation of noble character. While character education as mandated by the low of Indonesian National Education System is based on religion and culture. However, the main obstacle to the implementation of character education is the limited teaching materials. As an effort to solve the problem, we developed the learning instrument in the form of learning module of Physics subjects based on Islamic values on fluid concept for grade XI Senior High School sudents to support character education in schools. Development of learning istrument using 4-D development model consist of four phases: define, design, development and disseminate. The data analysis uses Likert sects to test the validity, validity and effectiveness of teaching materials. From these three experiments, the result of the integrated physics module of Islamic Values on fluid concept is very valid, very practical and very effective so it is suitable to be used in Physics education process based on character education.

Keywords: module, values, teaching

Topic: 3. Physics Education
[ABS-191]  
**Lets Reveal it : What are Learning Obstacles in Combinatorial Problems**  

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**Abstract**  
Combinatoric problems usually raises a contextual problems in our daily life and needs a deep understand for solving it. This article tells about exploring what are the learning obstacles in Combinatoric Problems. The writer use a diagnostic test to observe what is the learning obstacles in combinatoric problems. The writer gave the test to 15 students who already learned this topic and they answered questions from three different problems. At the end, they have to find what are the differences from that third situation. The results were they could be understand the situation and solved the problem. the conclusion was none of learning obstacles that found but it is a few things that should be noted for the writer. First, how to make a better learning materials and learning situation. Second, how to develop and to increase the student conceptual understanding so they can analyze every problem comprehensively.This paper as a part of Didactic Design Research.

**Keywords:** Combinatorial Problems, Learning Obstacles, Didactical Design Research  
**Topic:** 1. Mathematics Education

[ABS-192]  
**The effect of activity sheet based on outdoor learning on students science process skills**  

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**Abstract**  
Science is not only a series of facts, principles, and concepts but also the process of discovery. This statement gives a hint that not only the mastery of the concept should be good, but also the students have to know how the process of finding it. The aim of this study is find out the effect of activity sheet based on outdoor learning to the students science process skills. This study was applied to 29 grade 4 primary school student. This study is a pre-experimental conducted for 4 days. To find out the effectiveness of learning using activity sheet based on outdoor learning on students science process skills, science process skill tests consist of 6 items given as pretest and posttest for student. The result of the analysis explain that there is a significant influence between the activity sheet based on outdoor learning to the students science process skill and there is a significant improvement in the result of the students science process skill test after experiencing the learning by using the activity sheet based on outdoor learning.

**Keywords:** Activity Sheet, Outdoor Learning, Science Process Skill  
**Topic:** 2. Science Education
Beliefs of Junior High School Teachers on Learning Process on Mathematical Problem Solving

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Abstract
Teachers beliefs had already been categorized by expert in the general process of mathematics learning, but there was still not yet many expert studies on how the teacher beliefs on the learning process of mathematical problem solving. This study was designed to answer the question how the category or orientation of junior high school teachers beliefs on learning about mathematical problem solving. The research approach was a qualitative approach with grounded theory design. Three teachers from three different cluster junior high schools were made as research subjects. Each teacher was given a questionnaire, interviewed, and the learning process that they did on geometry material was recorded and documented for three meetings. The learning process on geometry was chosen because it will contain more mathematical problem solving process. Furthermore, interviews will be noted and coded and synchronized with a questionnaire and analysis of instructional videos by teachers. Based on data analysis, three categories of teachers beliefs on the learning process on problem solving had been obtained. The categorization was called good, very good, and excellent category in this research. How the teachers beliefs of each category will be described in detail in this paper.

Keywords: Teachers beliefs; problem solving; teaching; learning

Topic: 1. Mathematics Education

The Effect of STAD Learning Model and Science Comics on Cognitive Students Achievement

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Abstract
This research aimed to determine the effect of STAD learning model and science comics on cognitive students achievement. The type of research was quasi-experimental. The research design used nonequivalent control group design which was consisted of two experimental groups and one control group. The sample in this research included 84 grade VII students taken from Junior High School in Manokwari. The Technique of collected data used achievement test. The result of data analysis used Kruskal-Wallis Test showed that there was a mean difference of cognitive students achievement (P = 0.000 < 0.05), where the mean of cognitive students achievement taught used STAD learning model and science comics higher than cognitive students achievement of students taught used STAD learning model and conventional learning model. The 1st experimental group gain score was 0.59, the 2nd experimental group was 0.40, and the control group was 0.37. It can be concluded that there is an effect of STAD learning model and science comics on cognitive students achievement.

Keywords: STAD Learning Model, Science Comics, Cognitive Students Achievement

Topic: 2. Science Education
[ABS-206] 
**The Analysis of Students Self Efficacy in Learning Mathematics**

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**Abstract**

The purpose of this research is to analyze the self-efficacy of students in learning mathematics viewed by the theory of Bandura. This research used the qualitative method with the triangulation for collecting data in the forms of interview, observation, and documentation. The subject in this research were students from the 10th grade at one of the high schools in Bandung. Based on the results of research, it was concluded that students have the low self-efficacy since the majority of students in the high school have less confidence in solving mathematical problems and class discussion during learning mathematics. Another interesting result from this research was no correspondence between the self-efficacy of students and their level of cognitive, which means students with the high level of cognitive is not necessarily have the high self-efficacy, and vice versa.

**Keywords:** Learning Mathematics, Self Efficacy, theory of Bandura  
**Topic:** 1. Mathematics Education

[ABS-207] 

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**Abstract**

The main purpose of the current study is to identify the differences between Indonesian and Korean high school students in the regard to science learning orientations based on the inter-correlation between conceptions of, approach to and self-efficacy in learning science. A total of 1241 Indonesian and Korean high school students (609 Indonesian and 632 Korean) participated in the current study. There were three translated research instruments used in the study, namely; the conceptions of learning science (COLS), the approach to learning science (ALS) and the science self-efficacy which were used to identify the students learning orientations from both countries. A Rasch model analyses were performed to seek validation of the instruments, and to obtain the students scores in the interval data form. The Pearson correlation test and a multi-group structural equation modelling were run, to respond to the main purpose of the current study. Based on the result, the current study generated an acceptable model of inter-correlation between COLS, ALS and science self-efficacy. Further analysis using a multi-group analysis to the generated acceptable model indicated that the model was significantly different, as mediated by the country shown by notating significant differences in the several identified paths. The cultural impacts on the learning orientations are discussed in order to understand the differences noted in this case.

**Keywords:** cross cultural study, learning orientations, multi-group analysis, science learning, secondary students  
**Topic:** 2. Science Education
[ABS-208]
Indonesian Preservice Biology Teachers Conceptual Understanding of Genetics and Its Comparison to Americans

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Abstract
Genetics content knowledge plays an important role in creating a scientifically literate society. The main purpose of current study was to find out Indonesian preservice Biology teachers conceptual understanding of genetics by comparing it to previously published American data. Additionally, the current study also identified the effects of different biology education programs and educational years on preservice Biology teachers understanding of genetics. A set of Genetics Concept Assessment (GCA) was administered to 380 Indonesian undergraduate students affiliated with biology education department. The students were in their first, second, third and fourth year of undergraduate levels. Rasch model was performed to validate the instrument and convert the raw scores into interval data forms. Converted raw scores were later used in the further statistical analyses. Based on the analysis, the current study found that Indonesian preservice biology teachers understanding of genetics was significantly affected by their educational years. However, types of the program did not significantly impact their understanding of genetics. The comparison results showed that Indonesian preservice biology teachers had a slightly similar level of genetic understanding to American nonmajors pretest score, while two more times lower than American majors posttest score. Lastly, among nine genetics topics measured on the test Indonesian preservice teachers had the lowest score on describing the molecular anatomy of genes and genomes. The differences on Indonesian and American genetics education for undergraduate levels and suggestions on refinement of Indonesian genetics education curriculum are discussed.

Keywords: comparison study, conceptual understanding, genetics education
Topic: 5. Biology Education

[ABS-209]
Development of teaching materials in the linear program of class XI

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Abstract
The aim of this study is to know the development of educational comic to improve students understanding in a linear program high school of class XI. This educational comic can be said valid to improve students understanding of a linear program in high school grade XI, and students response to learning by using comic media of education. The type of research used is qualitative research. Subjects in this study are the validation experts and students of XI grade in SMA Negeri 8 Cirebon. Based on research conducted, the development of educational comic media has been in accordance with the expected goals. Validation performed by experts has a very valid validity rate with a percentage of 86.7%. Students response to the following learning using educational comic media equal to 76% with strong criteria. So, the conclusion of this research is educational comic media has been successful in its development because of the valid and strong response of students in learning.

Keywords: Comics Mathematics, Understanding Ability, Linear Program
Topic: 1. Mathematics Education
[ABS-212]
The profile of cognitive style, logical thinking ability, and conceptual knowledge of electricity and magnetism topic based on prospective physics teachers grade level

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Abstract
One of the efforts that can be done in designing classroom assessment is to mapping a number of variables that affect the physics learning process, especially on electricity and magnetism topics. In this research, mapping cognitive style, logical thinking ability, and conceptual knowledge of electrical and magnetism topics aimed to know the pattern of change of three variables owned by prospective physics teachers based on grade level. This study is descriptive research with 95 respondents as sample taken from one class for each level by random sampling. The results showed that cognitive style, logical thinking ability, and Electrical and Magnetism conceptual knowledge variables changed with linear pattern. This finding becomes one of the next considerations to design electricity and magnetism learning assessment in universities.

Keywords: cognitive style; logical thinking ability; electricity and magnetism; conceptual knowledge; learning assessment

Topic: 3. Physics Education

[ABS-213]
The content quality of pedagogical and professional competences of teacher of senior high school physics teacher guide books

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Abstract
The teacher guide book has an important role in supporting the implementation of the 2013 curriculum. The using of qualifying teacher guide book has a major impact on the success of the learning process. The book should support teachers developing pedagogical and professional competence because both of these competencies are indicators of basic teaching abilities of a teacher. This study aims to determine the quality of pedagogical and professional competence content of four senior high school physics teacher guide books. The instrument used assessment rubric developed based on pedagogical and professional competence standards of teacher. The assessment was conducted by four experts from LPTK and two physics teachers. The results of the assessment can be concluded that the four of teacher guide books generally are in enough categories both of pedagogical and professional competence. However, there are some both of the competence standards that have not been met in each book. One of the limitations on the standard of professional competence is creativity in the development and presentation of learning materials. Therefore, still need to improving and developing of the teacher guide book in order that can provide further pedagogical and professional competence of teachers.

Keywords: teacher guide book, competence, pedagogical, professional

Topic: 3. Physics Education
[ABS-214]

Interface Web Development For Analysis Of Item Response Theory With Mix Model Approach and Application On Bank Soal MGMP

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Abstract

The development of the world of education today is progressing very rapidly, the era of technology is increasingly modern, so that teachers must have adequate competence in every process of teaching and learning activities. One type of measurement often done in education are measurement of the students performance both for cognitive and effective aspects. These measures are extremely important therefore must use a good measuring tool and the results also easy to interpret. The measurement of students performance mostly use tests. Items response theory have evolved from traditional one to modern theories to apply more realistic models which are known as item response theory. However the use of modern test theory much rely on availability of the computer software. In this paper we report the development of a web-GUI interface that can be used to analyze polytomous responses, using Hierarchical Generalized Linear Models which will also contains theories and interpretations of the results. This Web GUI interface is expected to help teachers to understand and to do the analysis of polytomous responses more easily.

Keywords: Item Response Theory, Web GUI interface, Hierarchical Generalized Linear Models.
Topic: 1. Mathematics Education

[ABS-215]

Problem-based learning model to improve the ability of counting operation on fractions

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Abstract

This study aims to determine the improvement of students ability in the operation of fractions of mathematics subjects through a problem-based learning model. Participants in the study were 32 students of class V from the primary schools in the city of Bogor Indonesia. By applying classroom action research approach, this research is carried out collaboratively with two cycles in which each cycle has stages of planning, implementation, observation, and reflection. The results showed an improvement in cycle II. The results of student behavior change showed an increase in discipline, cooperation, confidence and spirit of students. The acquisition of the average value of learning outcomes increases in cycle II. Improved value seen in aspects of the implementation of learning, changes in student behavior, and the ability to calculate operations on the fraction of mathematics subjects. Results of this study indicate that the problem-based learning model can improve student ability in fractional calculation operations.

Keywords: Problem-based learning model, ability of counting operation, fractions
Topic: 1. Mathematics Education
[ABS-216]
Developing Media 3Dmetric to Increase Spatial Ability of Elementary Student
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Abstract
In the national curriculum of Indonesia, the level of elementary school education is required to be able to master the material geometry fields and space geometry that in fact also requires spatial ability. At the stage of thinking in the age of elementary students need a concrete object to realize abstract thinking that is in the minds of students so that thought becomes concrete or more real. The purpose of developing 3D-Geometric (3Dmetric) that students more easily understand three dimensional space specifically into the spatial abilities of their students. This research has used Design Research method that is part of research and development method that protrudes toward the development of instructional materials and or learning materials. This study uses Hypothetical Learning Trajectory as a reference in research and several supporting instruments of development. The result of this research is that media 3Dmetric can increasing spatial ability. Students can also distinguish between diagonal space and diagonal side of space.

Keywords: 3D Geometry, Augmented Reality, Design Research

Topic: 1. Mathematics Education

[ABS-217]
The Ocean Climate Phenomenon and Crisis and the Challenges of Earth Physics Education in Indonesia
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Abstract
The study aims was as to describe ocean climate phenomena occurring in Indonesia and earth physics education profile conducted at the institution of teacher education to answer crisis and challenge ocean climate in Indonesia. The method used is descriptive analysis based on syllabus and test result and interview to student of pre-servis teacher to 25 student in private Lembaga Pendidikan Tenaga Kependidikan (LPTK) 1 and to 19 student in LPTK 2 about ocean climate through field study. The results show that students have a low understanding of the impact of the ocean climate and there are some issues related to the concept of ocean climate. Another fact of the syllabus used is that earth physics courses are not deeply taught material, dominated by theoretical studies and less focused on preparing students for ocean climate phenomena. As a recommendation, it is necessary to restructure the earth physics education of the ocean climate in order to increase the climate literacy. Through course accordingly, we can greatly help students physics prospective teacher to improve climate literacy to solve the problem of ocean climate crisis in the society

Keywords: ocean climate phenomena and Crisis; earth physics courses; climate literacy; student physics pre-servis teacher.

Topic: 3. Physics Education
[ABS-219]
Enhancement of Learning Outcomes Using Audio Visual Media

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Abstract
This study aims to determine the improvement of learning outcomes of students IPA by using audio visual media. The result of learning activities that have been done for three cycles, it can be concluded that the process of learning implementation using audio visual media (video) on the subject matter to know the main parts of the animal can attract the attention of learners, so as to improve the learning result of IPA, the number of learners who got the science learning outcomes above the mean score under the criteria, to 29 students or 90.62% got an average score above the criteria. So this situation indicates that there is an increase in learning outcomes of students IPA by using audio visual media.

Keywords: Learning Outcome, Media, Audio Visual
Topic: 6. STEM Education

[ABS-220]
Investigating Scientific Literacy of Students on The Topic of Water Pollution Through STEM Based 6E Learning By Design

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Abstract
Indonesian PISA achievement in 2015 was the lowest of the OECD countries. The average of Indonesia students scores on PISA 2015 for scientific literacy has been evaluated on the ranked of 62 from 69 countries. This PISA achievement must be improved in 2030. The scientific literacy competence of domain demanded students to have the ability to explain scientific phenomena, evaluate and design scientific investigation, interpret data and scientific facts, where learning stage consists of engage, explore, explain, engineer, enrich, and evaluate. The study aims to investigate scientific literacy of students on the topic of water pollution through STEM Based 6E Learning by Design. The research design used poor experimental design with The One-Group Pretest-Posttest. The research subjects were students of VII class in SMPN Bandung. The research instruments used scientific literacy test (pretest and posttest). The technique of data analysis used N-gain test. The result shows that the N-gain of scientific literacy is 63.71 (in medium category).

Keywords: Scientific Literacy, STEM, 6E Learning By Design
Topic: 2. Science Education
Analysis on strength, weaknesses, and challenges in Chemistry Learning Course: a descriptive study to enhance the quality of learning

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Abstract
Chemistry Instructional Planning (CIP) is one of courses provided by most of Chemistry Education Department as a part of Chemistry Education curriculum. The course aims to enhance chemistry prospective teachers capabilities in designing lesson plan (LP). Descriptive study was conducted to explore the strength, and weaknesses of CIP curriculum and its implementation. The results were expected to contribute in improving the quality of CIP course (CIPc). The objects of this research were secondary data curriculum, LP made by student, and learning situation. The research instruments were curriculum assessment format, assessment rubric of LP and class observation sheet. The result shows that some strengths were found in the curriculum and implementation of the CIPc. In general, the course has facilitated students to design learning step by step. However, the weakness that must be anticipated was learning process has not trained the metacognition skills. This skills are needed in designing LP to exercise argumentation, and reflecting skills. Therefore, reorientation of CIPc and learning is recommended to fit with expectation

Keywords: Chemistry Instructional Planning, lesson plan, metacognition
Topic: 4. Chemistry Education

Mathematics Anxiety of Grade VII Junior High School in East Jakarta

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Abstract
The purpose of this study was to determine the mathematics anxiety in urban areas like Jakarta which is the dominant area one of the advanced cities in Indonesia. This study focuses on how the image of mathematics anxiety of students in one junior high school in East Jakarta. This research used questionnaire design with descriptive analysis of qualitative. This study was conducted on 49 students of grade VII and discuss about 4 main indicators of mathematics anxiety, i.e. 1) Mathematics knowledge/understanding related to the things such as the emergence of a mind that he did not know enough about the mathematics; 2) Somatic related to the changes on the state of the individual body for example like sweating or heart beating fast; 3) Cognitive related to the changes in cognitive a person when dealing with mathematics such as unable to think clearly or be forgotten; 4) Attitude related to the attutudes that arise when someone has mathematics anxiety such as not confident to do the things that are asked or do not want to do it. Data were collected based on questionnaire which has been developed based on the 4 indicators.

Keywords: Mathematics Anxiety, Junior High School
Topic: 1. Mathematics Education
The potentials of students creative disposition as perspective to develop creative teaching and learning for senior high school biological science

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Abstract
This study aims to identify the potentials of students creative disposition and the perceived position of their creative disposition in biology learning. Research participants were 72 senior high school students in Mataram, West Nusa Tenggara. Data were collected through questionnaires. The participants were required to complete a closed questionnaire as self-report responses to statements about creative dispositions and position of students creative dispositions as compared to their peers. The resulting data were processed qualitatively to determine the categories of creative characteristics and quantitatively t test was used to analysis the effect of creative disposition on students position of creative disposition. The results showed that students have high category, average and low level creative disposition. The position of the students creative disposition is influenced by their creative disposition. The male student group shows more creative characters in the persistent domain than in the inquisitive, imaginative, collaborative, and disciplined domains; meanwhile, the female student group exhibits more collaborative character. The student creative disposition importance as base for creative instructional development design.

Keywords: Creative disposition, position of students creative disposition, and Biology science creativity

Topic: 5. Biology Education

The analysis of students answers in solving ratio and proportion problems

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Abstract
The ratio and proportion is one of the basic concepts in mathematics. This concept is not only used to solve problems in mathematics but also in other disciplines and in daily lives. So, students should have proficiency in solving ratio and proportion problems. During solving ratio and proportion problems, among students may have difference answers. Based on the students answer and prediction of didactical situation, lesson plan and anticipation of didactical situation would be done by teacher. The purpose of this study was to analyze the various answers of students as well as to see the mistakes made by students in solving ratio and proportion problems. The method used in this study was a descriptive qualitative. The subject were ten students of junior high school in Tangerang Selatan, Indonesia. Written tests related to ratio and proportion problems would be done by the subject and to be continued with depth interviewing. The result of this study are that almost students apply formula although without understand why the formula be used and the concept of ratio and proportion. These results can be used as a reference in implementing the learning of the ratio and proportion.

Keywords: Ratio and Proportion Problems, Students Answers

Topic: 1. Mathematics Education
The ability of senior high school students in comprehending mathematical proofs

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Abstract

Mathematical proving ability is an ability which has function to improve mathematical high order thinking and reasoning skill. This ability consists of two sub-abilities, which are mathematical proof comprehension and mathematical proof construction. Both of the sub-abilities are related each other. To construct mathematical proofs, students need to have good mathematical proof comprehension. Due to the importance of mathematical proof comprehension, a qualitative descriptive study was conducted to describe senior high school students ability in mathematical proof comprehension. A test was given to 9 students of 11th grade in one of senior high schools at Bandung, West Java, Indonesia. The students works were analyzed for each proof comprehension indicator. Overall, the research found four results, the students: (i) were good in giving a reason for each step of proofs; (ii) got difficulties in validating a step of proof; (iii) were good in applying the steps of a proof to prove similar statement; and (iv) failed in determining and proving a notion based on pattern from the given statements. This study concludes that the senior high school students ability in comprehending mathematical proofs has not been satisfied. In several parts, it needs to be improved during mathematics learning process.

Keywords: mathematical proving ability, mathematical proof comprehension, proof validation

Profile of Elementary Students Argument Ability on the Energy Topics

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Abstract

The purpose of this research is to explore information about students argumentation ability in elementary education level. This research uses descriptive quantitative method. The sample in this research is 34 students with 26 students in grade 3 and 18 students in class 6. The technique of argumentation profile data compilation is using worksheet that provides image with topic energy then students give argument through writing. Techniques Data analysis using the Quality Assessment refers to Toulmins Arguments Pattern (TAP) such as: Data, Claim and Warrant which is the basic structure of an argumentation. The results show that grade 3 students argument ability is better than grade 6. In grade 6 argumentation in category D (27.8%), D-C (22.2%) and D-W-C (5.6%) while the rest can not provide argumentation. In the grade 3 the argumentation ability on D (23.1%), D-C (26.9%) and D-W-C (23.1%) and the rest are not able to provide argumentation.

Keywords: Argumentation Ability, elementary education level, Energy Topic

Topic: 1. Mathematics Education

Topic: 2. Science Education
[ABS-229]
Using Physics Representation Worksheet to Enhance Students Understanding and Performance about Force

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Abstract
The aim of this study is to investigate students abilities to understand and solve physics problems by teaching them how to develop representations using physics representation worksheets. The particular curriculum component studied here relates to the concept of force (the application of Newtons laws). The first year students were involved in this study to find out the extent to which the worksheet can support students understandings and capacity for problem-solving. An experimental approach was applied for this study. For data collection, before and after instruction, students were asked to solve 11 items from the force concept inventory FCI (a standardized force concept test) which is a multiplechoice test. Two open questions were solved by students to measure students performance at the end of the instruction. Based on the analysis of the results, students score of the eight FCI items increased while scores for the two open-ended items decreased; score for one item did not changed. Students performance in solving inclined plane, above 50% students were able to correctly draw all forces exerted on an object. Furthermore, in the horizontal surface problem, 5 out of 23 students could perfectly solve the problem; they drew all forces precisely and executed the final answer.

Keywords: FCI, Representation
Topic: 3. Physics Education

[ABS-232]
Feasibility of physics teaching materials oriented on cognitive ability and argumentation skill of student

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Abstract
This study aims to determine quality and understanding textbooks of physics-based multimodal representation oriented on the provision of student cognitive abilities and argumentation skills. The research method is used research and developments design. Instrument that are used test of quality and understanding test of textbooks. Data analysis technique for textbook quality instrument through a questionnaire consisting of several aspects and the instrument of textbook understanding using the main idea test and supporting the main idea test that consist of 38 paragraphs. The results of data analysis for the quality textbook test obtained through the scores of questionnaires scores from three expert lecturers and 10 teachers in comprehension of physics studies are converted in the form of a percentage of textbook quality obtained in the developed 87.4% that is in the category very well. The results of data analysis for understanding test of students obtained by 88% that is in the category of independence (high understanding). The average of quality test and understanding test is 87%. Thus, the feasibility of textbooks based on multimodal representation oriented on the provision of cognitive abilities and argumentation skills in the feasible category.

Keywords: Textbooks, Teaching Material, Multimodal Representations, Cognitive Abilities, Scientific Argumentation Skills
Topic: 3. Physics Education
[ABS-233] Profile of the prospective teachers response to the development of scientific communication skills through physics learning

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Abstract
This article discusses the profiles of prospective teacher responses to the development of scientific communication skills through physics learning. Data were collected using questionnaires and interviews to strengthen the data obtained through questionnaires, data were analyzed descriptively. The results show that prospective physics teachers who have already joined the Teaching practice/Field Experience Program 2 (FEP 2) or who are currently following FEP 1, generally argues that the development of scientific communication skills can be conducted through subject matter learning, especially physics learning. Some prospective teachers gave an anomalous response to some statements on the questionnaire, for example they agreed on the statement that the source of physics learning is sufficient from teachers explanation, students do not need to read textbooks, not yet need to read scientific articles and scientific reports. Based on these findings they should be given good understanding of the aspects to be learned in developing scientific communication skills, as well as their ability in transferring or developing scientific communication skill integrated within physics learning need to be assessed.

Keywords: scientific communication skills, physics learning, prospective teachers

Topic: 3. Physics Education

[ABS-234] The Utilization of Bio-Booklet of Plants Diversities Based on Local Potency to Enhance Students Conservation Attitudes and Skills for Classification

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Abstract
Community-based natural resources in Indonesia are highly diverse and notably important as potential learning resources. One of those local potencies lies in Taman Hutan Kota Langsa. The classroom activities were conducted through the use of bio-booklet containing near extinct plants and native plants of Aceh that existed in Taman Hutan Kota Langsa. With regard to this issue, the current study was carried out to enhance classification skills and conservation attitudes of young learners during field trip to Taman Hutan kota Langsa. The samples of this study were first grade students of SMA Negeri 5 Langsa. Data of conservation attitudes were obtained from questionnaire, whereas data of classification skills were collected using pretest-posttest and students worksheet. In addition, the data were analyzed using mean-difference test and normalized gain score. Preliminary study disclosed that Taman Hutan Kota Langsa is importantly feasible to be learning resource because of its 80 plants species which consist of 5 near extinct plants and 5 native plants of Aceh. According to the interview with biology teacher from SMA Negeri 5 Langsa, conventional lessons with text-books and indoor learnings were still not effective to enhance classification skills and conservation attitudes of students.

Keywords: Bio-Booklet, Local Potency, Conservation Attitude, Skills for Classification

Topic: 5. Biology Education
Analysis of Mathematical Modeling Ability in Solving Combination Problems Using LIT Teaching Materials

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Abstract
This article was written based on the results of student learning evaluation after learning combination by using Local Instruction Theory (LIT) teaching materials in realistic mathematics education. This study aims to explain the process of mathematical modeling of students in solving the problem of combinations that refers to the process of horizontal and vertical mathematization. The research method using case study approach by classifying the students into three categories of ability that is high, medium and low. From each capability category, one student is selected as the subject of the study. The results showed that students in high ability category, can perform all modeling process including the process of horizontal and vertical mathematization well. Students in the medium category, can perform the second stage modeling process that students can understand, simplify, perform the process of horizontal mathematization but students have not achieved vertical mathematization. Students in the low ability category are only able to work in the earliest modeling stages of understanding, simplifying and incomplete horizontal mathematization.

Keywords: combination, local instruction theory, mathematical modeling, mathematization

Topic: 1. Mathematics Education

From Ratios of Right Triangle to Unit Circle: An Introduction to Trigonometry Function

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Abstract
Knowing the two contexts of trigonometry both trigonometry as ratios of right-angle triangle and trigonometry as a function is important to students. Educational research has shown that students could not distinguish between these contexts and understand why trigonometry is a function. Study showed that a unit circle context can be a glue between them. However, the transition from the triangle concept to unit circle concept is not well delivered. In this study we propose a lesson design for trigonometric to filling the gap between right triangle context and circular function context. This study is underpinned by the previous research proposed by Altman & Kidron (2017) that describe how is students cognitive process through constructing knowlegde. We also report on the results of a classroom case study in which the design has been implemented and researched through a phenomenological investigation based on interviews, classroom observations. We discuss the task-related difficulties that students faced in their concept development. The results of the study suggest that the design can link between trigonometry as ratios of right-angle triangle context and unit circle context. Also, we suggest that prior knowledge of students is the main indicator in order to the design runs well. A consideration of technical support in group work devision is also discussed.

Keywords: Trigonometry, High School Students, Didactical Design, Students Difficulty, Learning Trajectory

Topic: 1. Mathematics Education
Design Practicum Water Purification and Sea Water Treatment Becomes Freshwater To Increase Student Creativity SMP On Mix Purification Material

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Abstract
Abstract. This practice uses a distillation device from household waste. The water used for the clarification process is the sewage water from the ditch in Tomba Village in Baubau and the sea water used is sea water from the sea of Baubau city. This research method is ADDIE development (Analysis, Design, Development, Implementation, and Evaluation). However, this research method only did until the development step. In necessity analysis, the researcher analyzed literature study and field study. After the stages of next analysis stage is the design stage, researchers design a practicum design and then consulted with a competent lecturer in the field of water purification and processing of sea water into fresh water. After the design stage then carried out the stages of development, the researchers conducted the optimization process as much as 3 times. During the optimization process a feasibility assessment of practical design is undertaken. The assessment was conducted by 5 observers of postgraduate chemistry education students. Indicator of practical feasibility assessment that is related to mixed separation material, equipment resistance, practicality of the tool, accuracy of equipment and student safety and tool capability of separation is directed from the distillation result in terms of smell and taste. The result of percentage of process of appraisal feasibility evaluation 90.90%, 90.90%, 93.18%, 93.18% and 93.18%, respectively. The percentage is included in the category of excellent interpretation, based on the result of the feasibility assessment, the practical design is ready to be implemented in the learning of mixed separation material.

Keywords: Practical Design, Water Purification, Creativity
Topic: 4. Chemistry Education

Developing 21st century student research skills through assessment matrix and edmodo in biology project

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Abstract
This reasearch aimed to develop 21st century student research skill by using assessment matrix and guidance through edmodo. An assessment matrix based on a research skill development framework modified by Venning & Buisman-Pijlmann. The study was using mixed method which combine qualitative and quantitative data. Design of the study was embedded experimental. Research subject used 2 class XI in senior high school that consist of RSD1 and RSD2. Instruments that used were test of logical thinking skill (TOLT), assessment matrix, research skill test, and student response questionnaire. The results showed that the students research skill by using assessment matrix were increased with recurring guidance in edmodo application. There was significant difference of research skill scores between class RSD1 and RSD2. This is accordance with the TOLT results that showed student formal thinking in RSD1 is higher than RSD2. Our finding may aid in reforming 21st century student research skill, particularly in project learning by using assessment matrix and edmodo.

Keywords: 21st century research skills; Assessment matrix; Edmodo; Biology project
Topic: 5. Biology Education
Facilitating of fourth grade students problem solving skills on force and changing

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Abstract
This research determinations to designate students Problem-solving skills on force and changing toward elementary level through experiential learning. The indicators of problem-solving skills applied in this research were the indicators that definite to the problem-solving skills on impulses and attractions. A descriptive-qualitative design has already been fulfilled to collect data from fourth-grade elementary students in one of school in Bandung Barat Regency (32 participants: 9-10 years old). The instrument which is developed formed essay with the interview process. The result shows that every characteristic of problem-solving skills has been developed and described such as identification, arguments hypothesis, collecting data, analysis synthesis and conclusion. To summarize, the experiential learning is able to designate the 4th-grade elementary students problem-solving skills on force and changing

Keywords: problem solving skills, fourth graders, force and changing
Topic: 3. Physics Education

Analysis of air pollution conception on pre-service elementary teachers

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Abstract
This research aims to identify the conception of pre-service elementary school teacher on air pollution. Analysis of air pollution conception on pre-service elementary school teachers straight away desirable for developing proficiency and mastery of the concept. Data were collected on as undergraduate students of elementary school teachers in Sumedang (84 participants). The sample is measured by a diagnostic tests (four-tier test) that have been tested for validity by the validator experts and in-depth interviews. Based on the results, (1) the samples are clustered into 4 groups based on understanding the concept, do not know the concept, misconceptions, and less understanding the concept. (2) The misconception occurred of pre-service elementary school teacher unperceptive the process on air convection and the environment. (3) The generating of the misconception on pre-service elementary school teacher is the source on the information acknowledged such as books and the internet. The development of learning models and information sources on pre-service elementary school teachers can improve knowledge of conception on air pollution.

Keywords: conception, air pollution, pre-service elementary teachers,
Topic: 4. Chemistry Education
[ABS-243]
Students construction error in translation among mathematical representations

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Abstract
This research arises from student failure to construct target representation equivalent to source representation. The study aims to explore student construction errors in translation among mathematical representations. Explorative study with a qualitative approach was conducted to 51 students majoring in mathematics. The data collection tools used are the mathematical translation task and interview protocol. Data were collected by think aloud and task-based interviews. The finding of the study showed that student construction errors in translation among mathematical representations occur in various forms, i.e. lost of representational attributes, interference thinking, pseudo-thinking, disconnected connections, miscalculation and lack of preservation of representative equivalence. The research findings have implications for designing scaffolding of learning-oriented reconstruction for students thinking to make meaningful translations.

Keywords: Construction error, Translation, Mathematical representation
Topic: 1. Mathematics Education

[ABS-244]
Argument Driven Inquiry instruction to facilitate scientific reasoning of 11th grade students in light and visual instrument topic

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Abstract
Scientific reasoning is one of the most important processes for developing scientific knowledge and also one of the skills required for students to handle open ended real world tasks in their future career. This research aims to develop the scientific reasoning of 11th grade students through argument driven inquiry instruction (ADI) in the topic of light and visual instrument. The participants were 34 11th grade science emphasized program students. They were selected by purposive sampling. Research instruments were comprised of Lawson Classroom Test of Scientific Reasoning (LCTSR) and student reports. The data were analysed by using qualitative data analysis and quantitative data analysis, which were content analysis, mean and percentage. The student scientific reasoning measured by the pre and post LCTSR improved from 11 to 48 percentages. The results from student reports indicated 42 percentages of participants had well-scientific reasoning. The argument processes, both verbal and written, are keys to practice and develop student scientific reasoning.

Keywords: Argument Driven Inquiry; Scientific reasoning
Topic: 3. Physics Education
[ABS-245]
Problem Based Learning with the Use of Manipulative Materials to Improve Student Interest of Mathematics Learning

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Abstract
Abstract. This classroom action research reviews about the using of Problem Based Learning (PBL) with the use of manipulative materials to improve students interest in mathematics learning. PBL provides an opportunity for students to learn mathematical activities related to real life problems with use of small groups in the classroom. The manipulative material will help students understand abstract ideas of mathematics, and make learning mathematics more interesting, challenging, active and can increase student interest in mathematics. Thus, applying PBL with the use of manipulative materials can improve student interest in mathematics learning.

Keywords: Problem Based Learning, Manipulative Materials, mathematics interest of students in mathematics learning.

Topic: 1. Mathematics Education

[ABS-246]
Cognitive Load Analysis of Pre-service Science Teachers in Developing Teaching Skills of Waves

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Abstract. This study aims to analyze the correlation between Intrinsic Cognitive Load (ICL) and Extraneous Cognitive Load (ECL) in lectures that develop the teaching skills of pre-service science teachers. Participants in the study were 31 pre-service science teachers in Bogor and Bandung Indonesia. Data of ECL were collected with a complexity task containing a short question to measure the ability of information analysis during a learning activity to take place. ECL data were collected with a 7-scale questionnaire. Questionnaire to disclose the ECL contains a statement of the mental effort of pre-service science teachers in lectures that develop teaching skills through lectures strategy with the stages of Introduction, Reflection, Visualization, Application, Recitation, and Evaluation. Result of data analysis found that applied lecture strategy successfully improved pre-service science teachers ICL and reduce ECL. This strategy produced low mental effort especially at introduction stage. The mental effort increases on the application stage.

Keywords: Cognitive Load, teaching skills, pre-service teachers

Topic: 2. Science Education
[ABS-247]

Reconstruction of Collaborative Problem Solving Based Learning in Thermodynamics with the Aid of Interactive Simulation and Derivative Games

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Abstract

The reconstruction of thermodynamic learning aims to develop and innovate more active and student-centered learning, in addition to providing skills such as problem-solving and reflective thinking skills through collaborative problem-solving (CPS). Development of students' ability to solve problems, effectively carried out in groups in which they are encouraged to exchange arguments, combine knowledge and skills in finding solutions. The reconstruction of thermodynamic learning is developed with the help of interactive simulations with the aim of understanding abstract concepts, cycles and graphs, and derivatives games with the objective of assisting in the understanding of thermodynamic mathematics. Method used in this research was design and development research (DDR). DDR stages that had been done in this research were the design and development model which was the design of CPS based thermodynamic learning model and the development of learning tools including: syllabus, semester learning plan, learning activity, and learning experience.

Keywords: thermodynamic learning, collaborative problem-solving (CPS), interactive simulations, derivatives games

Topic: 3. Physics Education

[ABS-248]

The effect of inquiry in scientific learning on students self-confidence

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Abstract

The study investigated the effect of inquiry in scientific learning on secondary school students' self-confidence in mathematics. The design of the study was quasi-experimental with 70 students in two different classes in the 11th grade of this school participated in the study. The result of the research showed a significant difference between self-confidence scores of the experiment group and the control group. It was also found out that inquiry in scientific learning was more effective in the positive development of the students' self-confidence. At the end of the research, it is revealed that the students who are educated by inquiry in scientific learning are more successful than the students who are educated by the traditional instructional learning.

Keywords: inquiry, scientific learning, students self-confidence

Topic: 1. Mathematics Education
[ABS-249]
Development of Learning Tools Physics Problem Based Learning Model with PhET Assistance to Improve the Ability of Critical Thinking of Junior High School Students

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Abstract
The purpose of this research is to produce physic learning device regarding to the material of dynamic electricity by using problem based learning (PBL) assisted by PhET in guiding critical thinking skill of junior high school students. The objective details are generating the validity of learning tools developed through PBL model as well as teaching materials for students and student activity sheets, resulting the practice of instructional tools developed through PBL model, analyzing and describing the effectiveness of learning tools developed through PBL assisted by PhET reviewed by students critical thinking skill after the application of PBL model assisted by PhET to strengthen students critical thinking skill. Research and Development is a type of research used with 4D as the model and one group pretest posttest design. Data collection in this research is by using validation, questionnaire, test, and observation while the technique of data analysis is using quantitative descriptive analysis. The instruments developed are lesson plans, student worksheets, critical thinking skills tests and PhET simulation media for experiments. The final result in this result is to bring on a valid, practical and effective learning instrument in order to drill students critical thinking skill on the subject of dynamic electricity.

Keywords: Critical Thinking Skill, Problem Based Learning
Topic: 3. Physics Education

[ABS-250]
The Use of Inquiry Cycle Learning to Enhance Students Cognitive Abilities on Simple Harmonic Motion

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Abstract
The aim of this study was to get an overview of cognitive enhancement in the subject matter of simple harmonic motion of students who received inquiry cycle learning. There were 20 items test were given to 63 X-grade students from a senior high school in Pandeglang. Each item had five options and students had to choose the right one. Method used in this study was quasi experiment with the randomized pretest-posttest control group design. The result showed that implementation of inquiry cycle learning significantly can further enhance students cognitive abilities ($g = 0.46$) compared to conventional learning ($g = 0.2$). From the hypothesis testing, students cognitive abilities using inquiry cycle learning was better than students cognitive abilities using than conventional learning.

Keywords: Inquiry Cycle, Cognitive Abilities, Simple Harmonic Motion
Topic: 3. Physics Education
IMPLEMENTATION OF COOPERATIVE LEARNING JIGSAW TO IMPROVE METABOLISM ANALYSE COMPETENCY OF STUDENTS

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Abstract
The aim of this study is to improve analyze competency of students through the implementation of cooperative learning jigsaw on metabolism concepts. The cooperative learning jigsaw began with information collecting about the materials assigned to each member of the jigsaw groups, and then each expert gathered in expert groups to discuss the same material and agree on it, ending with sharing among all team members in the jigsaw group. This study used a pre experimental design pre test and post test group. The metabolism concepts consist of cell respiration and photosynthesis. The results showed that by cooperative learning jigsaw implementation the students analyze competency on metabolism concepts can increase significantly, although this competency is still low. There are increasing team recognition from the good and very good teams, becoming very good and super teams. Thus the implementation of jigsaw cooperative learning can increase metabolism concept analyze of students and team recognition. One of the weaknesses of students is metabolism concepts mastery is less detailed and less integrate concepts each other. It takes a long time in carry out the cooperative learning jigsaw. All students prefer jigsaw cooperative learning.

Keywords: Jigsaw, metabolism, analyze competency
Topic: 5. Biology Education

Study Mistake Thinking Students in Solving Cognitive Reflection Test (CRT) Required From Dual Procces Theory (DPT)

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Abstract
This study aims to describe the mistakes of students thinking in solving the problem of Cognitive Reflection Test (CRT) based on dual process theory especially on system 1. The research approach is qualitative by taking the subject as much as 2 students in Senior High School (SMA) 4 Ternate City. The results showed that there are 2 categories of student error in solving mathematical problems using system 1. Where students who solve problems using system 1 but wrong and students who solve problems using system 1 and correct but have no logical reason. The misconception of the students identified is on understanding the concept and modeling of mathematics.

Keywords: thinking process, student error, CRT, dual process theory.
Topic: 1. Mathematics Education
The Development of Worksheets IPA with Cognitive Conflict Strategy to Reduce Misconception in Heat Material

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Abstract
This study aims to analyze the feasibility of LKS IPA with cognitive conflict strategy, that has been developed to reduce misconceptions Heat material. This research includes the development of research which refers to the 4-D models by Thiagarajan. The Samples are 50 students of SMP Negeri 1 Lamongan. The design of the study is one group pretest-posttest design implemented in a single group without a comparison group. Research instrument used in the form of validation sheets, observation sheets, and diagnostic tests misconceptions. The misconceptions identification can be done by individuals or groups using Certain of Response Index (CRI). Techniques to determine the improvement of learning outcomes in this study using techniques normalized gain $<g>$. Data analysis is the initial diagnostic test (pretest) aims to identify the concepts that experienced student misconceptions, while the end of the diagnostic test (posttest) aims to determine the effectiveness of IPA LKS cognitive conflict strategy in overcoming misconceptions. The result shows the regression of misconceptions. The decline of students misconceptions after study shows that the development of LKS IPA with cognitive conflict strategy provides a good contribution in reducing students misconceptions. Based on the understanding of the concept of positive student learning outcomes indicate that happens to change, the use of LKS IPA with cognitive conflict strategy contributes improve students conceptions in line with the findings.

Keywords: misconceptions, cognitive conflict strategy, Calorific Material
Topic: 3. Physics Education

Android based multimedia for learning acid and base solutions

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Abstract
One of the chemical concepts that require high-level skills is acid-base solutions. Students understanding of the concept can be achieved by using android-based multimedia support. This study aims to describe the stages of manufacture and feasibility of android-based multimedia for learning acid and base. The Research and Development methods used include two stages, namely analysis and design phase. In the analysis phase, resulting connectedness of concepts and indicators of critical thinking skills in presenting the draft strategy. The design stage generates android-based multimedia that has characteristics of concept presented through the steering questions to develop critical thinking skills equipped with visualization of text and images. The result of validation test has done by lecturer of material and media expert which is valid by counting average of 0.76. While the results of a limited trial conducted by students of chemistry education department is considered feasible to be used as a medium for learning the acid and base concept in class or independent with a percentage of 90.8%.

Keywords: Android-Based, Multimedia for Learning, Acid base solution
Topic: 4. Chemistry Education
The effectiveness of learning based ordeP2E model to trained problem solving skills of the science in elementary school

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Abstract

Abstract. OrDeP2E model (the orientation of problem, the definition of problem, hypothesis submission, hypothesis examination, evaluation) is a learning model that refers to the scientific approach to trained problem solving skills student. This research is a pre-experiment research was conducted to two groups of students, 10 students of class A and 10 students of class B using one group pre-test and post-test design. Before doing the learning with OrDeP2E model, students are given a problem solving skills test (pre-test) and after learning, students are given the same test (post-test) again. The data were analysed using the paired t-test, the n-gain, and the two average similarity tests. The results showed that: there was a significant increase in problem solving skills of the science at α = 5%, n-gain average of high category, and both were not different for two groups. The conclusion of this research is that the learning based OrDeP2E model can effectively to trained problem solving skills in elementary school.

Keywords: Science learning; Problem solving skill; OrDeP2E model

Topic: 2. Science Education

Exploring the effect of reflection to inquiry teaching through lesson study for learning community

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Abstract

The purpose of this study is to explore the learning science of Junior High School teachers from inquiry-based learning strategy through reflection session during activity of lesson study for learning community program. Reflection is important part of the professional development of teachers through lesson study for learning community that teachers learn science content, didactic, and pedagogy. In lesson study for learning community program, teachers learn science content, learn how to develop lesson design, learn how to deliver the science lesson at real class and teacher learn also how student learn through reflection sessions. Data was collected through video recordings and field note from two classes. Then video recordings was transcribed and analyzed. We found the most discussed reflection theme is 48% about student learning activity. In addition the second most discussed theme of reflection is about the learning phase of 43% and 9% of teachers to reflect on learning content. And then we found that teachers play an important role to facilitate (a) students to engage in scientific investigation, both cognitively and attitude; (b) students to understand and build the concept through collaborative learning. Reflection session helps teachers to learn new teaching strategies from practice and improve student learning outcome.

Keywords: Reflection, Inquiry Teaching, Lesson Study

Topic: 2. Science Education
Types and the roles of questions from teacher in science classroom practice

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Abstract
In science experiment, questioning is a major scientific skill in science classroom practice. Questions that encourage scientific investigation can come from many sources including teachers and students. The purpose of this study is to provide an overview of how the teacher presents the questions and find out the roles of questions from teacher in science classroom. This research involved a teacher who taught two science classes at a Junior High School. The learning activities were audio and video recorded. Then recorded was transcribed and analysed. The analysis is devoted to interactions involving questions. Interactional issues related to the way of speaking and questions that encourage responses of student and thinking are discussed in this study. The results show that types and characteristic of questions from teacher involved explication questions, scientific practice questions, explanation questions, and science concept questions. The roles of questions from teacher are to guide students in building knowledge and help students learn about scientific practice, explain phenomena, and develop explanations of the phenomenon. This information provides a description of effective investigation questions in science learning practice, and also useful for teachers in identifying appropriate skills for teacher education and further professional development.

Keywords: Questions of teacher, learning discourse, science classroom practice
Topic: 2. Science Education

Collaborative lesson design of acid base titration curve in Indonesia senior high school

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Abstract
Acid base titration curve is one of the important topics in Indonesia senior high school chemistry. Base on interview with chemistry teachers from different province, the study revealed most of the teachers disregarded this topic, because they got difficulties to find the best strategy to teach the topic effectively and efficiently. The purpose of this study is to develop a collaborative lesson design based on sharing and jumping task of acid base titration curve at the senior high school level in Indonesia. The topic of acid base titration curve can promote high order thinking skills of the student how to present and to communicate data of acid base titration. The methodology used is didactical design research (DDR). Didactical design research has three steps are, (a) analyzing didactical condition before learning, (b) analyzing metapedadidactical and (c) analyzing prospective. Data were collected by interview teacher from different provinces, recordings (audio). The lesson design has been develop, include learning target, prediction student response, and teacher assistance. The developed lesson design will be implemented at grade 11 of senior high school in Bandung

Keywords: Collaborative lesson design, sharing and jumping task, acid base titration curve
Topic: 4. Chemistry Education
The Implementation of Indigenous People Local Wisdom Lekuk 50 Tumbi in managing agriculture and lakes as Biological Learning Sources

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Abstract

The environment plays a crucial role for the survival of living things. But now the environment has encountered various problems such as pollution. Some people still wisely manage the environment, the indigenous people Lekuk 50 Tumbi are a good example of the wisdom in managing agriculture and lakes. This can be one solution to deal with environmental problems, namely by applying the local wisdom into learning one of them through biology learning. This study aims to apply local wisdom of indigenous Lekuk 50 Tumbi as a source of biology learning. This research was conducted by survey method through conducting in-depth interview, participant observation, documentation study and field note. Data have been analyzed by triangulation using qualitative analysis of data collection, data reduction and data display. Indigenous peoples Lekuk 50 tumbi manage their farms by maintaining traditions such as ureh padoi, kenduri sko, tauh, mina padoi and managing the lake by applying the rules and customary law and mutual cooperation together by the community. The value of indigenous knowledge of indigenous peoples is implemented as a source of biology learning that is adapted to the basic competencies of learning.

Keywords: local wisdom; indigenous people; agriculture; lake

Topic: 5. Biology Education

The development of angklung composition teaching materials using music notation software with virtual studio technology integration

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Abstract

Teaching angklung composition by only displaying notations might not be sufficient. To learn conveniently, learners require a conception of the angklung composition tones in addition to the notation display, especially for songs with new arrangements. This paper aims at analyzing a way in developing angklung composition teaching materials using computer technology, which are Sibelius as a music notation software and Kontakt as a virtual studio that can play high-quality sound samples of music instruments, including angklung. To analyze the angklung composition creation process, the computational methods were used. The analysis includes the integration process of Sibelius and Kontakt. After creating the angklung composition, a sound quality test was conducted to 54 students of primary school teacher education program taking art concentration using survey technique. The results indicated that the combination of Sibelius and Kontakt produced angklung music compositions with natural, neat, and clear notes. The majority of the students found the angklung sound samples to sound real. The students were also interested to learn angklung through computer. Thus, it can be concluded that the development of angklung composition teaching materials using a combination of music notation software and sounds sample-based instruments can potentially appear to learners.

Keywords: Angklung composition; music notation software; virtual studio technology; Sibelius; Kontakt

Topic: 6. STEM Education
LEARNING MANAGEMENT THROUGH ENGINEERING DESIGN PROCESS BASED ON STEM EDUCATION FOR DEVELOPING CREATIVE THINKING IN EQUILIBRIUM TOPIC FOR 10th GRADE STUDENTS

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Abstract

Nowadays, the economy is highly competitive, the government needs to develop innovations to increase the value of output by focusing on using creative thinking and innovation to solve the problem. The purpose of this research was to develop creative thinking through engineering design process based on STEM education in the topic of equilibrium for 10th grade Thai students. The methodology of this research was classroom action research. The participants were 44 students. The research instruments included students worksheets, posters and student artifacts, classroom behavior observation forms and interviews. The data were analyzed using content analysis. The results of this study illustrated that the learning management through engineering design process based on STEM education can promoted students creative thinking in the following three competencies, in order of the number of students showing development from most to least: 1) Implement Innovations; 2) Work Creatively with Others; and 3) Think Creatively.

Keywords: Engineering design process; STEM education; Creative thinking

Algebraic thinking obstacle of elementary school students: a hermeneutics-phenomenology study

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Abstract

The main purpose of this research is to explore learning obstacles on algebraic thinking that occurs in elementary school students. It is important to understand learning obstacles to anticipate a didactic teacher during learning process and conduct an innovation in developing new learning designs. Therefore, this study is conducted by utilizing a qualitative research with hermeneutics and phenomenology paradigms. The findings suggest that there are three types of obstacles are ontogenic obstacle, epistemological obstacle and didactical obstacle. This information is expected to be a material for developing didactic design of algebraic thinking. Furthermore, Algebraic thinking habit in elementary school is expected to reduce the difficulty when studying algebra formally.

Keywords: Algebraic Thinking, Elementary School, Learning Obstacles, Tables and Diagrams.

Topic: 1. Mathematics Education
Wave Energy Concept Mastery Relate on Creative Thinking Skills of the Pre-Service Physics Teachers in Environmental Physics Lectures

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Abstract
This research is a survey that aims to wave energy concept mastery relate on creative thinking skills of Pre-Service Physics Teachers in a university in Bima Town-West Nusa Tenggara. This survey involved 23 of seventh semester Physics education students who have taken the Environmental Physics Lecture. Data collected through an instrument in essay form that integrated with indicators of creative thinking skills. Data analysis was done by using descriptive quantitative analysis techniques and anova test using SPSS 20. Based on the results of data analysis, it was concluded the mastery of wave energy concept of Pre-Service Physics Teachers was still low, where the average value was 44.78. Besides that, 78% of Pre-Service Physics Teachers creative thinking skills can be categorized on low categorized. In addition, based on the anova test there was a difference the mastery of wave energy concept in Pre-Service Physics Teachers who have low and middle category of creative thinking skills. The map of wave energy concept mastery and levels of creative thinking skills will be used as references in developing environmental physics lectures about wave energy and creative thinking skills for Pre-Service Physics Teachers.

Keywords: Concept Mastery, Wave Energy, environmental Physics Lectures, Creative Thinking Skills

Topic: 3. Physics Education

STUDENTS GESTURE OF NAIVE, ROUTINE, AND SHOPISTICATED BEHAVIOR ORIENTED ON MATHEMATICAL PROBLEM SOLVING

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Abstract
Gesture aims to see students understanding when such understanding is not visible in writing. This research is a qualitative research with descriptive method that aims to examine the gesture of three students whose orientations are different in solving the problem. Based on literature, there are three kind of behavior problem solving, there are naive, routine, and sophisticated. To reveal the gesture of the students of the three behaviors, six issues related to geometry were given to two junior high school students of equal ability. Data collection was done through mathematical problem solving test, recording of student presentation and interview between researcher and student after doing the problem. Based on the result of the research, sophisticated-gesture students tended to show a profound way of thinking. Routine-gesture students were more relaxed and occasionally showed doubt and unconfidence. Naive gesture students did not tended to behave that look thoughtful. These Gestures were shown consistently for each given question.

Keywords: Gesture; Mathematical Problem Solving

Topic: 1. Mathematics Education
Mental models of secondary school students on atomic structure and chemical bonding

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Abstract

ABSTRACT. This research reports on students mental models on the concept of atomic structure and chemical bonds. The objectives of the study were to reveal the profile of mental models of students based on the level of academic ability, grade level and gender. The clinical interview technique conducted on 9 students determined by purposive sampling. The Participants consist of 3 students each grade X, XI and XII Science Program. The data obtained were processed qualitatively. The results showed that students representation of the concept of atoms and chemical bonds verbally differed from visual representations. Meanwhile the submicroscopic representation participants are likely to give the correct choice on the alternative answers provided by the researcher on the target mental model of the atomic structure and chemical bonding.

Keywords: representation of mental models, atomic structure, and chemical bonding.

The development of grade 11 students mathematical literacy on sequences and series using mathematical modelling

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Abstract

Mathematical literacy is one of the necessary performances to applies mathematical knowledge and skill in real-life. The objective of this research was to develop grade 11 students mathematical literacy through mathematical modelling in topic of sequences and series. The mathematical modelling is a process that uses mathematics to represent, analyze, make predictions or otherwise provide insight into real-world phenomena. The participants were 36 11th grade students along with the classroom action research methodology. The results of this study had demonstrated that the competency of mathematical literacy can be enhanced by using the mathematical modelling process. The data also indicate that two competencies, formulating situations mathematically and interpreting, applying and evaluating mathematical outcomes obviously were improved. During the time, employing mathematical concepts, facts, procedures, and reasoning was slightly improved. It necessary for educator to provide the student-familiar situation to be meaningful lesson for student.

Keywords: Mathematical literacy, Mathematical modelling

Topic: 1. Mathematics Education
[ABS-277]

Mathematics anxiety in dealing math exams

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Abstract

Mathematics anxiety is one of the factors impacting the students achievement. The current study aims at describing the mathematics anxiety of XI class students. This study emphasizes the mathematics anxiety in general and each indicator. This research is a qualitative study adapting the case study approach. The purposeful sampling has been used to select the subjects. The subjects of this study are 17 students of class XI Science in Senior High School 1 Puding Besar. Data have been collected through observations, interviews and questionnaires of mathematics anxiety. Students have been asked to fill out a questionnaire developed by the researcher. Three mathematics anxiety indicators have been considered including somatic, cognitive, and attitude in the context of math exams. The data analysis of the questionnaire findings showed that students generally experience mathematics anxiety at moderate level. The total percentage of mathematics anxiety is 29.4% at high level, 41.2% at moderate level, and 29.4% at low level. The results of interviewing the teachers showed that both students with high and low achievement could encounter light anxiety what could become an aspect that requires teachers attention when preparing their students to carry out mathematics exams.

Keywords: mathematics anxiety
Topic: 1. Mathematics Education

[ABS-278]

Fourth-Grade elementary students critical thinking skills: a preliminary study on magnetic force

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Abstract

This research purposes to define students critical thinking skills on magnetic forces toward elementary level through experiential learning. The indicators of critical thinking skills which were utilized in this research were the indicators that were precise to the critical thinking skills on magnetism. A descriptive-qualitative design has already been effected to collect data from fourth grade elementary students in one of Bandung Regency (27 participants: 9-10 years old). The instrument which is utilized formed multiple choices with interview process. The consequence shows that every aspect of critical thinking skills have been developed and defined such as: reasoning, arguments analysis, likelihood and uncertainly analysis, and problem-solving and decision-making. To sum up, the experiential learning is able to define the 4th grade elementary students critical thinking skills on magnetic forces.

Keywords: Elementary students, critical thinking skills, and magnetic force
Topic: 3. Physics Education
How are misconceptions about material discontinuation by gender in elementary school teacher candidates?

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Abstract

This study wishes to conclude the gender differences in conceptions about the discontinuous nature of the material in potential elementary school teacher candidates. Exhausting descriptive-qualitative research method, the data were composed of the third-grade school teacher candidates of Sumedang Regional State University, with 84 participants (20-21-year-old). Instruments used in the usage of multiple-choice four-tier, questionnaires, and interviews. The upshots of the tests are then treated by evaluating the school teacher candidate answers for each item and gathered by four-tier categories combined with the questionnaire and the interview. The upshots of this study indicate that the highest average percentage of school teacher candidate answers, be it female or male school teacher candidates experiencing misconception. Consequently, it can be supposed that the conception of the discontinuous nature of the material on the third-grade school teacher candidates is still very low. As a final point, countless school teacher candidates are incapable to understand the material well.

Keywords: Misconceptions, material discontinuation by gender, and elementary school teacher candidates

Topic: 4. Chemistry Education

Teachers, pre-service teachers, and students understanding about the heat conduction

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Abstract

The purpose of this study is to analyze teachers, pre-service teachers, and students conceptual understandings related to heat conduction in macroscopic and sub-microscopic (verbal and visual). This description research involves 15 teachers, 33 pre-service teachers, and 39 students. Data were collected by using a conceptual understanding diagnostic test. The result shows that almost the participants know about the macroscopic level. This study suggested that the sub-microscopic level of the science concepts must be learned and taught to students to make science more easy to understand and explained

Keywords: macroscopic, microscopic, representation, conduction

Topic: 2. Science Education
Using Edmodo as Assessment for Learning to Facilitate Improvement of 21st Century Health Literacy

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Abstract
In this 21st century era student health literacy is becoming increasingly important to improve and can be seen as an asset for students. Assessment for learning are viewed as powerful levers for improving student health literacy by giving feedback, so student as learners know their strengths and weaknesses and how to improve their learning. This study aimed to investigate Edmodo as Assessment for learning to assess student performance during the biology learning process. Data collection techniques used are teachers and students questionnaires, documentation, and students digestive system tasks based on health literacy indicators. The analytical technique used in this study is descriptive method. The result showed improvement students average score from task 1 to task 2 in every indicators that indicate by using Edmodo students can improve 4 dimension of health literacy indicators based on Partnership-21 Century Skills frameworks.

Keywords: Edmodo; Assessment for Learning; Health Literacy
Topic: 5. Biology Education

Students Difficulties on Solving Mathematical Problem Based on ESD Objectives

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Abstract
The objective of this study was to analyze students difficulty on solving mathematical problem based on Education for Sustainable Development (ESD) objectives. One of ESD objectives is Clean Water and Sanitation used as context of mathematical problem given beside economic and social context. The method used in this study was descriptive qualitative research. The subject of this study were 34 high school students. They were tested mathematical problem deal with derivatives based on ESD objectives. Polya's problem-solving steps were used to analyze students difficulties on solving mathematical problems that focus on derivatives. The results showed that students have difficulty in devising a problem-solving plan which related to ESD context when they seek maximum value using the concept of the first derivative algebraic functions and they have error in determining the derivative functions. The conclusion is that students are able to solve mathematical problems but they have difficulties when meet the problem related with mathematical problems in the ESD context. This can serve as a basis for further research on the development of high school mathematics teaching materials based on ESD objectives to improve mathematical problem solving ability.

Keywords: ESD, Mathematical Problem solving, Students Difficulties
Topic: 1. Mathematics Education
Enhancing Students Mathematics Literacy Skills and Self Efficacy: Thinking Actively in A Social Context (TASC) Model

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Abstract
TASC learning model directs students to do and think in solving the problem, so that, those require various tools and strategies which developed in increasing thinking capacity and doing mathematics problem. Each individuals thinking skills can be enhanced through various thinking activities that encourage individual growth in enhancing mathematics literacy skills and self efficacy. Mathematics literacy is directed at how to use mathematics in everyday life. The role of mathematics literacy involves more on the implication of knowledge procedures to be applied in the practical world in solving the problem. Based on the preliminary study results, the students are low enough in interpreting the data by applying mathematical concepts to solve the problems about mathematics literacy test that adopted from PISSA. Beside that, self efficacy can influence students in making decisions on an activity undertaken. Therefore, it contributes in students confidence to be earnest and diligent in improving the ability of mathematics literacy. This research is aimed to describe the enhancement of students mathematics literacy and self efficacy through TASC model. The research was experimentally carried out on the seventh grade secondary school students in one of junior high school in Bandung, Indonesia. The participants were 53 students, during the research, the experiment group (n = 26) had taught through TASC model, while the control group (n = 27) had continued through conventional learning model. The data obtained are not only pretest and postest of mathematics literacy test, but also the prescale and postscale of self efficacy.

Keywords: TASC Model, Mathematics Literacy Skill and Self Efficacy

Topic: 1. Mathematics Education

Comprehension of in-service primary-science teachers toward 21st century skills: a case study on Purwakarta

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Abstract
Twenty first century skills usually are going neglected by several primary teachers (in service teachers) in term of learning process rather than students achievement. Though implementation of information-acquisition theory, this research aims to explore primary teachers perceptions toward 21st century skills. The research method which was utilized was a case study with respondents were about tenth in service primary teachers from five schools in Purwakarta city. The data has been collected through semi structural interview and analyzed using grounded theory. The research results show that primary teachers need to comprehend 21st century skills regarding to develop toward primary students learning. Furthermore they also explain the complexity of teachers which were facing and developing their 21st century skills. As a consequence, this research promote the educational training for primary teachers to develop twenty first century skills in primary context.

Keywords: in-service primary teachers, 21st century skills, case study

Topic: Other Relevant Fields
[ABS-293]
Understanding the Combinatorial Thinking through the Strategy Used by Students Cognitive Reflective in Solving Permutation

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Abstract
Combinatorial thinking is useful for training students in the concept of enumeration and others. Therefore, it is important to understand the students combinatorial thinking. The strategy were used to be able to know the combinatorial way of thinking. This research aimed to determine the strategy and describe the process of using the strategy of the research subject. The data collection was done by giving the permutation problem and interview. The validation was done in time triangulation. The technique of data analysis was done through three steps namely data reduction, data presentation, and conclusion. The students with reflective cognitive style were chosen based on MFFT to 140 students. There were 49 students with reflective cognitive style were asked to do the permutation problem. There were two groups namely 92% of the students used one strategy and 8% of the students used two kinds of strategy. The research subjects chosen were only two students. The results showed that two types of strategies used are the filling slot and the formula. The students in general used filling slot. For convincing the truth, some students used another way that is the formula of permutation. Finally, the students matched the answers from the two strategies

Keywords: Combinatorial thinking, strategy, Cognitive Reflective

Topic: 1. Mathematics Education

[ABS-295]
Modelling testlet instrument in blended learning design to assess students metacognition in the environmental chemistry course

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Abstract
Metacognition is one of the skills in the 21st century learning and defined as someone’s awareness about their own knowledge and regulation of their own thinking. Metacognition is needed in chemistry learning and everyday life to understand matter and solve problems. Learners need to know their own metacognition in order to improve and develop their metacognitive. This paper aimed to prescribe metacognition indicators that used in the instrument and modelling a proper testlet instrument in blended learning design to assess students metacognition in the Environmental Chemistry course. This instrument is in e-learning website to support blended learning and the application of ICT in the 21st-century learning. Participants in this study were 9 experts who tested the validity of metacognition indicators and the validity of the instrument. The Delphi technique and Aikens Formula with 9 experts used to measure the content validity. The results were metacognition indicators measured were declarative knowledge, conditional knowledge, procedural knowledge, planning, and evaluation and the instrument validity test results showed that each item was valid and matching with the metacognition indicators. Based on the results, the valid testlet instrument can be used to measure students metacognition level.

Keywords: Testlet, Metacognition, Blended Learning, Environmental Chemistry

Topic: 4. Chemistry Education
[ABS-296]
Development of Active Learning Strategy Integrated with Computer Simulation in Physics Teaching and Learning on Makassar State University

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Abstract
One of the physics learning strategies in the university is active learning. Active learning strategy requires students to be able to learn independently. so that this can be realized learning should be integrated with computer simulation. This research aims to produce learning instrument of active learning strategy integrated computer simulation which is valid, interesting, practical, and effective on Physics Department, Makassar State University. This research is a research and development at (R&D) type. The development procedure was referred to Four-D model consisted of definition phase, design phase, development phase and dissemination phase. The data analysis used Content Validity Ratio (CVR), Content Validity index and continued with reability analysis. Before used in the real class then first was conducted a limited trial test. a limited trial test aimed to avoid biased data by taking 5 students as a limited trial sample. The results obtained that physics learning instrument of active learning strategy integrated computer simulation were valid, reliable, interesting, practical, and effective assessment.

Keywords: Active Learning Strategi, Computer Simulation
Topic: 3. Physics Education

[ABS-297]
Students Conceptual Understanding on Inverse Function Concept

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Abstract
The success of students on solving question about inverse function concept is supported by conceptual understanding which they have. This article has a purpose to describe students conceptual understanding on inverse function concept. This research is a descriptive research with a qualitative approach. The participants of the research are 20 students, who are in the fourth semester of their study. They are the students of a university which located in Malang. The result of the research shows that when the participants answer questions about inverse function, they apply their conceptual understanding. The characteristics of students who have conceptual understanding on inverse function concept are they are able to explain and draw inverse function concept, explain steps on determining inverse of a function, and give explanation why a function which has an inverse has to be bijective. There are some students or participants who as if they solve the question using conceptual understanding. However, it turns out that they have misconception on inverse function concept after a series of investigation by the researchers.

Keywords: Conceptual Understanding; Misconception; Inverse Function Concept
Topic: 1. Mathematics Education
Profile of problem solving ability of junior high school students in science

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Abstract
Problem solving ability becomes one of the required in 21st Century skills. This research is aimed to describe the students problem solving in one of Junior High Schools in Bandung. This research uses descriptive method. The data was collected using test questions which were developed based on problem solving ability meter according to PISA 2012. The research is conducted towards 40 of 7th grade students of Junior High School in the second semester of 2017/2018 academic year. The data was analyzed quantitatively and presented in percentage chart. Overall, there were only 27.5% of the students who are able to answer the problem solving question test. 50.25% of the students were able exploring and understanding problem, 20% students are able to representing and formulating problem; and planning and executing solution. Thus, it can be concluded that the students problem solving ability in science is still low (30.83%). The identified dominant factor that causes the students low of problem solving ability is the learning process which has not facilitated the students yet to develop the problem solving ability. This research recommends to test a learning method which can help the learning process which is able to train the problem solving ability.

Keywords: Problem Solving Ability
Topic: 2. Science Education

Learning Obstacles on Linear Equation concept in Junior High school Students: Analysis of Intellectual Need of DNR-Based Instructions

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Abstract
The purpose of this study was analysis the learning obstacle by students in solving the problems of linear equations system based on students intellectual need. Two problems about linear equations was given to two students of 8th Grade as subjects who had the same initial mathematical abilities. The data collection was using the test of mathematical concept comprehension, and interview with subjects. Interviews was conducted by asking open-ended questions related to the mathematical concept comprehension test that they had been working on. This data were transcribed then analysis in depth to see the learning obstacle and intellectual need. This research finally finds three types of learning obstacle students related to intellectual need. These learning obstacle are ontogenic obstacle, epistemological obstacle, and didactical obstacle. Ontogenic obstacles are where students didnt have of basic mathematical knowledge. Epistemological obstacles were where students couldnt translate problems into mathematical models, miscalculate and also couldnt provide an explanation of the answers obtained. This indicates that the students did not have need for certainty, need for causality, need for computation, need for communication, and need for structure. Didactical obstacle occurs when the teachers are unable to create learning that accommodates the intellectual need of students.

Keywords: learning obstacle, intelectual need, concept analisys
Topic: 1. Mathematics Education
[ABS-302]
Development of Mobile Learning Model Games used RPG Maker MV in Ecosystem Concept

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Abstract
The purpose of this study is to develop learning media based on mobile learning model games on biology learning that is feasible and practical to use. This research uses a research and development approach (R & D) with the development model of ADDIE (Analyze, Design, Development and Evaluation). Media developed using RPG Maker MV software with learning materials of ecosystem concept. The research data was collected using questionnaire for assessment by media expert, material expert, observation sheet, assessment sheet and concept mastering test. The data were then analyzed qualitatively and quantitatively using SPSS v.21 software. Based on the results of research indicates that the media developed according to the assessment of media experts, material experts and users pertained worthy to use with high category. The result of activity observation and user response in learning using mobile learning model categorized by high means that most students focus and antusian on learning. The results of the implementation of media usage measured from the mastery of student concepts show that mobile learning model games are able to increase the mastery of students concepts on ecosystem materials.

Keywords: Mobile Learning, RPG Maker MV, Ecosystem
Topic: 5. Biology Education

[ABS-303]
Using of Science Technology Society and Environment Approach to Improve Scientific Literacy of Grade 11 Students in Plant Growth and Development

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Abstract
The environmental issues surrounding agrochemical products include serious health and ecological problems facing people today. Scientific literacy is necessary for students to understand scientific knowledge and get ready for the future world. Therefore, this action research aims to promote scientific literacy, in the area of plant growth using the Science, Technology, Society and Environment (STSE) approach that consists of 4 steps: 1) motivation; 2) exploration; 3) brainstorming; and 4) decision making. The participants are 35 special program in Biology students in grade 11. The PISA-like test and worksheets were used to collect data. Content analysis and triangulation were used to indicate the development of the scientific literacy. The findings show that the students have better scientific literacy and higher competencies in explaining phenomena scientifically, evaluating and designing scientific inquiry and interpreting data and evidence scientifically. This study strongly suggests that the exploration process within the real situation significantly supports students in developing scientific literacy.

Keywords: scientific literacy; Science, Technology, Society and Environment (STSE) approach; Plant growth and development
Topic: 5. Biology Education
[ABS-304]

**Students Error on Mathematical Literacy Problems**

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**Abstract**

This research aims to analyze of students error on mathematics literacy problems related to trigonometry in secondary school. The error in solving this literacy problem was analyzed based on the types of error by Nolting. This research used descriptive research method and the data in this research were collected through mathematical literacy test and interview. Subjects were selected based on types of error on mathematical literacy test. The results of this research indicate that the types of error made by the student in solving the literacy problems were careless errors, concept errors, and application errors.

**Keywords:** students error, mathematics literacy problems

**Topic:** 1. Mathematics Education

[ABS-305]

**Implementation analysis of formative self and peer assessment towards critical thinking skill in junior high school**

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**Abstract**

The change of assessment paradigm from assessment of learning to assessment for learning is an effort to implement formative assessment. Implementation of assessment for learning involves the students to understand and be responsible for their ability, while the teacher acts as their partner that directs the learning process which is integrated with assessment. The formative self and peer assessment provides feedback to direct students to do self-regulation and think critically. This study explains that the implementation of formative self and peer assessment has not been optimal so that the results of self-assessment tests of junior high students on critical thinking skills in the average category. Implementation of school learning is based on scientific approach but formative assessment has not been integrated. The critical thinking skills of the students are only supported from the learning process only without scaffolding. Interviews were also conducted with four science teachers indicating that this school has developed a website in the implementation of cognitive and formative assessment, but there is no optimization of the system in it merely to transfer paper media to the website. The availability of media can be an opportunity to present formative self and peer assessment in this school.

**Keywords:** Formative assessment, self assessment, peer assessment, critical thinking

**Topic:** 2. Science Education
[ABS-307] 
Developing Teaching Materials of Learning Cycle 7E Based ARCS Motivational Strategies for Topic Optical Instruments

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Abstract
This research aimed to develop teaching materials of Learning Cycle 7E based on ARCS motivational strategies for Optical Instruments matter. The research of subjects are teaching materials and students of grade X in MAN Lamongan. the study used Dick and Carey model. The developed teaching materials is tryouted using one group pretest-posttest design in the classroom. the study of data analysis used descriptive quantitative technique and descriptive qualitative technique. The result are obtained, developing teaching material validity are generally categorized as valid, RPP performing is well, the dominant activity is not observation result, student also have positive responses to learning model, student learning achievement which include competency knowledge with average 0,76 (hig gain catagorized). the obstacles encountered during learning is the time required to carry out learning activities exceeds from predetermined time. Based in teh findings and results, it is concluded that the teaching materials of Learning Cycle 7E based ARCS motivational strategies are feasible application which has developed fit to higher of learning achievement.

Keywords: Learning Cycle 7E; ARCS Motivational Strategies
Topic: 3. Physics Education

[ABS-308] 
IS IT REQUIRED TO REMOVE BORROWING TECHNIQUE IN CLEARLY REDUCED OPERATIONS IN ELEMENTARY SCHOOL?

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Abstract
Operational learning on chunks, especially reduction operations conducted in grade II elementary school, is still an important and interesting issue to discuss, and one of the problems in learning to count the number of counts is the application of borrowing techniques. There are still many teachers who are learning this part unreasonably to the students because it is too abstract and tends to provide a forced way and does not offer a contextual strategy to the students. Operational learning on chunks, especially reduction operations conducted in grade II primary school, is still an important and interesting issue to discuss and discuss, and one of the problems in learning to count the number of counts is the application of borrowing techniques. There are still many teachers who are learning this part unreasonably to the students, because it is too abstract and tends to provide a forced way and does not offer a contextual strategy to the students. The problem mainly arises when the number is reduced in the form of hundreds or thousands that contain the number 0. The reduction algorithm offered by teachers is in fact very difficult to understand by the students. As a result, there are so many mistakes students make on the operation of counting numbers like this. This study aims to provide alternative solutions for teachers in completing the reduction of counting operations, especially on the use of borrowing techniques. This research uses descriptive method where researchers collect data and studies that related to the process of reducing the number of counting done by students. The reduction algorithm offered by teachers is in fact very difficult to understand by students. As a result, many errors are made by students in the operation of counting numbers like this. This study aims to provide alternative solutions for teachers in completing the reduction of counting operations, especially on the use of borrowing techniques. This research uses a descriptive method where researchers collect data and studies that related to the process of reducing the number of counting done by the students.

Keywords: Counting Number, Reduction Operations, Borrowing Techniques
Topic: 1. Mathematics Education
The development of the computer-based instructional media with the interactive tutorial model

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Abstract

This research aims to develop the computer-based instructional media with the interactive tutorial model. This research used the development model design composed by Borg and Gall modified by Sugiyono. The development was conducted through the following steps: (1) potentials and problems; (2) data collection; (3) media design; (4) validation; (5) revision; (6) small group trial; (7) revision; (8) large group trial; and (9) revision. At the stage of potentials and problems, researchers created a need analysis of the results of interviews with mathematics teachers. The media was developed for four meetings, validated by three validators and furthermore revised based on the input from validators. The revised media was tested on small and big groups by students at the Junior High School 8 Pekanbaru. The results of the data analysis showed that the computer-based instructional media with the interactive tutorial model on the coordinate system is valid with the average value of 3.4 and is practical to use by students.

Keywords: Computer-Based Instructional Media, Interactive Tutorial Model

Topic: 1. Mathematics Education

Effective Teaching For Increase Higher-Order Thinking Skills (HOTS) In Education Of Elementary School

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Abstract

Teaching learners to have high-level thinking skills is a challenge in the 21st century, this is because high-order thinking skills (hots) becomes a very important part in the world of education, it is expected when students have high-level thinking skills (hots) can improve the competitiveness of labor, productivity, added value, and opens job opportunities, thereby high-level thinking skills become very interesting topics to discuss. High-level thinking skills (hots) can be trained through Mathematics lessons. This study aims to explain the aspects that must be considered in support of participants educate, these aspects include learning strategies, Assessment, classroom environment. This research uses literature method, literature method is a method that uses library sources, articles, journals, books or others as reference source in this writing research.

Keywords: HOTS, learning strategies, Assessment, classroom environment.

Topic: 1. Mathematics Education
[ABS-313]
Science Textbook Based on Science, Technology and Society in Elementary School

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Abstract
This study reports a quasi-experimental investigating the development of Science textbook based on Science Technology and Society for elementary school. The data collection was got from the achievement test (pretest-posttest). The population was all fourth-grade students of elementary schools in Gatak Subdistrict and the sample of the study was two schools as an experimental class and control class. The research sample was taken by random sampling technique. The results of this research showed that there was an improvement of student achievement before and after the implementation of science textbook based on Science Technology and Society. The result of the independent sample t-test shows that tobs is higher than ttable (5.489>1.681). The outcomes of the learning improvement in the experimental class based on the acquisition of N-Gain scores of 0.558. Based on tobs results, H0 is rejected. So it can be concluded that the development of a science textbook based on Science Technology Society in elementary school is appropriate to use for learning.

Keywords: science textbook, Science, Technology and Society

Topic: 2. Science Education

[ABS-314]
Analysis of students critical thinking skill of fractions on primary school

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Abstract
Mathematics is one of the most important subjects for students to learn and important as a guide to mindset as well as forming attitude. Students accomplish to develop critical thinking skills in everyday life through mathematical learning. Therefore, This research aim to analyze students critical thinking on the topic of fraction materials. The research method used a descriptive-qualitative method were composed 25 fourth grade students of primary school in Tasikmalaya. The instruments used are tests and interview. The result of this study showed that students critical thinking skills still are low. Non-routine tasks given still have not been able to resolve by most of students. The obstacle which is found by researcher is related to fractions associated with the students critical thinking skill are: 1) Students have not been able to give a simple explanation, 2) The students have not been able to provide further explanation, 3) The student have not been able to arrange the strategy and tactic appropriately, 4) The students have not been able to conclude correctly. The results of this research can be used to develop of students critical thinking in the future.

Keywords: Fractions, Critical Thinking Skills, non-routine tasks

Topic: 1. Mathematics Education
[ABS-315]  
**Investigating Students Metacognitive Failures of Mathematical Problem Solving Based on Metacognitive Behaviours**  

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**Abstract**  
This article aims to trace the students metacognitive failures in mathematical problem solving based on their metacognitive behaviors. There are three types of metacognitive failure in mathematical problem solving: metacognitive blindness, metacognitive vandalism and metacognitive mirage. From 20 students taken as research subjects, they were grouped into 2 groups. The first group is students who perform 2 times on the completion of mathematical problem and the second group is students who perform 3 times on the completion of mathematical problem. Research subjects were taken by a person representing each group. Data were collected by using a task sheet where the subject worked with think aloud then followed by interviewing based on the subjects work. The findings in this study indicates that students who perform the completion of mathematical problem for 2 times experienced 6 times successful of metacognitive behavior and 6 times failures of metacognitive behaviors with the tendency to metacognitive vandalism. While students who perform the completion of mathematical problem for 3 times experienced 5 times successful of metacognitive behavior and 13 times failures of metacognitive behavior with the tendency to metacognitive vandalism and metacognitive mirage.  

**Keywords:** metacognitive failure, problem solving and metacognitive behaviour  

**Topic:** 1. Mathematics Education

[ABS-316]  
**The Sport Students Statistical Literacy through Statistical Reasoning Learning Environment (SRLE)**  

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**Abstract**  
The purpose of this research is to find the influence of Statistical Reasoning Learning Environment (SRLE) on the improvement of statistical literacy ability of sport student. This research is a quasi experimental research. The study was conducted in one of University in Bandung with 58 the sport students as a sample. Sample consist of 29 students with direct learning and 29 students through SRLE learning. Data conducted by test statistical literacy before and after learning approach applied by researcher. The result indicated that the enhanced statistical literacy abilities who obtain SRLE learning are better than students with direct learning. This means that learning with SRLE has a significant effect on improving students statistical literacy abilities. It caused in SRLE learning, the student has opportunity to use that learning that make student more enthusiasm and easier to understand about concept. Based on the result lecturer can apply this approach in statistical learning to improve students statistical literacy ability.  

**Keywords:** Statistical Literacy, Sport Student, SRLE Learning  

**Topic:** 1. Mathematics Education
[ABS-317]

Strategic Competence in Solving Financial Problems: A Case Study of Climber Students

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Abstract

Strategic competence was mental activities apply strategies to formulate, represent, and solve mathematical problems. The aim of qualitative research is to explore strategic competence of climber student in solving financial problems. In this case, we selected from 40 students who has different adversity quotient to 3 climber students. Data based on semi-structured interview was analyzed by some steps that was consist of data condensation, data display and drawing/verification conclusion. The result pointed out that student understood the problem by reading and recall prior knowledge. They formulate problem solving by understanding mathematical formulation. Student solving financial problems by numerical and verbal strategy. Finally, they determine effective solution using arithmetical method, then find cheaper solution. For the next research, we could give a suggestion to exploring another students adversity quotient.

Keywords: strategic competence; financial problems; adversity quotient

Topic: 1. Mathematics Education

[ABS-319]

Analysis of Items on Test Instruments of Mathematical Representation Ability on Quadrilateral Material for Junior High School Student

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Abstract

Abstract. This article presents about test instruments to measure students mathematical representation abilities. This instrument is one of several research steps undertaken by the author. A good test instrument must meet the valid and reliable criteria. The steps of developing this mathematical representation instrument include: (1) study of mathematical representation literature; (2) create a lattice based on indicators of mathematical representation ability; (3) preparation of test items; (4) trials; (5) analysis of trial results; (6) revisions; (7) retest; And (8) analysis of retesting results. The instrument was tried to 30 grade VII students from one of the junior high school in Tangerang. Based on the analysis of the results obtained items test math representation abilities are valid and have high reliability. Thus, the instrument can be used to collect research data that measures students mathematical representation abilities.

Keywords: Mathematical representation ability, instruments, quadrilateral material

Topic: 1. Mathematics Education
Influence of concrete pictorial abstract approach to the improvement of elementary school students spatial sense ability

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Abstract
The present study is aimed at investigating the influence of CPA approach to the improvement of elementary school students Spatial Sense Ability (SSA) seen from Mathematical Prior Ability (MPA) and as a whole. It is a quasy experiment with control design of pre test and post test in Mathematics in the topic of 3 dimension geometry (3D geometry) to 74 elementary school students in Cikampek, Karawang, West Java. The present study is conducted by using two study groups, group which implements CPA learning approach as the experimental group and group which implements conventional learning as the control group. Both descriptive and inferential data analysis show that the improvement of students SSA is better in students with CPA learning approach rather than students with conventional learning, seen as a whole and in every MPA. Therefore, CPA learning can improve elementary school students SSA.

Keywords: cpa approach, elementary school, spatial sense

Topic: 1. Mathematics Education

Survey of principles and techniques about synthesis of organic compounds and green chemistry

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Abstract
An experimental synthesis of organic compounds should be a means of learning that can facilitate students to better understand the basic concepts and techniques of organic compound synthesis. This study aimed to identify how the implementation of synthesis experiments of organic compounds and their effects on the mastery of basic principles and techniques about the synthesis of organic compounds. Data were collected through observations, tests of the principles and techniques of synthesis of organic compounds, and a questionnaire of Green Chemistry. After conducting the experiment, it was identified that there is an improvement on students achievements on the principles and techniques of the synthesis of organic compounds. Although, after the test, there were still some weaknesses related to the basic principles of synthesis of organic compounds and thus, it is still needed an experiment that can improve basic principles of synthesis of organic compounds and apply the principles of green chemistry.

Keywords: principle and technique of synthesis of organic compounds; green chemistry

Topic: 4. Chemistry Education
[ABS-326]
Profile of inquiry skills pre-service physics teacher in aceh

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Abstract
This study purposed to explore the inquiry literacy of pre service teachers skill in Aceh. The subject was 85 pre service teachers from two universities in Aceh. The study used descriptive quantitative approach, and ScInqLiT instrument to measure the skill of inquiry literacy which is developed by Wenning. Data analyse result showed the average score of formulating the hypothesis is 45 % (enough), making prediction is 29% (low), designing experiment procedure is 57% (enough), scientific investigating is 26% (low), analyse and interpreting data is 33% (low), applying the numeric and statistic method is 46% (enough), explaining unpredictable result is 34% (low), and using technology is 28% (low). Over all, the conclusions of inquiry skill of pre service teachers are low and need to be improved for all aspect. The lowes of inquiry skill caused of they are never be introduced by learning activity, verify experiment design and intellectual skill. This result could be reference that how much important to develop physics experiment model which explore the inquiry skill

Keywords: inquiry Skills, Scientific Inquiry Literacy Test, Pre-Service Physics Teacher

Topic: 3. Physics Education

[ABS-327]
Design and development of model-eliciting activity in energy and electrical power topics

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Abstract
The purpose of this research is to design and develop the model eliciting activity in the physics course on energy and electric power topic for students of electrical engineering. Themethod used in this research is Design and Development Research (DDR). This research was carried out in electrical engineering study program in one of private Universities in Lampung. This research consists of three phases of design and development research: 1) identify the problem, 2) describe the objectives, 3) design & develop the artifact. The result obtained in this research is the model eliciting activity design which consists of learning units based on model eliciting activity at the topic of energy and electric power to improve conceptual understanding students.

Keywords: model eliciting activity, design and development research (DDR),
Topic: 3. Physics Education
[ABS-329]
Embodied cognition of the student mathematical imaginations in conceptual understanding of algebraic expression

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Abstract
Development of imagination in education creates a continuous education process and always new. The aim of research to describe of the student mathematical imagination and embodied cognition in conceptual understanding of algebraic expression. Type of this research is explorative with qualitative descriptive approach. The study was conducted in SMP Negeri 2 Semarang, at the end of 2017 for 3 months. Subjects involved in the study is a student who has a visual learning style. Methods of data collection using tests, interviews and observations. Test of data validity of research result using time triangulation technique. The results of this study are as follows: 1) subject imagine variables as objects that she recognized, such as the number of objects in a box or tin; 2) subject imagines an example and not an example of algebraic expression when it will define the concept of algebraic expression; 3) subject using gesture representation of variables, coefficients or constants; gesture pointing and gestures of writing as embodied cognition of the mathematical imaginations used; 4) subjects using the utterance as embodied cognition of mathematical imagination used or as the embodiment of social interaction that he did to get a confirmation or approval of researchers.

Keywords: embodied cognition, mathematical imagination, conceptual understanding of algebraic expression

Topic: 1. Mathematics Education

[ABS-331]
Analysis of Students Argumentation Skills in Chemistry Class of Grade XI through Product Life-Cycle Analysis Assessment on Colloid Lesson

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Abstract
This study aimed to investigate the students argumentation skills in chemistry class of Grade XI after completing lesson through Project Based Learning (PBL) and Life-Cycle Analysis (LCA) on Colloid Lesson. The method used in this study was qualitative research. The data of the study were derived from interview, documentation, observation, and portfolio. The instruments used in this study were pre-task and post-task stories, students essays, and students projects. The data were analyzed into the Toulmin aspects (2003). This study focused on the analysis of students argumentation skills through life-cycle approach on lessons by combining social and scientific issues and life-cycle analysis. The result of the study shows that the students argumentation skills on ecological and socio-economic aspects were developed. Students argumentation skills on scientific and moral aspects were indicated lower than on ecological and socio-economic aspects. The data shows that the Life-Cycle Analysis (LCA) in chemistry class was effectively used to develop students argumentation skills.

Keywords: Life-cycle analysis, students argumentation skills, chemistry learning

Topic: 4. Chemistry Education
The analysis of students mathematical reflective and critical thinking ability

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Abstract

This research is aimed to students of mathematics education with the purpose to analyze the ability of higher-order thinking at formal operational stage in mathematics learning. This research was conducted by giving tests that can measure the ability of reflective and critical thinking mathematically and interviewing subjects based on their answers. The results obtained are then analyzed to see the students ability level. Research instrument used is a test of reflective and critical thinking ability, and interview with students. The results showed that students already have a good reflective and critical thinking ability in mathematics learning.

Keywords: mathematical reflective thinking ability, mathematical critical thinking ability

Topic: 1. Mathematics Education

Students Difficulties in Solving Geometrical Problems from Matematization Perspective

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Abstract

This study aim is to describe student difficulties based on matematization perspective in solving geometry problems. This research uses descriptive qualitative method by using purposive sampling technique. To investigate and understand these difficulties, we used material test and interview by the 8th graders of Junior High School in Indonesia. Horizontal matematization refers to the activity to transform into symbolic mathematical problem, and vertical matematization refers to reorganize mathematical system by using same appropriate rules. The results of this study show that difficulties horizontal matematization are transfering a real world problem to a matematical model, schematizing, and visualizing a problem in shapes and difficulties vertical matematization are ajusting, combining, refining, and integrating models. This research is expected to give information about the importence of matematization as crucial process in learning and teaching of geometry.

Keywords: geometry education, matematization, word problems

Topic: 1. Mathematics Education
Implementation of active-reflective method to analyze students creative, communication and self confidence ability in mathematics learning

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Abstract

Creative ability is important for facing competition in a world that more advanced because creativity is capital to face the challenges. In addition it required communication skills to convey the creativity that will give rise to confidence with capabilities. This research aims to know the ability of creative, communication and self confidence of the students use active-reflective learning methods. This active-reflective learning methods belonged in a good criteria. The instruments used are the creative ability test, a test of the ability of communication and the sheets of measure students affective. The results showed that students have a creative and communication capability good enough with the ability to self confidence which is also good.

Keywords: active-reflective method, creative ability, communication ability, self confidence ability

Construct validity examination of inquisitiveness indicator on critical thinking disposition test in biology

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Abstract

Inquisitiveness is one of indicators of the critical thinking disposition which is curiosity to gain knowledge. The aims of this research were to examine the construct validity of inquisitiveness indicators on critical thinking disposition test in biology. The critical thinking disposition test consisted of 22 multiple choice questions that have been validated by experts and the items were presented through cases relating to biological content. This research involved 526 students of biology education from University of Muhammadiyah Bengkulu and the State University of Bengkulu in the grade of study (year 1, year 2, year 3, and year 4). Based on the confirmation by confirmatory factor analysis, this research found that the critical thinking disposition test for inquisitiveness indicators had the suitable construct validity for 10 items. This results were supported with the acceptable values of convergent validity, they were the standardized factor loading more than 0.5, composite reliability 0.57 and average variance extract 0.93. from those results of this research, it can concluded that this instrument has a high validity and reliability to measure inquisitiveness of critical thinking disposition in biology.

Keywords: construct validity, inquisitiveness, critical thinking disposition, biology

Topic: 1. Mathematics Education

Topic: 5. Biology Education
[ABS-336]

Predict Observe Explain (POE) Strategy toward Mental Model of Primary Students

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**Abstract**

A mental model is an inaccurate and complete storage of basic or incomplete knowledge that arises from previous experience and can then develop if one can increase knowledge through the process of cognition. A person's mental model can be changed or modified through the learning process. Therefore, the purpose of this research is to test Predict Observe Explain (POE) strategy to change the mental model of fifth grade in material of light. This research used quantitative research method with quasi experimental design. Population in this research were fifth grade of Jayagiri village, Lembang Subdistrict. The sample of this research was class V students in one of the elementary schools of Lembang sub-district. The sampling technique was done purposively. Data collection techniques in this study were objective tests. Meanwhile, the instrument used was a two tier test that has been empirically validated. The data in the study was analyzed with descriptive and inference statistic. Result in this research shows that Predict Observe Explain (POE) strategy has effect on the change of mental model of fifth grade in material of light.

**Keywords:** light, mental model, predict observe explain (poe) strategy

**Topic:** 2. Science Education

[ABS-337]

Observing practice as a science-process skill by elementary school teachers

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**Abstract**

Observing is one of the basic process skills that determines the success of a scientific process. Without adequate observation, relevant inquiry questions are difficult to be stated and needed data will not be obtained. Observing skills should be trained since early age, by optimizing the use of the senses that will continue to grow. Although observing is often considered as such simple activities, it turns out that not everyone, including the teachers, really understands the nature of observation in the context of the scientific process. This paper reveals the knowledge and perception of elementary school teachers about observing skills in scientific process and how they practice the observation activities in a training session.

**Keywords:** science process skills, elementary school teachers

**Topic:** 2. Science Education
Junior High School Students Scientific Literacy On Earth Science Concept

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Abstract
This study aims to investigate junior high school students scientific literacy on earth science concept through scientific literacy test. The context of earth science in this research consists of layer of earth, earthquake, and volcano. The research instrument employed was 14 multiple choices with four alternative answers that covered 3 competencies of scientific literacy. The participants of this study were 29 students enrolled in grade 8 in a public junior high school in Bandung. The data were analyzed by using descriptive statistics in form of percentage and bar chart. The results show that the average score of each competency in respective way is: 67.59% for explaining phenomena scientifically, 58.62% for evaluating and designing scientific inquiry, and 61.64% for interpreting data and evidence scientifically. The findings could be interpreted that the scientific literacy on earth science concept of the 8th grade junior high school students was in medium category. This research suggests to develop scientific literacy ability with levels of inquiry as science processes.

Keywords: scientific literacy, earth science concept, levels of inquiry

Achievement profile of high school students on chemical dynamics material at three levels of representation

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Abstract
This study aims to explore information about the achievement profile of high school students on chemical dynamics material at three levels representation. This research uses non experimental design in the form of survey. Sample of the survey was 219 students of 11th grade high school students in Ketapang, West Borneo. Cluster random sampling was used as a sampling method. The data collection of survey use a multiple choice tests that contains chemical dynamics material that includes chemical kinetic concepts and chemical equilibrium concepts. Each item of the tests contains three levels representation such as macroscopic levels, symbolic levels, and submicroscopic levels. Based on the findings, it shows that high school students in Ketapang have high mean score of symbolic representation by 55.1%, and sequentially 49.8% in macroscopic level, and 40.8% in submicroscopic level. The results based ANOVA tests conclude that the mean score of each representation level was significantly different.

Keywords: Three levels representation; Learning achievement; Chemical dynamics

Topic: 2. Science Education

Topic: 4. Chemistry Education
[ABS-342]

Psychological view on students conviction in mathematical proof

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Abstract

There are only few mathematics students who feel convinced with their proof construction. The studies about the conviction are mainly done psychologically. Students conviction in mathematical proof was mostly studied based on their utterances when they were being interviewed. Therefore, the components which cause the conviction were not elaborated clearly. In this study, we found eight psychological components which caused students feel convinced with their mathematical proof construction. These components were based on students disclosure on their proof constructions. Those components were: concrete (conformity of the argument given, in the form of oral, written and figure presented in the proof construction), familiar (fluency in giving reasons to the statement given), detailed (argument is conveyed in a well-detailed manner), generalized (the overall presentation is generalized), clear (the ability to give a good and correct explanation to each statements and the reason of constructing the proof), valid (can give logical reasons to all of the statements in their proof constructions completely and in detailed manner), feasible (the statement presented is appropriate or fulfill the proof) and caprice (there are words, gestures, and attitudes that indicate a doubt).

Keywords: Psychological view; Conviction; Mathematical Proof

Topic: 1. Mathematics Education

[ABS-343]

The relationship between students achievement of organic laboratory course with understanding about organic subjects including green chemistry

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Abstract

Students achievement of laboratory organic courses always relate with their understanding of organic subjects in a whole course. Students learn from their experiences in laboratory and their understanding of basic organic concepts to help them synthesize problems. This study aims at students achievement of organic laboratory courses relate with their understanding of a whole organic subjects using descriptive method. The respondents of this research were students from chemistry education department from two different states universities in Indonesia (Bandung and Jayapura). The research use the result of students final grade of laboratory course compare with students answers of synthesis organic problems, organic basic concepts and synthesis technique as the data. Therefore we were using a correlation statistic to analyze the data. We also have questionnaires to know students perceptions about the green chemistry. It was analyze using a correlation statistics. We found significant relationship between students achievement of organic laboratory courses with their understanding of basic organic concepts and their ability in synthesizing organic compounds. Inversely, for the result of synthesis technique show there is no relation with the students achievement of organic laboratory courses. Furthermore, we found that student have a few information about green chemistry.

Keywords: Relationship, students achievement of organic laboratory course, understanding about organic subjects, green chemistry

Topic: 4. Chemistry Education
[ABS-346]
The Improvement of Students Scientific Literacy through Problem-Based STEM Learning on Static Fluid

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Abstract
The purpose of this study was to know students scientific literacy after studied problem-based STEM learning. The study used mixed method with embedded experimental design. The instrument test of this study consisted of 5 essay questions to measure students scientific literacy with reliability Cronbachs alpha 0.72. Other instruments that used in this study were the interview guide and questionnaire. The subjects of this study were 27 students in SMAN 8 Muaro Jambi who studied static fluid. The result of this study shows that there is the increasing students scientific literacy after studying problem-based STEM learning shown by the post-test scores which is higher than the pretest scores. The improvement of students scientific literacy is significantly shown by 8.35 in t value with significant 0.0000. The interview result shows that through problem-based STEM learning the students are easy to understand the phenomena in the daily lives. Besides, the students can interpret the data evidence and design an experiment. The improvement of students scientific literacy is shown by N-gain in medium category. The influence of problem based STEM learning toward students scientific literacy shown by the Cohens d-effect size. It is 1.72 with high category. The students positively responded toward problem-based STEM learning shown by 58.2% of the students are indicated in agree scale and 38.3% are in very agree scale.

Keywords: scientific literacy, Problem-based STEM learning, Static Fluid
Topic: 6. STEM Education

[ABS-347]
Effectiveness of local wisdom integrated (LWI) learning model to improve scientific communication skills of junior high school students in science learning

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Abstract
The previous research has been developed Local Wisdom Integrated (LWI) Learning Model and has been declared that it is valid to improve problem solving skill, scientific communication skills, and environmental care attitude of junior high school students. This study aims to analyze the effectiveness of the LWI Learning Model on improving the scientific communication skills of junior high school students in science learning. This study used one group pre-test and post-test design toward 140 students of junior high school class VII who was divided into 3 groups in SMPN 1 Lingsar and and 3 groups in SMPN 2 Gunung Sari, academic year 2017/2018. The data collection was conducted through questioner, observation, and interview. The scientific communication skills of junior high school students were measured by using scientific communication skills Evaluation Sheet (SCSES). The data analysis technique was done by using paired t-test, Wilcoxon test, and N-gain. The results showed that there was a significant increase in students scientific communication at α = 5%, with low N-gain and medium category. LWI Learning Model were proved to be effective to improve scientific communication skills of junior high school students in science learning.

Keywords: Local Wisdom Integrated, scientific communication skills
Topic: 2. Science Education
How to improve the science process skills of biology education students on photosynthetic topic?

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Abstract

Abstract. The DP4 learning strategy in this research is the acronym of Demonstration method, Practical work-discussion1 method, Presentation-discussion1 method, Practical work-discussion2 method, and Presentation-discussion2 method. This study aims to describe the effect of applying DP4 learning strategy to Science Process Skills (SPS) of biology education students on photosynthesis topic. The research method is a weak experiment, with the research design The One-Group Pretest-Posttest Design. The implementation of the study involved 36 biology education students at one of the universities in Pontianak. The research instrument used is in the form of test equipment, assessment rubric, and questionnaire. Data were analyzed using Microsoft Excel and SPSS 24 Program. The statistical results show that DP4 learning strategy has an effect on improving biology education students science process skills on photosynthesis topic. This due to the topic of photosynthesis that is learned through demonstration, practical work-discussion, and presentation-discussion activities to direct the students to observe the facts that appear in experiment, to formulate hypotheses, to determine the independent variables, bound variables and control variables in the experiment, to experiment, create data tables and write experiment data, interpreting and analyzing experimental data, connecting experimental variables, and make a conclusions from experimental results. This DP4 learning strategy can be utilized by educators in learning photosynthesis topic.

Keywords: DP4 Learning Strategy; Photosynthesis; Science Process Skills

Analyzing instrument characteristics of critical thinking skills and mastery of concepts based on item response theory

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Abstract

Studying aim is to exploration the instrument characteristics that can measure critical thinking skills (CTS) and mastery of concepts senior high school students by multiple-choice instrument in optic tools subject. The multiple-choice instrument will be analyzed about validity, reliability, item discrimination, item difficulty and item guessing factor based on item response theory (IRT). The multiple-choice instrument has 19 items measuring CTS such as interpretation, analysis, inference, evaluation and explanation. Together with measure cognitive processes dimension those are understand, applying, analyzing and evaluation. Moreover to measure knowledges dimension such as factual knowledge, conceptual knowledge and procedural knowledge. Subject and location of research are 40 senior high school 12 grade in South Banding region. They were selected using purposive sampling as participants of limited test. IRT counting is using add-ins irt for Microsoft Excel. The analysis results by IRT stated that instrument has been valid and reliable, as well every item has parameter-a, b and c scores. Thus, the multiple-choice assessment instrument fulfills quality test criteria and can measure CTS and mastery of concepts.

Keywords: Item Response Theory, Critical Thinking Skills and Mastery of Concepts

[ABS-348] [ABS-349]
Complexity of student argument in reasoning plant tissue system through multiple representations

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Abstract
Understanding of pre-service Biology teachers about the structure system of complex plant tissue represented a modest reasoning ability, by doing so, it needed an effort to develop that skill. Training the reasoning skill by using multiple representations supported by argumentative explanations played an important role in understanding complex systems. Nevertheless the existing learning tools were limited to worksheets facilitating learning to understand the concepts of using external representations. The aim of this study was to examine whether instructional support by utilizing multiple representations can help students constructing their reasoning argument framework about complex systems. This study involved 30 pre-service biology teachers, which studying tissue plant system using multiple representations. The data in reasoning argument framework about complex systems were obtained using worksheets, developed according to multi-representation pedagogy and hierarchy of system thinking. The research findings showed that most of the students were able to construct complex, complicated argument frameworks. The use of multiple representations could provide benefits for students obtaining evidence to support complex relationship claims within the system.

Keywords: argument, complex system reasoning, multiple representation

Topic: 5. Biology Education

An Autocognitive Conflict and Its Mapping in Solving Mathematics Problem

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Abstract
An autocognitive conflict is a condition while students meet their cognitive conflict in doing mathematical problem. It is an abstract activities but important to expose, because it can be harmful to their knowledge construction process and their solving problems process. It can be described by using a cognitive map. Therefore, this research aims to investigated their autocognitive conflict that occurs in their thinking structure while completing mathematics problem and make the auto cognitive conflict map. This is a descriptive qualitative research that conducted in Universitas Negeri Malang. Subject in this research consist of two subjects. Based on our in-depth interview by using a think aloud method, we found that their cognitive conflict was an auto cognitive conflict and it can be illustrated by using cognitive maps. We also found that one subject failed to solve her autocognitive conflict, and have an impact on her problem solution. Beside that, the other subject was successfully in finding his conflict resolution and also his problem solution.

Keywords: auto-cognitive conflict, cognitive map

Topic: 1. Mathematics Education
[ABS-352]

Metacognition ability of students through discovery learning practice guide on acid-base practicum

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Abstract

This study aims to analyze the metacognition ability of students through the use of discovery learning practice guide on acid-base practicum. The research method used is quantitative and qualitative methods. Preparation of a practicum guide is designed beginning with the selection of practicum materials, the preparation of lecture guidance content content, content mixing and learning syntax, expert validation, practicum trials, and analysis of trial data. Metacognition skills are measured through tests, questionnaires, and interviews. Quantitative data were analyzed based on the percentage of metacognition ability level obtained from test result. In addition, the quantitative data of questionnaire results were analyzed by means of percentage, while the qualitative data from the interview result were analyzed descriptively. The results showed the average score of the test with metacognition indicator of 87.94%, while the mean score of the questionnaire was 81.64%. Metacognition ability test level was 17.64% low; 61.76% moderate; and 20.59% at high levels. Based on the results of metacognition capability analysis from both test and questionnaire, and supported by interview results, it is known that high-level students always realize what should be designed, done, and feel able to carry out the practicum. Thus a discovery learning practice guide can show the level of metacognition ability of each student.

Keywords: discovery learning; metacognition; practice guide

Topic: 4. Chemistry Education

[ABS-353]

Profile of Pedagogical Content Knowledge Ability of Science Teacher in Learning

suci nurmati

Sekolah Tinggi Agama Islam Tasikmalaya

Abstract

This study aims to analyze the ability of Pedagogical Content Knowledge (PCK) in implementing learning in the classroom. A number of two students who have become teachers as research subjects. Data on the ability of PCK subjects in carrying out the learning obtained based on observations and video recordings made during the subject to implement learning in the classroom, and then analyze based on pedagogic competence and professional competence in Ministerial Regulation No 16. The result of observation and video shows that the ability of PCK of two subjects who have become good teachers especially in the implementation of learning to ask questions, reasoning and communicate

Keywords: PCK, Science Teachers, Implementation of Learning

Topic: 2. Science Education
An analyses of multiple representation about intermolecular forces

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Abstract
Intermolecular forces (IMFs) is an abstract concept. Therefore, to understand this concept requires understanding of concepts from various chemical representations. This study aims to analyze the topic of IMFs in term of three representation of chemistry such as: macroscopic, submicroscopic, and symbolic. This study use descriptive method involving document analyses including 5 general chemistry textbooks. The result of this study present various ways of explaining the IMFs concept in three different levels of representation. All chemical representations presented in those chemistry textbooks are dedicated to provide comprehensive explanations about the concept of IMFs. This kind of study is essential for formulating a concept correctly which can avoid the raise of misconceptions. Furthermore the results of this study will be beneficial for further study about developing an effective strategy to teach the topic of IMFs to the students.

Keywords: multiple representation
Topic: 4. Chemistry Education

How Indonesian Students Think about Environment: Case Study at North Coastal Central Java, Indonesia

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Abstract
Aberration in the northern coastal area of Central Java province of Indonesia is at an alarming level. What are the students think about the surrounding environment becomes very important information in increasing the environmental literacy in the region. 329 of students were given a questionnaire and some were interviewed to explore their opinions and verbal commitment to the various environmental issues and actions they could take. There is a variation in the verbal commitment of students who are dominated by willingness to invite others in pollution prevention efforts. Other results indicate that students have low scores on energy saving aspects. So it is necessary to update learning especially those related to environmental literacy.

Keywords: coastal area, environment, thinking ability
Topic: 5. Biology Education
Misconceptions and threshold concepts in chemical bonding

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Abstract

In the last few decades, research has shown that chemical bonding is a difficult concept for students that can lead to misconceptions. The purpose of this research is to know the misconceptions and threshold concept in chemical bonding from various research studies and teacher experiences. This study uses a qualitative method including document analysis which mostly the journal articles which presented research studies about misconceptions. Beside, this study also conducted a clinical interview with three chemistry teachers to get information from a real practice. Based on the analysis of the journal, the book and the interview with chemistry teachers, there are a frequent misconceptions of the chemical bonding such as: ionic bonding was sharing electron; there is a transfer of electrons in covalent bonding; the atoms of Na and Cl attract each other and form NaCl; covalent bonding have very different electronegativity; equal sharing of the electron pair occurs in all covalent bonding; and metallic bonding was a transfer of electron. Meanwhile, the threshold concepts for chemical bonding are periodic properties of the elements, electron configuration, and metal/non-metal/metalloid.

Keywords: misconceptions; threshold concept; chemical bonding

Topic: 4. Chemistry Education

Experiment laboratory design of dyestuff from secang (Caesalpinia sappan linn) to improve conceptual understanding students of textile chemistry

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Abstract

Textile waste contributes for one-third of the worlds waste. Natural dyes can be a solution to reduce it. Secang (Caesalpinia Sappan linn) is one of the natural dyes used to dye textiles and gives red effect. The experiment of dyestuff from secang is expected to make students of textile chemistry major having the ability to understanding of knowledge about colour, dyestuff structure, and the process of making it in order to solve problem. The research subjects were 32 students textile programme of chemistry major in one of the polytechnics in Bandung. Instruments used in the form of observation, questionnaires, interviews, daily activities score and Midterm test. From the results of statistical calculations obtained conclusion there is a relationship of experiment activities conducted with the understanding of the concept of students and there is a difference conceptual understanding students before and after the application of experiment design.

Keywords: experiment of dyestuff from secang, conceptual understanding

Topic: 4. Chemistry Education
[ABS-360]
Contextual approach in teaching differential calculus

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Abstract
This study aims to both designing a modeling task for Differential Calculus course with contextual approach and analyzing the results after task implementation. Interviews were also conducted to six Mathematics pre-service teachers. The researcher initially suspect that the modeling process that occurs would follow the ideal mathematical modeling cycle but this study found that the modeling process did not necessarily follow sequential development according to model construction as described in various mathematical modeling cycles.

Keywords: mathematical modeling, differential calculus, contextual approach, local wisdom
Topic: 1. Mathematics Education

[ABS-361]
The effectiveness of PO2E2W model on science learning to improve student problem solving skill

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Abstract
PO2E2W model (problem oriented, observation, explanation, elaboration, and write in science) is a learning model which oriented on self regulated learning that is designed to improve problem solving skill. The aim of this research is analyzing the effectiveness of PO2E2W model to improve problem solving skill on elementary school student in science at the year 2017/ 2018. This research is pre-experimental research that uses one group pre-test and post-test design on two groups which every group consists of ten students. Before science learning with PO2E2W model begins, the students is given an problem solving skill (pre-test) and after doing the learning, students is given a same test like before (post-test). The data which has been collected is analyzed by using pairing t-test, n-gain, and two average similarity tests. The result of this research shows that there is an improvement of students problem solving skill at αα = 5% with average n-gain in medium category and there is no differences between two groups. Therefore, the PO2E2W model is effective to to improve problem solving skill on elementary school student.

Keywords: Problem solving skill, Science learning, PO2E2W model
Topic: 3. Physics Education
[ABS-362]
Students Error in Solving Mathematical Word Problems in Geometry

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Abstract
Solving mathematical word problems are still considered as a difficult matter for the students, because the word problems are related to many mathematical concepts and language. This study aims to identify students error in solving the word problems deal with plane geometry. The method used in this study was descriptive-qualitative approach. The subjects were 23 grade 7 students from one of Junior High School in Subang, Indonesia. The data analysis focused on the results of the student answers on the written test in plane geometry topic. The analysis of students error based on Polya strategy. The result are that almost student are still in low category deal with problem solving skill especially in mathematical word problems related with plane geometry. Mistakes often made students are the transformation and process skill. The errors due to students have difficulty of understanding the problems, determining the formulas, and illustrating the picture of a given mathematical word problems. It is expected that there will be other research that can be minimize students error related to the plane geometry topic.

Keywords: error, mathematical word problem, geometry

Topic: 1. Mathematics Education

[ABS-363]
Improving Students Science Literacy : A Development of Ethnoscience-Based Thematic Teaching Materials

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Abstract
This research aims to develop ethnoscience-based thematic teaching materials to improve students science literacy. The procedure was divided into two phases; developmental phase and experimental phase. This developmental research used Four-D Model. However, within this research, the process of development would not involve disseminated as the last step. The teaching materials which were developed consist of a lesson plan, student handbook, student worksheet, achievement test and science literacy test. The experimental phase used one group pretest-posttest design. Results show that the validity of teaching materials which were developed was very good and revealed the enhancement of students activities with a positive response to the teaching-learning process. Furthermore, the learning materials increase the students science literacy level.

Keywords: Science Literacy, Thematic, Ethnoscience

Topic: 2. Science Education
Implementation of rigorous mathematical thinking approach to analyze the students ability of algebraic thinking and understanding concept and mathematical habits of mind

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Abstract
This study aims to determine the improvement of students algebraic thinking skills and understanding of mathematical concept and mathematical habits of mind student using rigorous mathematical thinking. This research is conducted by providing information to student in learning mathematics and analysis to see the improvement of students mathematical ability. The research instrument used is ability test and ability of concept and mathematical habits of mind. The result show that student who learn by using rigorous mathematical thinking have algebraic thinking skills and good conceptual understanding. In addition, students also have good mathematical habits of mind. This evidenced by the result of the questionnaire which indicates that it is in accordance with the answers given by the students and at a fairly high level.

Keywords: Algebraic Thinking Ability, Conceptual Comprehension, Mathematical Habits of Mind, Rigorous Mathematical Thinking Approach
Topic: 1. Mathematics Education

Students statistical literacy on junior high school

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Abstract
Statistical literacy is a key ability expected of citizens in information-laden societies, and is often touted as an expected outcome of schooling and as a necessary component of students numeracy and literacy. The facts show that the statistical literacy ability of Indonesian students is still in an alarming category and Indonesian students for junior high school have not been able to compete internationally in the statistical literacy. This qualitative descriptive research was conducted to describe junior high school students ability and difficulties in basic skills of statistical literacy. Data were collected from 6 students of 8th grade in one of junior high schools in Aceh, Indonesia through test and interviews. The results clearly show that students statistical literacy are still in low category. Students are good in understanding the data but they have limited understanding of the data presentation concept. Students have difficulty in using the principle of presenting the data into the pie chart. Many steps of presenting the data are not complete. From this study can be concluded that students basic skills of statistical literacy has not been satisfied. Therefore, mathematics learning process in data presentation concept should be improved.

Keywords: Statistical Literacy
Topic: 1. Mathematics Education
The achievement of high school students conceptual change level as effect of using video supported conceptual change text in remedial the concept of boiling

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Abstract

This study aims to construct and test the use of Video Supported Conceptual Change Text (VSCCText) to assist the conceptual change level of high school students in remedial teaching on boiling concepts. This research utilizes pre-experiment method with one group pretest-posttest design. The subjects of the research were the students of class XI in one of the senior high schools in Bekasi regency. The sample of this research were 30 students at the school selected by random sampling technique. Conceptions and levels of student confidence are identified in part-I and IV-sections of VSCCText. To identify the conception and level of confidence the students used the conception test in four tier test format (FTT). The VSCCText has been constructed related to the state of student conception by following the six stages of the Conceptual Change Model (CCM). Students conceptual change which is correlated with the concept of boiling is determined by comparing the students initial conceptions to identify their levels. The research data have been analyzed by using a quantitative approach. The levels of conceptual change reviewed include; level of scientific conception from the start, construction level, reconstruction level, static level, and disorientation level. The analysis conceptual change level has been described that the total subjects is 10% of students were at the science conception level, 20% of students were at construction level, 55% of students were at reconstruction level, 15% of students were at static level and 0% of students were at disorientation level. If calculated from the number of students who initially experienced misconceptions and did not have a preliminary conception, then got the number 82% of students are in the type of conceptual change of construction and reconstruction. To sum up, the use of VSCCText has a high effectiveness in facilitating the achievement of conceptual change level of construction and reconstruction.

Keywords: VSCCText; Level of conceptual change; four tier test

Topic: 3. Physics Education

The important of self-efficacy and self-regulation in learning: how should a student be?

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Abstract

Self efficacy and self regulation are important for a student. Self efficacy is the ability of students to organize and implement actions that will make students motivated to learn through self use as a goal setting process. Self regulation is the ability to control oneself through a process that activates thoughts, behaviors and feelings in achieving goals. This study aims to describe students self efficacy and self regulation. The research method used was mix method. Research subjects were 22 senior high school students. The results showed students self efficacy abilities are categorized as good and students self regulation are categorized as excellent. Correlation test results showed that self efficacy and self regulation are inversely correlated (r² = .451), means that the lower the students self efficacy, the higher the students self regulation. Based on these results, we can conclude that the ability of self efficacy and self regulation will aid in achieving the learning objectives. Teachers roles and strategies are needed to build students self efficacy and self regulation.

Keywords: self efficacy, self regulation, learning activities, teaching strategies

Topic: 5. Biology Education
Assessing students 21st century attitude and environmental awareness: promoting education for sustainable development through science education

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Abstract
The study aims to measure students 21st century attitudes and environmental awareness. This study was a survey study which is part of development research of character learning model based on education for sustainable development. The data were collected by using 21st century attitude questionnaire and environmental awareness self-assessment that given to senior high school students in West Nusa Tenggara (NTB). The result shows that generally students 21st century attitude can be categorized on low category and mostly students environmental awareness can be concluded on enough category. The study will be used as the reference and need assessment of developing character learning model based on education for sustainable development.

Keywords: 21st century attitude, environmental awareness, education for sustainable development, science education

Topic: 2. Science Education

Interaction of motivation and learning outcomes toward ecological phenomena using Problem based ecopedagogy

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Abstract
Knowledge as a cognitive outcome and academic motivation is directly linked to the affective outcome as an attitudes and behaviours. Ecopedagogy as a learning model lead students to enhance the interaction on outcomes. This research focused on the interaction of the motivation and ecological phenomenon to the cognitive and affective outcomes. Validated instruments were used to collect data of motivation, cognitive and affective. Data were analyzed using factorial design with two ways ANOVA model. The result showed the different interaction between motivation and cognitive to deforestation phenomena and the motivation and affective to deforestation phenomena interactions. Through analysis of interaction, the features of such approaches based eco-pedagogy to ecological phenomena subjects are a discussed.

Keywords: Motivation, Learning outcomes, Ecological fenomena, Problem-Based Ecopedagogy

Topic: 2. Science Education
[ABS-373]
Pre-service teachers beliefs and knowledge about mathematics

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Abstract
This study describes the knowledge and beliefs of pre-service teachers to mathematics. Data collection of this study using written test of 143 mathematics pre-service teachers who have taken six semesters at Universitas PGRI Semarang, and interviewing of 3 students who are not consistent between knowledge and belief. The data are presented in the form of descriptive quantitative and analyzed qualitatively, including: data reduction, data display, and conclusions drawing/verification. The results show that most of the knowledge of pre-service teachers are consistent with their beliefs. It is indicate that the pre-service teachers knowledge has been internalized into a strong beliefs that affects their words and behaviors. The belief of almost half of pre-service teachers who become respondents changes because of lecturer activity effect. It can say that belief changes at any time, both the process of alteration and formation of new beliefs as well as the reinforcement of the beliefs they have.

Keywords: knowledge, beliefs, mathematics and pre-service teachers
Topic: 1. Mathematics Education

[ABS-374]
Pre-services science teachers conceptual understanding level on several electricity concepts

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Abstract
This research is aimed to analyze pre-services science teachers conceptual understanding level on several electricity concepts. This research belongs to descriptive research. The subjects of the research were 88 pre-services science teachers of Sebelas Maret University from physic and science education in academic year of 2017/2018. The instrument of the research was multiple choices with open-ended responses. Based on the result of answer analysis, it showed that most of pre-services science teachers had partial understanding with misconception on subtopic of characteristic of electrical current in series and parallel circuit. Meanwhile, the lowest level of conceptual understanding was on subtopic effect of charging and discharging capacitor to the loads. Due to the number of pre-services science teachers whose misconception on several electricity concepts, it is expected that teachers are able to develop the appropriate learning method because electricity concept is closely related to the daily life.

Keywords: pre-services science teachers, conceptual understanding level, electricity concepts
Topic: 3. Physics Education
Gender difference and scientific literacy level of secondary student: a study on global warming theme

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Abstract
A research study was conducted to measure scientific literacy achievement of junior high school students in the global warming learning theme. This survey research involved 112 fifteen-year students who attended the natural science course at three junior high schools in Bandung. Sampling was done by random sampling method. The scientific literacy achievement of students was measured by using developed science literacy instrument test on the global warming theme. This instrument test was considered valid and be able to measure the expected concepts and discriminate between high and low-achieving students. The research showed that the averages of the three competencies of science literacy (based on PISA framework 2015) were in the moderate category, and no significant differences among the three competencies. Moreover, it revealed that based on gender issue, the achievement of science literacy of male student was in the moderate category, and was not significantly different with the female students.

Keywords: Scientific literacy; Gender; Global warming

The Ability of Superior Student in Fraction Materials Based on Ecopreneurship

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Abstract
One of the innovations in mathematics learning is the implementation of ecopreneurship principle as a representation of social science approaches in developing fractional problems at the inclusive of primary school aimed at superior students. So this study aims to provide an overview of superior students understanding skills in fractional materials through the development of questions based ecopreneurship that are expected to improve superior students cognitive ability and be able to interpret questions that implicitly imply the principle of ecopreneurship. This Action Research conducted on 3 superior students in the inclusive of primary school proves that there is an enhancement in students understanding in fractional material in cycle II by 45% when it compared with cycles I. the indicators is that students are able to apply the concepts and answer the questions precisely in addition to implicitly they are able to understand the content of questions related to the principle of ecopreneurship. The results are expected to become the reference for the teachers in developing more innovative mathematics lessons. This concept is expected to be a new finding that is useful in improving superior students understanding in answering mathematical fractions and is expected to be able to train their social skills.

Keywords: Ecopreneurship, Fraction and Superior Student

Topic: 1. Mathematics Education
[ABS-378]  
Fifth-Grade Elementary School Perception of STEM  
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Abstract  
This study aims to determine the early perception of fifth grade of students about STEM (Science Technology Engineering Mathematics). The method used in this research is descriptive-qualitative method with the participant amounted to 34 fifth graders in one of elementary school in Bandung city. The instrument used in this study is a questionnaire of students perceptions about STEM which amounted to 49 items. The results of data analysis collected showed that the students early perception of STEM was quite high with an average of 78%, which 66% in terms of interest, 63% in terms of difficulty, 80% in terms of ability, 69% in terms of readiness, 76% in terms of influence, 78% in terms of career and 75% in terms of benefit. This is because students much interest in STEM subjects such as Science and Mathematics is much greater even though it has not become the main choice subject. Therefore, it is necessary to do further research related STEM implementation in learning process at elementary school which is to see student perception after applied this approach.  

Keywords: STEM, Student Early Perception and Elementary School  
Topic: 6. STEM Education  

[ABS-379]  
Enhancing Vocation Students Physics Problem Solving Skills through Modeling Instruction Applying on Direct Current Circuit  
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Abstract  
The aim of this research was to obtain about vocation students physics problem solving skills, increasing as the effect of modeling instruction applied in physics learning. Quasi experiment method was used with the randomized control group pretest postest design. The research was conducted on the students in grade X at one of vocation school in Pekanbaru city that was choice with random sampling technique. An experimental class and one controller class selected with 33 students both of them. Experiment class gets modelling instruction treatment, while control class only gets conventional model. Problem solving skills data was collected by using problem solving skills test instrument in the essay. The result showed that applying modeling instruction in physics learning can increasing physics problem solving skills than conventional model with experiment class N-Gain (0,58) is greater than control class N-Gain (0,32). Consequently, it was concluded that applying of modeling instruction in direct current circuit learning is more effective for increasing physics problem solving skills than conventional models.  

Keywords: problem solving skill, modeling instruction  
Topic: 3. Physics Education
Analysis of student difficulties based on respondents ability test on the topic of factors affecting reaction rate

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Abstract
Reaction rate is one of the essential topic in the chemistry because of the results of the final exam analysis for the last 5 years (2012-2016), the question of reaction rate always appear. The purpose of this research is to obtain information about students difficulties and level of students understanding on the topic of factors affecting reaction rate. This research was conducted at one high school in Bandung with 60 students of grade XI IPA. Test method in the form of respondent ability test with 4 item has been applied in this research. Analysis of test results using quantitative and descriptive qualitative analysis. Based on the results of the analysis of responses of respondents test. It was found that only 33 students who can do respondents ability test with good results. The results of the descriptive analysis show that students know about factors affecting reaction rate but students do not understand how these factors work to accelerate a reaction. These results shown that students still do not understand how these factors affect the reactions rate, so that it is required further investigation to find out how to overcome student learning difficulties on the topic of factors affecting reaction rate.

Keywords: factors affecting reaction rate; respondents ability test; student difficulties

From Integer to Real Numbers: Student Obstacles in Understanding Decimal Numbers

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Abstract
The various difficulties and obstacles that students face when they are introduced to decimal numbers are well documented and described in the relevant bibliography. This research is a preliminary qualitative research. The participants of the study are 60 six and five graders. The data were collected using the test. The data analysis showed that the elementary school students performance on number sense of decimal was still weak on the component of understanding the meaning and concept of numbers.

Keywords: Obstacles; Decimal Numbers

Topic: 1. Mathematics Education
Enhancing Students Conceptual Understanding of Electricity Using Learning Media-Based Augmented Reality

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Abstract

Abstract. Some contents of physics provide abstract concepts (e.g. electricity) so they are demanding to be visualized and students are challenging to understand. However, the recent development in technology namely augmented reality can be used as a learning media to depict the some abstract concepts in physics. This study aimed to examine the implementation of learning media-based augmented reality that was developed in electricity topics to enhance students conceptual understanding. The research method used in this study was pre-experiment with one group pretest-posttest design. The participant of this study was 30 students in the first year of one public vocational high school in Indonesia. Students conceptual understanding was snapped using an instrument test (26 item questions) developed in multiple choices. In addition, average gain and normalized gain were used to analyze the enhancing of students conceptual understanding. The result of this study portrayed that improvement of conceptual understanding was in medium category. This case was illustrated by average gain (29.03) and normalized gain (0.56). According to result findings of this study can be inferred that learning media-based augmented reality developed in electricity topics can enhance students conceptual understanding.

Keywords: augmented reality, students conceptual understanding

Correlation between motivation and learning behavior with learning achievement (a case study on the Biology Education Department Faculty of Teacher Training and Education University of Nusa Cendana)

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Abstract

The purpose of this study was to analyze the correlation between intrinsic, extrinsic motivation and learning behavior with learning achievement of the students on the Biology Education Department. This research is a correlational research. Variables of this research consist of internal motivation (X1), extrinsic motivation (X2), learning behavior (X3) and learning achievement (X4). The number of respondents as many as 54 students from 229 students taken by proportionate stratified random sampling technique of each semester (II, IV and VI). The data obtained were analyzed descriptively and inferentially by correlation analysis. The results showed that the correlation between X1, X2 and X3 with X4 significant at the level of significance 1% and the three independent variables jointly have a strong relationship with the learning achievement of the students on the Biology Education Department.

Keywords: motivation, learning behavior, learning achievement

Topic: Other Relevant Fields
[ABS-384]
Algebraic Thinking Characteristics of Eighth Grade Junior High School Students Based on Superitem Test of SOLO Model

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Abstract

Abstract. The study aimed to know the characteristic of algebraic thinking of eighth grade junior high school students based on identification result using Superitem test of SOLO model. This study used descriptive qualitative method. The subject of this study is eighth grade junior high school students consisting of 32 students. The data collection method used in this study is superitem test of SOLO model and interview. The results showed there were differences of algebraic thinking characteristics of students based on levels of Superitem test of SOLO model. Subjects at the unistructural level have algebraic thinking characteristics as mathematics language, mathematics modeling, and arithmetic generalization. Subjects at the multistructural level have algebraic thinking characteristics as representation, mathematics language, mathematics modeling, and arithmetic generalization. Subjects at the relational level have algebraic thinking characteristics as mathematics language, mathematics modeling, arithmetic generalization, and problem solving. Subjects at the extended abstract level have algebraic thinking characteristics as representation, mathematics language, mathematics modeling, arithmetic generalization, problem solving, and quantitative reasoning.

Keywords: Algebraic thinking characteristics, Superitem Test of SOLO Model

Topic: 1. Mathematics Education

[ABS-385]
Enhancing Students Creative Thinking Skills through Web Blog-Assisted Cooperative Integrated Reading And Composition (CIRC) Learning

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Abstract

This study examined Web Blog-Assisted CIRC Learning in the subject of research methodology of physics education toward Student Creative Thinking Skills. Reading activity and finding main ideas cooperatively were able to improve students creative thinking skills. The improvement of students creative thinking after Learning CIRC Learning assisted by Web Blog get the mean of pretest of creative thinking skill 2.33, the mean of posttest is 54.22 and the mean of N-Gain is 0.53. The improvement is in the medium category. The differences Test of Creative Thinking Skills of students before and after Web Blog-Assisted CIRC Learning shows that there are significant differences between pretest and posttest values of creative thinking.

Keywords: CIRC, Blogspot website, Creative Thinking Skills

Topic: 3. Physics Education
[ABS-386]
Students thinking processes on Blooms taxonomy: exploring direct instruction learning model

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Abstract
This research aimed to describe the levels of thinking students in mathematical problem-solving based on Blooms taxonomy as seen from Direct Instruction learning model. The cognitive domain contains intellectual-centered behavior, such as knowledge, and thinking skills. Direct Instruction is an instructional model that focuses on the interaction between teachers and students. The type of this research is descriptive research with a qualitative approach. The research subjects were taken by one student in Direct Instruction learning model which then given the mathematical problem-solving test and the result was triangulated by interview. From this research, it is found that Direct Instruction student can achieve analyzing thinking level.

Keywords: Direct Instruction, problem-solving, Blooms taxonomy, cognitive domain
Topic: 1. Mathematics Education

[ABS-387]
Mathematical Communication Ability of Students Viewed from Self-Efficacy

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Abstract
This research aimed to describe mathematical communication ability of students viewed from self-efficacy. This research was descriptive qualitative research. Subjects in this research were students of eight grade SMP Negeri 1 Marioriawa Kabupaten Soppeng Sulawesi Selatan. The data were collected by a test, questionnaire, and interview. Data analysis techniques consisted of three steps, namely: data reduction, data display, and make conclusion. The result of data analysis showed that students with high self-efficacy could master all indicators of mathematical communication ability, namely: ability to identify and write information needed in solving problems by using notation, symbol, or mathematical term; ability to translate the essay or word problems into the picture or sketch and create mathematical models; ability to use precise mathematical concepts in solving the problem. Students with moderate self-efficacy could master two indicators, namely: ability to identify and write information needed in solving problems by using notation, symbol, or mathematical term; ability to translate the essay or word problems into the picture or sketch and create mathematical models. Students with low self-efficacy were only able to master indicator of ability to identify and write the information needed in solving problems by using notation, symbol, or mathematical term.

Keywords: Mathematical communication ability, self-efficacy
Topic: 1. Mathematics Education
Investigating The Misconception of Students in Initial Algebra

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Abstract
Misconception on algebra is one of the fundamental problems in mathematics learning. Misconception on algebra is a condition in which the student does not correctly understand and master the algebraic concept. This can cause students fail in building a correct knowledge framework, both in the concept of algebra and in other mathematical concepts using algebra. This study aims to reveal the phenomenon of misconceptions in initial algebra. A total of 52 eighth grade students from two different schools were given an algebra test and six students were interviewed afterwards. The results showed that most students made mistakes and were not correctly understanding simple algebraic forms, such as variables, coefficients and similar terms. It was concluded that students experienced some misconceptions on the basic concept of algebra.

Keywords: concept, misconception, initial algebra

Improving mathematical communication ability through problems based learning model

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Abstract
This study aims to examine the improvement of mathematical communication ability of students who learn with Problem Based Learning and students who learn by Direct learning. This study is a quasi experiment with a non-equivalent control group design. The population is all students of class XI one of Senior High School in Indragiri Hilir regency, Riau by taking sample of class XI IPA 3 students as experimental group that get Problem Based Learning (PBL) and XI IPA 1 as control group that get Direct learning. The problem studied is the improvement of students mathematical communication ability. The instrument used is the test of mathematical communication ability. Quantitative analysis uses the t-test and the Mann-Whitney test. While qualitative analysis done descriptively. Based on the data analysis obtained in this study, it is found that the mathematical communication ability of students who get Problem Based Learning is significantly better than the students who learn by direct learning.

Keywords: mathematical communication, Problem Based Learning

Topic: 1. Mathematics Education
Profile of Pre-Service Biology Teachers Critical Thinking Skills Based on Learning Project toward Sustainable Development

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Abstract
The aims of this research are to describe the pre-services Biology teacher critical thinking skills, based on learning project to build their sustainable development competencies. This research used survey method. The subject was consists of 19 pre-service teacher on 6th semester in one of university in Palangka Raya. The instruments using test Laurent Starkey and questionnaire. The data analyzed using quantitative descriptive analysis technique. The result show that students critical thinking was low (26%) and lower (74%) categories. The other result showed that the instructional has not led to either project base sustainable development or critical thinking during the class. It is suggested to develop project-based learning toward sustainable development to improve critical thinking skills.

Keywords: Pre-Service Biology Teachers, Critical thinking skills, Based on Learning Project, Sustainable Development

Topic: 5. Biology Education

Students conceptual understanding in modified flipped classroom approach: an experimental study in junior high school science learning

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Abstract
The flipped classroom approach is applied through moving the lecture outside the classroom via technology while the classroom time is used to engage students in student-centered learning activities such as inquiry and problem-solving activities, developing students to be more active during class sessions. This study aims at determining the effect of modified flipped classroom approach on students conceptual understanding of students at grade 8 Junior High School. An experimental study with the one group pre-test-post-test design was employed. The group consisted of 34 students, modified flipped classroom approach was used in which the students were given video lessons and worksheets before the class to be done at home. The research data were obtained via the conceptual understanding test. The results showed that based on Wilcoxon test to examine the difference of two data paired obtained Sig. (2-tailed) value 0.000 <alpha = 0.05, meaning that there was a significant difference between students pre-test and post-test scores. The post-test average score of 78.47 was higher than the pre-test average score of 35.56 with N-Gain score of 0.67, including medium category. Based on these results, modified flipped classroom approach is recommended to be implemented in science learning to improve the students conceptual understanding.

Keywords: students conceptual understanding; modified flipped classroom; science learning

Topic: 2. Science Education
Perceptions of Teachers and Agriculture Vocational High School Students on STEM-Based Biology Learning

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Abstract
STEM-based learning is now a trend in education. This study describes teacher and student perceptions of STEM. The researcher involves biology teachers and 72 students who are caught from six classes in grade X at Cianjur Agriculture Vocational High School, West Java, Indonesia. The method used in this research is descriptive. Data were obtained based on questionnaire answers regarding opinion, attitude, and environmental roles on respondents regarding STEM-based learning. The result showed that 57.60% of students were interested in STEM-based learning, and 66.52% of students had readiness to participate in STEM-based learning. As much as 67.54% of students recognize that careers in the STEM field are good and promising, supported by 70.92% of students recognize that STEM-based learning is beneficial to their lives. The results of teacher answers on the questionnaire that as many as 70.92% said that STEM useful for his life in the future. Master agrees that 100% career in STEM field is good. Teachers think that their students are interested in STEM as much as 71.42%. These two perceptions between teacher and student are in agreement.

Keywords: STEM, Perception

Topic: 6. STEM Education

Preliminary study on mathematical problem solving ability of junior high school students on the triangle subject

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Abstract
The triangle subject is a part of geometry concept. The subject is important to be mastered if a student wants to develop the geometrical ability. However, in the fact, some research reveal that Mathematical problem solving ability of students is still low because students are not yet accustomed to solve mathematical problems yet. The purpose of this study to determine the ability of mathematical problem solving students in junior high school on the triangle subject. This study was conducted by using descriptive qualitative method. The sample in this study is consisted of 32 students in the grade IX which was taken with purposive sampling technique. Data were collected through the test which consists of three essay questions based on the indicators: (1) identify the adequacy of the data; (2) create a mathematical model of daily problems and solve it; (3) select and implement strategies to solve mathematical problems; (4) interpret the results according to the origin of the problem and do the verification. The results of this study indicate that students difficulties in problem solving, and every student has different levels of mathematical problem solving ability.

Keywords: Geometry, Triangle, Mathematical problem solving ability

Topic: 1. Mathematics Education
Various Student Strategies in Making Graph of Quadratic Functions

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Abstract
Writing down the things that we think is a very important act. Including writing down things to be conveyed to others. In conveying something, every individual has their own way. Likewise in terms of describing the graph of quadratic functions. In this article, we would like to explain the ways students used to create graphs of quadratic function. We found four types of images produced from thirty-six students who worked on the questions we gave. This is related to the strategies students use to draw a graph of quadratic functions. Related to these strategies, we plan to explore it more deeply in terms of student learning styles.

Keywords: Quadratic function; Graph of quadratic functions; Learning style

Topic: 1. Mathematics Education

Students lateral mathematical thinking ability on trigonometric problems

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Abstract
To describe students lateral mathematical thinking ability on trigonometric problems, we conducted a research on 30 students (15/16 year old) in West Java, Indonesia. This research is a qualitative descriptive research and data collection technique is written test with 3 description questions. The test results were analyzed using three indicators of lateral mathematical thinking ability, i.e (1) finding different ways of looking at things, (2) identifying the dominant ideas of the problems, and (3) associating concepts / ideas into several strategies may be true or false. Results of the study showed that: (1) almost one-third of the number of students can look for different ways of looking at a problem, (2) more than one-third of students can identify the dominant ideas of the problem, and (3) more than half students can associate a concept / idea so that it becomes some strategies that may be true or false. Based on the result of research, it is seen that most students do not have good lateral thinking ability in solving trigonometric problems.

Keywords: lateral mathematical thinking ability, mathematical problem, trigonometry

Topic: 1. Mathematics Education
Students Visual-Spatial Ability in Representing Single Cell Epidermis of Rhoeo discolor leaf

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Abstract
The one of the way to study plant anatomy was taught by observation from microscopic object and visual-spatially. This study was focused on students visual spatial ability in representing single cell epidermis of Rhoeo discolor leaf. It was conducted with 44 undergraduate students who presently enchanting Plant Anatomy. Data was collected using visual spatial worksheet and questionnaire. Students was representing cell in three activities: (1) visual representation of two dimensional (2D) on transverse, longitudinal and paradermal incision of epidermis cell; (2) visual representation of three dimensional (3D) that represents three types of incision; and (3) spatial representation by constructed 3D model of single cell based on microscopic observation. Several types representation of the plant cell structure was observed. There are significant correlation between students ability to representing microscopic object in 2D to 3D (r=0.504; p<0.05) and representing 3D to 3D model of cell (r=0.460; p<0.05), but there is no significant correlation between students ability in representing 2D to 3D model of cell (r=0.288; p>0.05). The result shows, there is scaffolding correlation between visual representation ability to spatial representation ability. Several factors are supposed to affect the correlation between students visual spatial ability will be explain further in this article.

Keywords: visual spatial representation, visual spatial ability, 2D, 3D, plant anatomy, microscopic, observation

Topic: 5. Biology Education

KTG-SESC: Development of scientific explanation skills test instrument

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Abstract
A scientific explanation is one of the main goals in science learning, including physics. But, nowadays it is still rare that instruments can develop the scientific explanation skills, so it requires a specific test to measure it. This research aims to develop scientific explanation skills test instrument on the kinetic theory of gases material named KTG-SESC (Kinetic Theory of Gases-Scientific Explanation Skills Checker). The test instrument was prepared based on the adaptation and modification of Chaimalas scientific explanation skills test (2009). The method used is a method of research and development of instructional models 4D (define, design, develop and disseminate) is constrained only to a point 2D (define and design). The questions have already been developed as many as six questions in the form of essays. With the purpose of, it can be seen categories of students explain scientifically through the answer. Based on the trial, scientific explanation instruments have been high category reliability and good validity. Through the define and design stage, a scientific explanation skills test instrument for high school students has been developed in the kinetic theory of gases based instrument of SESC test by Chaimala.

Keywords: Scientific Explanation Skills, Kinetic Theory of Gases, Test

Topic: 3. Physics Education
Investigating Pre-service Primary School Teachers Conception on Heat Concept

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Abstract
This study reports on the scheming procedure which is to improve and to scheme a four-tier diagnostic test instruments, which has not been defined in the works. It is an improved procedure of the two-tier test elements. As in two-tier tests, its answer and reason tiers degree pre-service primary school teachers satisfied understanding and descriptive understanding, individually. The two added tiers measure the equal of confidence of pre-service primary school teachers in the correctness of their certain choices for the answer and reason tiers individually. The four-tier diagnostic test was concentrating on heat concept. It was restrained to 43 pre-service primary school teachers advanced. They were acceptably trained on the earlier subjects. The important group of the defendants was recognised to have an unsuccessful sympathetic and misconceptions of the themes tested. We have already defined that the test able to investigate and categorize students into student conception of heat concepts. Research result with four tier tests showed scientific conception 15.5%, which was likely to have misconceptions 62%, and the students were lack of knowledge the concept of 20.5%, and had an error amounted to 2%. The pre-service primary school teachers inclined to be indisposed aware among what they diagnosed and what they do not diagnose. Kind of question tested was connected by enhanced percentage of pre-service primary school teachers substantial accurate responses, established buoyancy and enhanced perception calculation. 10 truthful misconceptions were predictable. It might be determined that a Four-Tier Diagnostic Test which has previously been established be able to assess pre-service primary school teachers conception on heat concept.

Keywords: Diagnostic tests, Four-tier test, conception, Heat Concept
Topic: 3. Physics Education

Mathematical literacy as the 21st century skill

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Abstract
In the 21st century, the problems encountered in the daily life are increasingly difficult and complicated. It is important for each individual to know and understand the role of mathematics in real life so that the individual is able to appropriately evaluate and consider the use of mathematics for meeting the needs of being a society member who is constructive, caring, and willing to think. This skill is called mathematical literacy skill. This article focuses on competencies indicating that the students have mathematical literacy skill. The data in this article were collected through the literature study method, which aims to collect relevant information on the topic from written documents such as journals and books.

Keywords: 21st century ability, mathematical literacy.
Topic: 1. Mathematics Education
[ABS-405] Mathematics Anxiety among Prospective Elementary Teachers and Their Treatment

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Abstract

Primary school teachers need to master a variety of subjects in the school and must have the competence to teach various subjects, including math. The phenomenon found in the field was mathematics anxiety experienced by prospective elementary school teachers. The phenomenon of mathematics anxiety experienced by the elementary school teacher candidate was exaggerated in the form of anxiety response related to learning activities, solving, and discussing math problems. If this anxiety continues, it can impact the declining performance in teaching. As a result, the learning process is not optimal. Such conditions are contradictory to the practical demands of elementary school teachers in schools. One of alternative treatments to reduce the anxiety is by using neuro-linguistic programming. This study uses Single Subject Research (SRS) of eight respondents with the very high and high mathematics anxiety level. Instruments used Mini Mathematic Anxiety Scale (MMAS) and observation. Based on the research findings, neuro-linguistic treatment programming can reduce anxiety level of respondents.

Keywords: mathematic anxiety, prospective, elementary teachers, NLP

Topic: 1. Mathematics Education


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Abstract

Critical and creative thinking skills are part fundamental skills in the 21st century in addition collaboration and communication skill. Students critical and creative thinking skill is defined as students abilities to use their knowledge to solve the daily life problems. This study main goal is to develop a test instrument of senior high school students critical and creative thinking skills on momentum and impulse concepts. The test items are arranged based on critical and creative thinking skills indicator that proposed by P21st Century Skill. Indicator that used in this test are elaborate, refine, analyze and evaluate their own ideas; effectively analyze and evaluate evidence, arguments, claims and beliefs; analyze and evaluate major alternative points of view. This study used 4D model of research and development method. Eight test sets are designed based on three critical and creative thinking skill indicators that grouped to momentum and impulse concept. The result of instrument development shows all test items are valid through Pearson moment correlation coefficient test. Based on expert judgment and data collections, the test instruments were well developed and could be used to measure students critical and creative thinking skills on momentum and impulse concepts.

Keywords: critical thinking and caretive thinking skills; critical thinking and caretive skills instrument; momentum and impulse concepts.

Topic: 3. Physics Education
How do kindergarten teachers grow children's science process skill to construct float and sink concept

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Abstract
This exploration goal is to describe teachers performance on emerging 5-6 years childrens science process skill. Early science learning should optimize science process skill to arouse other childrens development domain. A descriptive-qualitative design with observation and interview has already been implemented to collect data from two kindergarten teachers in Tasikmalaya. The result shows that development of childrens science process skill on early science learning is not optimize yet. It caused, teachers have a lack understanding of early science learning and science concept and limitedness of facilities particularly science tool in the school. This finding can give information to academician and policy makers to make a solution to advance early science education implementation.

Keywords: Early Science Education, Science Process Skill, Early Childhood Education

The variation pattern of cooperative learning models implementation to increase the students creative thinking and learning motivation

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Abstract
The learning process that uses less-varied learning model can cause students to feel bored during discourse process. This study aimed to find the right pattern of variation in applying cooperative learning model to improve the student creative thinking and learning motivation. The method was quasi-experiment by using pretest-posttest design. The research conducted at three classes of the fourth-semester students, i.e. classes of experiment I, II and control. Learning process at the class of experiment I used variations of Student Team Achievement Division (STAD), Numbered Head Together (NHT), and Group Investigation (GI) models, experiment II used STAD and GI models, and control used discussion, question-and-answer, and presentation. Essay test and questionnaire were used to collect the data that furtherly were analyzed using ANOVA test. The results showed that a significant difference in student creative thinking among experiment I, II and control classes. Students in experiment I showed the highest creative thinking ability, followed by experiment II and control, respectively. Student learning motivation in the class of experimental I and II was also significantly better than in control class. The findings indicate practicing the variation of cooperative learning models can improve both student creative thinking ability and learning motivation.

Keywords: Cooperative learning, creative thinking, motivation, student

Topic: 5. Biology Education
[ABS-413]
Using Geogebra to Develop Student Understanding on Circle Concept

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Abstract
The circle is an important concept that is taught from basic to university level. But in reality there are still difficulties in learning the circle, so that required learning media such as with Geogebra. In this research will be analyzed students understanding on the concept of circle and attitude of student to learning. Student will be divided into control groups and experimental groups. After the course they were examined and the result were evaluated.

Keywords: Circle, understanding, Geogebra, manipulatives, analytic geometry
Topic: 1. Mathematics Education

[ABS-414]
Profile of science communication competence of junior high school students on science lesson

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Abstract
Communication skills are important part of the curriculum and education programs. This study aims to describe science communication competence of a junior high school student in Cianjur. This research uses a descriptive method. The data is analyzed quantitatively and presented in the form of percentage chart. The result of the science communication competence test of the students is low. Adresssee-oriented communication competency reaches 44.97% and Subject-adequate communication reaches 19.85%. Overall students science communication competence is very low. There needs to be an improvement over it. One of the factors that cause the result is the lack of learning activities and teaching materials content that oriented to science communication. Researchers recommend improvements to learning activities and teaching materials that oriented to science communication competence.

Keywords: communication skill, science communication competence
Topic: 2. Science Education
[ABS-415]
How to develop tests for measure critical and creative thinking skills of the 21st century in POPBL?

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Abstract
21st century skills are a set of capabilities students must possess to succeed in the information age. Critical and creative thinking skills are part of the basic skills in the 21st century addition of collaborating and communication skills. Therefore, we need a measuring instrument that can measure these skills. In this study, presented a way of developing tests to measure critical and creative thinking for the matter of direct current. The tests were developed, adapted to the Buck Institutes critical and creative thinking abilities. Based on expert judgment and analysis using Anates application, the test instruments were well developed and could be used to measure students critical and creative thinking. The findings show that the elusive test constructs greatly influence the validity of the test.

Keywords: 21st century skills, critical thinking skills, creative thinking skills
Topic: 3. Physics Education

[ABS-416]
Development of computer based two-tier multiple choice diagnostic test to identify misconceptions on chemical bonding

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Abstract
This research aims to find a computer-based two-tier multiple choice diagnostic test of student misconceptions on chemical bonding. The process of developing diagnostic test is conducted by: (1) analyzing student misconceptions on chemical bonding including analysis of the literature of previous journals and misconception books, (2) identification of concept targets, (3) analysis of student misconception through essay question given, and (4) the diagnostic questions compilation of a computer-based two-tier multiple choice misconception analysis result from related reference and essay test which given to student got ten general misconceptions. There are four materials which are ionic bonds, covalent bonds, metal bonds and coordination bonds. A computer-based of two-tier multiple choice diagnostic test on chemical bonding will be tested the effectivity by tested, misconceptions identification from feedback and re-tested again.

Keywords: Computer based two-tier multiple choice diagnostic test, misconception, chemical bonding.
Topic: 4. Chemistry Education
[ABS-417]
The effect of creative-collaborative problem solving to enhance cognitive ability and creative thinking skills in term of facilitating pre-service primary teachers solving thermal problems

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Abstract
Currently cognitive ability and creative thinking skills have been being warm issues and they need to be developed to solve the problems regarding to the electricity problems. This research aims to facilitate the creative-collaborative problem solving to enhance cognitive ability and creative thinking skills. A fourty pre-service primary teachers have been involved in to pre-experimental method with pre- and post tests design (30 male and 10 female). The instruments about creative thinking skills and cognitive skills have already developed to measure the creativity and cognitive ability of students. The data show that the in-service primary teachers have high about 80% for creative thinking skills and moderate level for cognitive ability as well. In conclusion, creative-collaborative problem solving is able to enhance effectively cognitive ability and creative thinking skills on thermal concepts (temperature, heat transfer and matter change).

Keywords: Problem Solving, Creative Collaborative, Creative Collaborative Problem Solving, creative thinking
Topic: 3. Physics Education

[ABS-418]
The use of argument based science inquiry (absi) learning model by using science writing heuristic (swh) approach to build students argument ability and communication skills in environmental pollution theme

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Abstract
Given the importance of the ability to argue and communication skills for students in Natural Science learning, it was necessary to find a solution, which is a method and learning approaches that are expected to develop students argumentation and communication skills. One of the methods that could be apply was the Argument Based Science Inquiry (ABSI) learning model with Science Writing Heuristic (SWH) approach. The object of this study was learning Natural Science by using webbed-based with the theme of environmental pollution. This study aims to obtain a description of students argumentation and communication skills in SMPN 1 Malingping. This research was the Quasi Experimental research with Non Equivalent Pretest Posttest Design type. The subject involved of students class VII in SMPN 1 Malingping. Experimental class and control class were given the same test, they were pretest and posttest. The pretest results in experimental class showed that the mean average of the students ability in argumentation and communication was 29.40 and 45.75. While the average of students ability in control class was 21.37 and 45.47. The researcher recommended that this research should be done in schools that have excellent classes and regular classes in order to make comparisons clear.

Keywords: Argument Based Science Inquiry, Science Writing Heuristic, argument ability, communication skill.
Topic: 2. Science Education
Implementing a Four-Tier Diagnostic Test to Assess Elementary School Students on Electricity Magnetism concept

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Abstract

This article reports on the calculation procedure which is to recover and to device a four-tier test diagnostic instrument, which has not been defined in the literature. It is an enhanced arrangement of the two-tier test substances. As in two-tier tests, its answer and reason tiers extent elementary school students contented knowledge and clarifying knowledge, separately. The two added tiers quantity the level of confidence of elementary school students in the accurateness of their selected choices for the answer and reason tiers separately. The four-tier diagnostic test was focussed on electricity magnetism concept. It was measured to 40 elementary school students later. They were correctly trained on the preceding topics. The substantial corporate of the respondents was established to have an unfortunate kind and misconceptions of the subjects tested. We have already described that the test was able to investigate and categorize students into student conception of electricity magnetism concepts. Research result with four tier tests showed scientific conception 8.85%, which was likely to have misconceptions 63.4%, and the students were lack of knowledge the concept of 25.2%, and had an error amounted to 2.55%. The elementary school students inclined to be unwell aware of what they diagnosed and what they do not diagnose. Kind of question tested was connected by enhanced percentage of elementary school students substantial accurate responses, established buoyancy and enhanced perception calculation. 20 truthful misconceptions were predictable. It might be determined that a Four-Tier Diagnostic Test which has previously been established be able to assess elementary school students conception of electricity magnetism concept.

Keywords: Diagnostic tests, Four-tier test, Misconceptions, Electricity Magnetism Concept

Topic: 3. Physics Education

The Use of Open Ended Problem in Developing Mathematical Reasoning Ability of Junior High School Students on Geometry

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Abstract

The mathematical ability of the students will only be the material that follows a series of procedures without knowing the meaning if the students reasoning abilities are not developed. The purpose of research to describe the use of open ended problem in developing students mathematical reasoning ability of junior high, especially on Geometry. This research is descriptive qualitative research. The instrument used in this research is test of mathematical reasoning ability based on open ended. The sample in this research is the students of grade 8 of Junior High School in Banjarmasin. Analysis of data by reducing data, presenting data and making conclusions. The results show that the use of open ended questions can develop students mathematical reasoning ability of Junior High School.

Keywords: Mathematics Reasoning, Open Ended Problem

Topic: 1. Mathematics Education
An early childhood teachers teaching ability in project based science learning: a case on visible light

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Abstract

The research aims to describe teachers ability in teaching science toward project based learning for early childhood students. The early Childhood teachers ability in term of using learning model are very useful. The instrument used in this study is teachers teaching ability assessment tool based project learning. This study was conducted on 2 teachers of early childhood education. Design The research used is descriptive qualitative. the results obtained indicate that teachers teaching project based science learning have not been compatible with project based learning steps. Thus the ability of early childhood education teachers to understand project based learning in project based science teaching is essential.

Keywords: project based science learning, teachers teaching ability

Teachers Content Knowledge in Generalizing Concept Maps of Quadrilateral

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Abstract

The knowledge mathematics teachers has been of interest within the maths education researchers. Teachers content knowledge (TCK) in constructing definition and classification of quadrilateral can correctly provide generalization concept maps of quadrilateral. By understanding the concept maps of quadrilateral, teachers should able to minimize misconceptions and difficulties in studying the quadrilateral. This study focused on TCK in generalizing concept maps of quadrilateral. The sample were 26 maths teachers, at least five years experiencing in teaching maths in secondary schools, having a bachelor degree, and qualified in the teachers certification program in Haluoleo University. Data were collected by a mixed methods approach, including both a geometry test and interviews to assess TCK on the concept of quadrilateral. The results emphasized that there were two participants were categorized in the economical definition level. Teachers difficulties were, namely declaring incorrectly properties or attributes, describing improperly necessary condition, defining inappropriately sufficient condition, and stating excessively necessary and sufficient of definitions. However, all participants were sufficient enough in generalizing concept maps of quadrilateral. Few participants with some difficulties, were referred to teachers knowledge, orientations and properties, and spatial knowledges. Finally, this study highlighted the need for a more in-depth maths education for improving teachers competences.

Keywords: Teachers Content Knowledge, Concept Maps, Quadrilateral

Topic: 1. Mathematics Education
Abstract

The interaction between new information and the existing scheme will always occur in learning as well as in problem solving. Thus, it is important to explore how this interaction takes place. Description of the interaction between new received information and the existing scheme was obtained through qualitative research. Data were obtained through problem-solving test done by the subject and interview based on the answers on the problem-solving test. The result of data analysis showed there were 4 processes done by subject when getting new information namely 1) assimilation, 2) equilibration, 3) accommodation, and 4) rejection of new information.

Keywords: scheme, assimilation, equilibration, accommodation

Topic: 1. Mathematics Education

Description of meta-analysis of inquiry-based learning of science in improving students inquiry skills

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Abstract

This meta-analysis is the result of preliminary research which aims to describe the effectiveness of inquiry-based science learning in effort to improve students inquiry skills. The study of meta-analysis with observation method and analyzed of fifteen journals, literature review using Google search engine in Journal of Baltic data base, ERIC journals (Education Resources Information Center and Google Scholar). Calculation of analysis used average Effect Size (ES) , analyzed the articles as research samples, then categorized based on Cohens criteria The results of the data analysis obtained average Effect Size of 0.45, with the category "medium." Variations between levels of education and the country of researchers in the journals, the highest effect was on the state of America with a score was 0.88, with the category "high" in elementary school level. Based on the analysis of all samples of this study concluded that inquiry-based learning can be used in the development of science learning and improving of students inquiry skills on each level of education.

Keywords: Inquiry-based learning;meta-analysis;scientific

Topic: 2. Science Education
Video supported critical thinking test in kinetic theory of gases: validity and reliability

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Abstract

This study is conducted to figure validity and reliability of Video Supported Critical Thinking Test (VSCT-Test). VSCT-Test has already been constructed to evaluate critical thinking skills of students in Physics subjects. The study used the descriptive quantitative method. Seventy students of a high school in West Bandung Regency have been chosen with purposive technique sampling. The VSCT-Test was constructed, according to five critical thinking categories from critical thinking framework developed by Tiruneh, consisting of: 1) Reasoning, 2) Hypothesis Testing, 3) Argument Analysis, 4) Likelihood and Uncertainty Analysis, and 5) Problem Solving and Decision Making. VSCT-Test validity was determined through expert judgement involving construct validity and content validity, whereas VSCT-Test reliability was concluded through field testing with the test-retest method. The results showed that all VSCT-Test items that were constructed had met a good construct validity as well as content validity and had high reliability characterized by reliability index of 0.82. Thus, this indicates that the VSCT-Test instrument has good quality and convenient for measuring the critical thinking skills of high school students.

Keywords: Critical Thinking, Video Supported Test, Kinetic Theory of Gases

Improving Mathematical Problem Solving Ability of High School Students Through Metacognitive Scaffolding Approach

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Abstract

Problem solving is an important skill that need to be developed in mathematics education. Sharpening problem solving skills enable students to improve their ability to analyze and train students to think creatively. However, in reality the students were less facilitated in sharpening the development of problem-solving abilities. Consequently, the problem solving ability of students has not been satisfactory. One of the efforts that could be done to overcome his problem is applying metacognitive scaffolding approach in learning. Metacognitive scaffolding is an approach that emphasizes self-monitoring capability. Monitoring is the way a person monitors what students know and do not know. While scaffolding is a help given by the teacher to the students. When students feel able to work independently, teachers slowly reduce scaffolding. This study aimed to determine whether the approach of metacognitive scaffolding could improve problem-solving abilities. The research applied quasi experiment research with Nonequivalent Control Group Design. This research took place in one of State Senior High School in Padang Pariaman District, West Sumatera. The results show that metacognitive scaffolding approach could improve mathematical problem solving ability.

Keywords: mathematical problem solving abilities, Metacognitive Scaffolding Approach

Topic: 1. Mathematics Education
Analytical thinking skill profile and perception of pre service chemistry teachers in analytical chemistry learning

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Abstract
Analytical Thinking is one of the HOT skills that is required in Analytical Chemistry learning. The purpose of this research is to portrait the profile of Analytical Thinking skills and perception of pre-service chemistry teachers towards learning. The aspects of analytical thinking skills is measured on using indicators developed by Marzano. The subjects in this study were 15 pre-service chemistry teachers, while the research data were collected through analytical thinking test instrument and questionnaire form. Further, the data obtained are were use as a basis for the development of analytical chemistry materials. The results showed that generally the analytical thinking skill of pre-service chemistry teacher is in the low category, with the average value of 63 (on 100 scale). Specifically, the tough stage from the highest are specifying, generalizing, analyzing errors, matching, and classifying. While the questionnaire results of pre service chemistry teacher toward Analytical Chemistry learning which got high, sufficient and low marks were the aspect of teaching materials; learning strategies, affective strategies, and cognitive strategies; the role of lecturers and material significance. Thus the role of lecturers and material significance is an aspect that must be developed to improve analytical thinking skills in the learning process.

Keywords: Analytical Thinking Skill, Perception, Analytical Chemistry

Topic: 4. Chemistry Education

HOTS profile of physics education students in STEM-based classes using PhET media

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Abstract
The development of information and communication technology is currently overgrowing. The utilization of this technology has become an opportunity for educators to be creative to improve the ability of high-order students or Higher Order Thinking Skills (HOTS) which is still a problem. The integration of Sciences, Technology, Engineering, and Mathematics (STEM) in learning especially in physics courses is essential because it consists of various abstract concepts and complex mathematical calculations. This study was aimed to find out the HOTS profile of students after the application of Physics-based lectures STEM using PhET Media. This quasi-experiment research with one group pretest-posttest design model through data analysis technique uses Rasch modeling concept. The results of the assessment indicate an increase in HOTS students ability after applied STEM-based Physics learning using PhET media, with the medium category at the normalized gain. The results of the research will be continually developed in other courses in Jurusan Pendidikan Fisika Universitas Papua.

Keywords: HOTS, Physics, STEM, and PhET

Topic: 3. Physics Education
Development of physics learning media based on lectora inspire software on the elasticity and Hookes law material in senior high school

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Abstract
The purpose of this research was to develop physics learning media based on software lectora inspire at elasticity and Hookes law material which are valid, practical, and effective. This development stages follow ADDIE model that consists of five phases (analyze, design, development, implementation, and evaluation). The tabulation process and analyzing the data uses Rush models through the software of winstep and facets. Process validation of learning media by the validator, obtained by the result of facets analysis showing good validation result. The implementation stage in SMAN 2 Manokwari, obtained winstep analysis results showing that the practicalities and effectiveness of instructional media that are in a good category. Developed learning media can be used to support the physics learning media at school.

Keywords: learning media, lectora inspire, elasticity, and Hookes law

Topic: 3. Physics Education

An Innovation Developing Flip Flop Book (Digital) On Organ Systems In Human

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Abstract
New trend in education leads to computer-based education, a variety of multimedia-based learning resources such as flip flop book. Flip flop book provides a combination of text, images, animations, and videos in one application. Thus students can learn optimally. The research aim is measuring effectiveness flip flop book to learning outcomes. The material chosen in the development of the flip flop book in this study is the material of the Organ Systems in Human. This material is selected based on need assessment which shows that some of the material on Human Organ System is the most difficult material in class XI. The research method used is Research and Development with Borg and Gall model, 2007. The research held in Senior High School . In learning the use of flip flop book is expected to improve student learning outcomes. From the results of the feasibility study by experts, small group trials, and large groups (whole class) show the results of Good (B) to Very Good (SB) indicator, from the value of 76 to 85 for the feasibility test. The effectiveness test results show a value of p < .05, which means that classes using digital books are better than that do not use. Conclusion that the development of digital books (Flip Flop Book) has a rating good to very good.

Keywords: flip flop book, organ systems in human, research and development

Topic: 5. Biology Education
Students response to project learning with online guidance through google classroom on biology projects

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Abstract
This study aims to describe students response to project learning with online guidance through Google Classroom on biology projects. This is a descriptive study which involved 35 high school students in the West Bandung regency. The study was conducted from March to April 2018 for 7 weeks. Data were collected using questionnaires and interviews to the students directly. The result of this research is Google Classroom can be used as a medium of online guidance on project learning. Students find it easy to upload their project progress reports and students feel that Google Classroom can be used in the future. Students also find it quite effective if Google Classroom is used to guide students projects. However, students find it difficult to understand the feedback given by teachers through Google Classroom. The presence of teachers physically was still needed to guide students especially when discussing feedback.

Keywords: Students response; Online guidance, Biology learning project
Topic: 5. Biology Education

Digestive System for the Re-design of Performance Assessment

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Abstract
In the 21st century this required an increase in student health literacy. Literacy of digestive health is important to be improved. Various efforts were made, one of them by using performance assessment for learning. The purpose of this study is to describe the use of re-design performance assessment to improve student health literacy. The research method used is descriptive method. Instrument used consisted of teacher questionnaire, student questionnaire, task, rubric and feedback mechanism. Health literacy is measured by 4 dimensions on the Partnership-21 Century Skills framework. The data were analyzed descriptively. Result of research from the use of task, rubric and feedback mechanism obtained significant improvement on 4 dimension of students health literacy.

Keywords: Digestive System, Health literacy, Re-design Performance Assessment.
Topic: 5. Biology Education
[ABS-438]

Development of Mathematics Teaching Materials Using Project-Based Learning Integrated STEM

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Abstract

Development of mathematics teaching materials using project-based learning model integrated STEM in junior high school not much done yet. Integration of STEM in education becomes a necessary thing to do based on the high demand for human resources who master the STEM field. Project-based learning provides space for students to choose activities to be undertaken during the lesson as well as providing opportunities for implementers of learning to observe activities that are considered more effective in developing student skills. The process of choosing the learning activities undertaken on each student begins with a thought process that results in a decision. This study aims to develop a project-based teaching materials which presents mathematical topics combined with other STEM fields. Based on the analysis of research data, the design of teaching materials often undergoes changes in arrangements of delivery and the amount of content that can be delivered is also accepted by students depending on the diversity of students abilities.

Keywords: Teaching Materials, Project-Based Learning, STEM

Topic: 6. STEM Education

[ABS-439]

Content analysis of misconceptions on bacteria in the biology textbook of high school

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Abstract

Abstract. Misconceptions on bacteria found in several sub-concepts, i.e. characteristics, structure, classification, form and shape, reproduction, and classification of gram positive and negative bacteria. Textbook is one of the factors that can lead to misconceptions. Textbooks are the teaching aids and sometimes become the only source for student regarding the concepts. The aim of this research is to identify the misconceptions in high school biology textbooks and to categorize the misconceptions in high school biology textbooks particularly on the materials of bacteria. Two textbooks were selected purposively, as the books used in two targeted high schools. The misconception was categorized based on 5 categories according to Hershey, i.e. undergeneralizations, obsolete concepts and terms, oversimplifications, overgeneralizations, and misidentifications. The result shows that there are misconceptions on both textbooks, that are 7.4% undergeneralizations, 2.5% oversimplifications, 0.6% overgeneralizations, and 0.6% misidentifications. Since the misconception dominated by categories of undergeneralizations and oversimplifications, it is predicted that it will stimulate difficulties of students to construct the complete concepts.

Keywords: Content Analysis, Misconceptions, Textbook, Bacteria.

Topic: 5. Biology Education
Sharing and Jumping Task Design on Chemical Equilibrium Lesson for Improving Learning Quality at Senior High School

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Abstract
Lack of teacher anticipation of students responses lead to obstacles in a learning process which affect the quality of learning, therefore we need develop an innovation of learning design that has prediction of students response. The purpose of this research is to develop didactical design based on sharing and jumping task in chemical equilibrium calculation. Sharing task used to facilitate students slow learners with help fast learners. While jumping task used to challenge fast learners so they didnt feel bored in learning. The method used in this research is the Didactical Design Research (DDR), which consists of three stages: prospective analysis, metapedadidactical, and retrospective analysis. The developed didactical design was implemented at students of grade 11 of a senior high school in Bandung. Then the revised didactical design was implemented at another group of students of grade 11. Data was collected through observations, interviews, documentation, then the data is transcribed and analyzed. Based upon the result of the first implementation analysis it was found that the teacher still dominated the learning proses, but in the second implementation of the revised didactical design affected some changes in the learning process indicated some students have started to discuss actively.

Keywords: Quality learning; Didactical design; Sharing and jumping task; Chemical equilibrium lesson

Topic: 4. Chemistry Education

The Effect of Implementation of Levels of Inquiry on Scientific Reasoning and Scientific Attitude The Senior High Students on Global Warming Topic

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Abstract
This study aimed to analyze the effect of implementation of levels of inquiry on the learning material about global warming in order to increase the senior high students scientific reasoning and scientific attitude. This study used weak experimental method with one group pretest-posttest. This study uses the senior high students as participants (N = 33) in the academic year 2017/2018. Data were gathered levels of inquiry implementation observation protocols, test on scientific reasoning, and questionnaire about the students scientific attitude. The category of scientific reasoning refers to Wenning and Vieryas framework. Scientific attitude indicators that were measured consists of six components. The average students gain on scientific reasoning is 0.35, which is categorized moderate. The effect size of 1.06 indicates a large contribution. The students scientific attitude is 78.09 %, which is categorized positive. This result indicates that implementation of levels of inquiry on global warming topic has large contribution to increase the scientific reasoning and scientific attitude the senior high students.

Keywords: Levels of inquiry; scientific reasoning; scientific attitude; global warming

Topic: 5. Biology Education
[ABS-442]

Engineering design model: environmental problem-solving ability, motivation and student perceptions

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Abstract

This study aims to describe students learning motivation, student perceptions and students ability in designing problem solving of environmental pollution through learning of EDM. This is a descriptive study which involved 60 high school students in the West Bandung regency. Students were divided into two groups: EDM 1 and EDM 2. Students in EDM 1 are given the freedom to choose the tools and materials that will be used in making prototype while the students in EDM 2 are required to choose the tools and materials provided by the teacher. The results showed that students ability in designing environmental problem solving through learning of Engineering Design Model (EDM) in EDM 1 and EDM 2 was not different (87.2% and 86.6%). Students in the EDM 1 class were superior to the ability to model prototype tools. While students in EDM 2 classes tended to be superior in the ability to identify problems. The result of student perception analysis showed that students in EDM 1 class had more motivation to innovate and had higher creativity than EDM 2 students.

Keywords: Engineering design model, Environmental problem-solving ability, Students perceptions

Topic: 5. Biology Education

[ABS-443]

How to Develop Teaching Material of Buffer Solution Based on SETS

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Abstract

This study aims to develop teaching materials for the buffer solution based on Science, Environment, Technology, and Society (SETS) to improve the science process skills. The research method used is development research, while the method of development of teaching materials used is 4S-TMD. This article is the first part of the development of teaching materials that includes selection and structurization steps. In the selection step, developing the indicator accordance with the curriculum requirements, explaining the buffer concept using standardized textbook sources, and analyzing SETS that can be integrated with the buffer concept. In the structurization step was developed concept maps, macrostructures and multiple representations that connect between the level representations of macroscopic, submicroscopic, and symbolic. The results of the selection and structurization steps were evaluated by expert lecturers. The results show that the teaching materials developed are in accordance with the curriculum requirements, it has been ensured the scientific truth, the phenomena presented in accordance with SETS and concept maps, macrostructures, and multiple representations developed have been valid. The first part of the development of teaching materials that includes the selection and structurization steps results in a draft of teaching material for the buffer solution based on SETS.

Keywords: Developmental teaching material; Buffer Solution; SETS; 4STMD

Topic: 4. Chemistry Education
Students critical thinking skills toward analyzing argumentation on heat conductivity concept

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Abstract

Abstract. We have already probed students critical thinking skills toward analyzing argumentation on heat conductivity concept. Analyzing argumentation is needed to be investigated because students require to obtain it in order to become a better thinker and making the right decisions. The heat conductivity problem has been given to 20 preservice physics students who have been enrolled in the Introductory Physics I. The test has precisely analyzed in qualitative way. An analysis of collected data has mainly focused on student conclusion in heat conductivity problem. Based on data analysis, it can be concluded that students critical thinking skills toward analyzing argumentation on heat conductivity concept is still poor category.

Keywords: Critical Thinking Skills, Analyzing Argumentation, Heat Conductivity Concept

Topic: 3. Physics Education

Levels of cognitive process in mathematics problem solving

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Abstract

Abstract. Level of cognitive process is a crucial issue in mathematics problem solving. The ability to solve unstructured problems in learning mathematics is influenced by level of cognitive process. The mastery of cognitive process level determines how individuals understand the problems and discover the way to solve these problems. The researcher adopted the concept proposed by Kitchener, then it is completed by the opinion of Anderson and Karthwohl. A-three level model of cognitive process consisted of cognition, metacognition, and epistemic cognition. The research is set to find out levels of cognitive process in mathematics problem solving. This is a qualitative research used task-based interview. A student at tenth grade of SMAN 6 Surakarta involved as a participant in this research. The result revealed that the student is able to solve mathematics problems which the problems are in the cognition level, exactly in the first stage, namely factual knowledge.

Keywords: cognitive process; cognition; metacognition; epistemic cognition

Topic: 1. Mathematics Education
Mathematical abstraction of 9th grade students using realistic mathematics education based on the van Hiele levels of geometry

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Abstract

The purpose of this research is to analyse mathematical abstraction based on van Hiele levels of geometry (VHLG) through Realistic Mathematics Education (RME) approach and through traditional learning seen from levels of prior knowledge. This research uses a descriptive qualitative method with the subject is junior high school grade 9th. Instruments in this research is a test of mathematical abstraction, van Hiele Geometry Test and interview guidelines. The results for students in the high and moderate category in the class using RME approach, the VHLG is at the Deduction level and the abstraction ability were dominated by Empirical and Reflective Abstraction, whereas the students in the low category are at the level of Abstraction, they have imperfect Empirical and Reflective Abstraction. For students in the high category in the class using traditional learning, the VHLG is at the level of Abstraction, they have Reflective Abstraction at the Representation level. While the students in the low and moderate category, the VHLG is at the Analysis level, they mastering the Reflective Abstraction at the level of Recognition. This study shows the RME approach can trigger the development of mathematical abstraction, and it can accelerate the progress van Hiele levels of geometry.

Keywords: Mathematical Abstraction; The Van Hiele Levels of Geometry; Realistic Mathematics Education

Topic: 1. Mathematics Education

The effectiveness of experiment-based student worksheets with map concept in understanding the physics concepts of static fluid materials

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Abstract

Research has been done to find out the effectiveness of experimentally based student worksheets in understanding the physics concept of static fluid material. The study was conducted in Madrasah Aliah Sorong Regency. Descriptive research method uses purposive sampling technique with students class XI IPA amounted to 13 students. The learning is done by concept map in which applying the experiment-based student worksheet. The results of pre-test and post-test data processing on each it found that the gain values were 0.36 and 0.51 respectively in the medium criterion. The results illustrate that the experimental based student worksheet with concept maps are effective in learning to understand the concepts of physics. Psychomotor skills responses are included in good criteria. The mean value of psychomotor skills in each learning was 70.64 and 80.6, respectively.

Keywords: effectiveness, experiment based student worksheets, physics concept, and static fluid

Topic: 3. Physics Education
The analysis of students interest for physics lessons at state high school in three districts in Manokwari Regency, West Papua Province

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Abstract

The purpose of this research is to know the interest of learners for physics lesson at state high school located in three districts of Manokwari Regency. School of research in the three districts are SMA Negeri 1 Warmare, SMA Negeri 1 Prafi, and SMA Negeri 1 Masni. The method used in this research is quantitative method with descriptive technique and use student population of class X and class XI IPA. Determination of sample using simple random sampling. Data were collected using a questionnaire with a total of 16 validated statements. The result of data analysis shows that the percentage of students interest in succession is SMA Negeri 1 Warmare 69.2%, SMA Negeri 1 Prafi 66.7% and SMA Negeri 1 Masni equal to 81.6%. Students interest in the subject of physics can be said to be in the good category.

Keywords: students interest, physics lessons, and state high school

Topic: 3. Physics Education

Analysis of students error in intuitive thinking test

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Abstract

This study aims to determine and analyze students mistakes in working out the problems of intuitive mathematical thinking. This research uses a descriptive qualitative method. The subject in this research is student of 8th grade in a junior high school. The data in this study was obtained through the test of mathematical were intuitive thinking ability. The results in this study showed that students intuitive thinking have visible, but students intuitive thinking should be improved by providing a good understanding of learning materials.

Keywords: Intuitive Thinking

Topic: 1. Mathematics Education
[ABS-451]

Pre-service physics teachers thinking styles and its relationship with critical thinking skills when learning interference and diffraction

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Abstract

This study is a survey that describes the profile of pre-service physics teachers (PPTs) thinking styles and critical thinking skills when learning interference and diffraction. The survey involved 46 fifth semester PPTs at one of the universities in Ternate city. Data related to PPTs thinking styles were collected through the Yanpiaw Creative-Critical Styles Test, while data related to PPTs critical thinking skills were collected through tests of critical thinking skills. Data were analyzed by using quantitative descriptive technique. Based on the results of the data analysis, it was concluded that generally the PPTs critical thinking skills for the group of superior critical, critical and balance thinking styles can be categorized as low, while for the group of creative thinking style can be categorized as high. The map of thinking styles and critical thinking skills will be used as a reference in developing a game design in the physics learning context.

Keywords: thinking styles, critical thinking skills, interference and diffraction
Topic: 3. Physics Education

[ABS-452]

Imitative and creative reasoning in mathematical problem solving of horticultural agribusiness context

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Abstract

The aim of the research is to describe the ability of imitative and creative reasoning in mathematical problem solving of horticultural agribusiness context. The research was held by qualitative approach toward six students as of participants, all of them are vocational students of horticultural and agribusiness in Tasikmalaya. The students were given a test and interviewed in order to get the Data about the ability of mathematical reasoning. Here are the result: (1) No student do memorize reasoning;(2) students reasoning when the logarithmic remember mathematical procedures; (3) The students started the process of solving the problem by using the procedures of cultivation, then follow up with a mathematical procedure, in this case, the students do local creative reasoning; (4) students do creative reasoning to create a sequence of procedures, suggests a predictive statement based on the nature of mathematics; (5) students helped solve the problems presented in the context of an agri business-horticultural competence. These results show that the mathematical problems presented in the context of agribusiness -horticultural reasoning raise a lot more creative.

Keywords: imitative and creative reasoning, problem solving, horticultural agribusiness
Topic: 1. Mathematics Education
High school student prior-knowledge in system thinking on the concept of plant classification system

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Abstract
This study aimed to investigate the prior-knowledge of high school students system thinking on the concept of plant classification system. This research method is described. Participants consisted of 36 from 10th grade students of science selected random from the high school student population 10th grade Bandung. Students were given multiple choice questions representing indicator of system thinking. Each correct answer is made a percentage. The results showed that the prior-knowledge of students in the system thinking the concept of plant classification system in the low category. Only 23% of students can recognizing system interconnections, 27% of students can identify feedback on the system, 17% of students understand the dynamic behavior of the system, 22% of student can organize the systems components and processes within a framework of relationships and 26% of students can understand the nature of the system. Low prior-knowledge of students is due to the tendency of students who think is not comprehensive and can not connect between the components that make up the system when system thinking is required for students to High Order Thinking (HOT).

Keywords: prior-knowledge, system thinking, plant classification system
Topic: 5. Biology Education

Self-confidence and mathematics achievement using guided discovery learning in scientific approach

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Abstract
The aimed of this research is to describe the effect of guided discovery learning in scientific approach toward student achievement and self-confidence. This research is quasi-experiment with the pre-test post-test design. The study was conducted in grade 7, with an age range of about 12-13 years, in one of the schools in the suburbs with the quality of students input being in the middle category. The data collected by using mathematics achievement test and self-confidence questionnaire that has been declared valid by the expert team. The criterions of effective are: 1) post-test score is higher than pre-test score; 2) the average of student achievement score is higher than 75; 3) the average of self-confidence score is higher than medium category; 4) the proportion of student that pass the achievement criterion is more than 70%; and 5) the proportion of student self-confidence that reaches very high and high is more than 70%. The result of this research showed that guided discovery learning in scientific approach is effective on students mathematics achievement and self-confidence.

Keywords: guided discovery learning, scientific approach, self-confidence, mathematics achievement
Topic: 1. Mathematics Education
The feasibility of worksheet based on scientific creative thinking skills and critical thinking skills for physics learning in high school

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Abstract
This research aimed to determine the quality and comprehension of worksheet based on scientific creative thinking skills and critical thinking skills. The method used in this research is research and development. The instruments used in this study consist of the test instrument of quality worksheet and the instrument of comprehension worksheet. Data analysis techniques for worksheet quality through questionnaire worksheet consisting of several aspects in 20 items, while data analysis for the comprehension worksheet using test of main idea the paragraph and test supporting main idea the paragraph. The result of data analysis for test of worksheet quality obtained by result of scoring of questionnaire value from three expert lecturers and 10 of physics teachers, converted in the form of percentage obtained the quality of worksheet developed by 82.5% that is in very good category. The result of data analysis for comprehension test conducted on 32 students is 87.5% in the independent category (high). The Average of quality test results and comprehension test of 85% are included in the eligible category. Thus, the feasibility of worksheet based on scientific creative thinking skills and critical thinking skills on the topic of momentum impulse is worth to using

Keywords: worksheet, scientific creative thinking, critical thinking, momentum impulse

Topic: 3. Physics Education

Identification of students misconceptions on global warming

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Abstract
Students misconception is defined as the students concept understanding that is inconsistent with the scientific concepts. These misconceptions commonly occur by either our mind, teacher, or textbook. The research aims to analyze students misconceptions on the topics of global warming, greenhouse effect, and ozone layer depletion. The quantity and the cause of misconceptions will be analyzed based on misconception percentages and interviews. The research is conducted in one private school in Bandung. The results show that there are 17 concepts identified as misconceptions. Students have 51.3% misconception, 37.7% understand the concept, and 11% unknown the concept. The interview has identified the causes of students misconceptions due to the invalid information comprehended by the students during a lesson in the class. Consequently, students tend to acquire misconceptions. The research implied that the teachers must elaborate several ways to recover students misconceptions. The learning model of process oriented guided inquiry learning (POGIL) is proposed to minimize students misconception.

Keywords: Case studies, misconception, physics education, global warming, greenhouse effect, ozone layer depletion.

Topic: 3. Physics Education
Lesson Study as a Means of Transforming Classroom Discourse and Student Cognitive Engagement in Science Classroom

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Abstract
This study deals with the impact of lesson study focused on classroom discourse and student cognitive engagement in science classroom. Lesson study has been used as a professional development program where teachers will be able to improve on teacher instructional practices. In this study, lesson study was conducted in two junior high schools for two cycles which a cycle starts from build a lesson design, implementation lesson design in science classroom, reflection, and revise the lesson design. A qualitative approach design in this study provides a detailed look at each aspect of lesson study which showed the impact on classroom and student cognitive engagement in science classroom. Classroom discourse and student cognitive engagement analyzed form transcribed video recordings and measured by EQUIP (The Electronic Quality of Inquiry Protocol). The result showed an increase in student cognitive engagement and the following aspect of classroom discourse: questioning level, complexity of questions, and communication pattern. In general, lesson study was effective to help teacher reflect the lessons and revise the lesson design as a part of lesson study was effective to improve classroom discourse. This study contributes to upgrade teacher instructional practices and student cognitive engagement in the science classroom.

Keywords: Lesson study, Classroom discourse, Student cognitive engagement.

Pattern of student mental representation when faced media animation video of plant transport and its relation with mental effort

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Abstract
Media animation video is one of visualization media that can describe the movement and transformation in a process as process of transport in plant. This study aimed to analyze the pattern of student mental representation when faced with media animation video and its relation to student mental effort. This research is a descriptive research conducted on 33 students of 4th semester who are studying the course of Plant Physiology at one of the University in Bandung, Indonesia. The measurement of mental representation is done by using worksheet CNET-Protocol while the measurement of mental effort is done by using questionnaire subjective rating scale. The analysis shows that there are 3 patterns of mental representation formed by the students when faced media animation video that is one-way linear pattern, simple branched pattern and branched more than two pattern. The analysis of correlation between mental representation and student mental effort show no significant correlation of both. This results describe that pattern of students mental representation formed on the media animation video shows a variety patterns. But in its formation, mental representation is not influenced by the mental effort done by the students but purely from working memory.

Keywords: Mental representation, Mental Effort, Working Memory, Plant Transport

Topic: 5. Biology Education
Analysis of students error in mathematical problem solving based on Newmans error analysis

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Abstract
After conducting literature studies, the researchers found that more studies on problem solving focused on the application of learning methods and the development of teaching materials to improve students problem-solving ability rather than identification and discovery of student errors. This study aims to describe students error according to Newmans Error Analysis in solving derivative of algebraic function problem. This research used a qualitative approach with case study design and purposive sampling technique. Data were collected through problem-solving test on derivative of algebraic function and interview of senior high school students grade 11 in Bandung. The results of this study showed that students did five types of errors in solving the problem of derivative of algebraic function that were comprehension error, transformation error, process skill error, encoding error and careless. Analysis of student error was expected to help to reflect on solving mathematical problems and became a reference for teachers in choosing strategy, model or learning media to reduce errors made by students.

Keywords: Problem Solving Ability; Newmans Error Analysis; Derivative of Algebraic Function;

Pre-service chemistry teachers attitude and attribute toward the twenty-first century learning

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Abstract
Teacher education has a significant role in preparing pre-service teachers with adequate 21st century skills. There has been a shift of educational standards in the 21st century learning that replaces basic skill competencies and knowledge expectation of the past. These changes need to be mastered by pre-service teachers. They will offer valuable insights for the present and future pre-service teachers when they have positive attitudes and attributes to the 21st century skills. This research aimed to analyse the pre-service Chemistry teachers attitudes and attributes toward the 21st century skills. Descriptive method involving 48 pre-service Chemistry teachers was used in this research. Ten skills grouped into four classes involving ways of thinking, ways of working, tools for working, and living in the world were identified using measurable dimensions: knowledge, skills, and attitudes/values/ethics. The overall findings indicated that pre-service Chemistry teachers expressed moderately positive attitude toward the 21st century skills but had lack of communication and collaboration skill in the ways of working. Each indicator of attitudes and attributes was discussed. For the future research, it is suggested to promote the 21st century skills using appropriate methods and approaches to pre-service Chemistry teachers in order to get more qualified education.

Keywords: Pre-service teacher, attitude, attribute, twenty-first century skill

Topic: 4. Chemistry Education
[ABS-463]
Development of problem based learning for online tutorial program in plant development using Gibbs reflective cycle and e-portfolio to enhance reflective thinking skills

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Abstract
Reflective thinking skill is needed by prospective and in-service teachers. This study aims to develop problem based learning program with Gibbs reflective cycle and e-portfolio to enhance reflective thinking skills of biology education students who participated in Plant Development online tutorial. Development research is used in this study is conducted through preliminary study, program development, trial of the program, program revision, and program implementation. This paper will discuss about the results of the program development and the trial of the program that were conducted in 2017. The Program development is conducted through program design development, instrument development, validation of program design and instrument by experts, and program development based on the revised program design. The trial of the program is conducted three times with different strategies to see which strategy is most effective to be implemented. Based on the results of experts validation, the results obtained that the design of programs and instruments can be used as references in the development of the program with some improvements. Based on the trial of the program, the results obtained that the program is needed to be improved in terms of setting access between sub-initiation and between initiation.

Keywords: Problem Based Learning; online tutorial; Plant Development; Gibbs reflective cycle; e-portfolio; reflective thinking
Topic: 5. Biology Education

[ABS-464]
Identification and analysis of students misconception in chemical equilibrium using computerized two-tier multiple choice instrument

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Abstract
The concept of chemical equilibrium is fundamental for students to understand. This concept becomes a prerequisite knowledge for many of Chemistry topics such as acid and base, hydrolysis, buffer and solubility. The characteristics of chemical equilibrium topic that have abstract concept are difficult to understand. It drives students to misconceptions. The aim of this study was to investigate the students misconception of chemical equilibrium. Formative test using Computerized Two-Tier-Multiple-Choice (CTTMC) instrument had been conducted. The participants of this study were 158 students from three different schools. The CTTMC instrument was developed in three indicators of chemical equilibrium consisting of 15 questions to identify and analyse students misconception. The students responses were marked in three levels of understanding (understand, not understand and misconception). From the study, it was found that the students adequately understood the chemical equilibrium, but still had misconception especially for explaining dynamic equilibrium and equilibrium constants. The details of the students misconceptions were discussed. For the future research, the information of their misconception can be used as the basis to address the misconception in appropriate way.

Keywords: misconception. chemical equilibrium, two-tier instrument
Topic: 4. Chemistry Education
Biology Teachers and High School Students Perceptions about STEM Learning

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Abstract

STEM Learning is developed to prepare students into a scientific and technologically advanced society. Teachers should begin to be sensitive to taking a role in STEM learning. The success of STEM implementation can be seen from 3 criteria, namely STEM outcomes students, school type, and how or instruction in implementing STEM. Research that has been done more focused on STEM outcomes students. It is necessary to examine how students and teachers interest in STEM. This study describes teacher and student perceptions of STEM. This research uses descriptive method involving 47 high school students and one high school biology teacher. Data were obtained based on student and teacher response to questionnaire about STEM. Results showed that average 71% of students showed positive perceptions of STEM viewed from 68% of interest, 63% of difficulty, 71% of ability, 75% of readiness, 69% of influence, 73% of career and 77% of STEM benefits. On average 82% of teachers showed a positive perception of STEM viewed from 71% of interest, 82% of ability, 83% of influence, 86% of benefit, and 86% of career. Students and teachers consider STEM essential for future career development, so feel interested and challenged to learn it.

Keywords: STEM, teacher and students perceptions

Investigation of Integrated Science Course Process and the Opportunities to Implement CSCL Learning Environment

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Abstract

Integrated science learning should be mastered by master students of science education program holistically. Master students of science education program consist of several disciplinary of science education graduates such as science education, physics education, chemistry education, and biology education backgrounds. This study aims of the investigation to describe an integrated science course process that should be synthesized all science disciplines in an integrated way both in content and pedagogy to construct lesson for junior high school. Data were collected using closed questionnaires with the study of documentation, observations and interviews added. Qualitative descriptive was used to analyze the data. The results revealed that there were no collaborative discussions during the course by students that lead affect misconceptions in 75.68% and difficulties in 81.08% to mastered integrated science, due to differences in scientific background. Based on the data, it was suggested to implement CSCL learning environment. The opportunities to implement it were relatively wide due to the availability of technology facilities and fundamental skills.

Keywords: Integrated science, CSCL

Topic: 6. STEM Education
Improving Creative Thinking Skill Through Project-Based-Learning in Science for Primary School

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Abstract

The aim of the present study is to examine the improvement of creative thinking skill of primary school students in science through project based learning (PBL). This research used quasi experiment with nonequivalent control group design. The study involved 45 fifth grade students at a public primary school in Karawang, West Java. The students were divided into two groups i.e. experimental group (n=24) and control group (n=21). The students in experimental group were given instruction through PBL; meanwhile, the control group were involved in traditional instruction. Creative thinking test was used as pre-test and post-test to both groups. The data were analyzed by using independent sample t-test to compare the creative thinking score between the experiment and the control group. The result showed that the students in experimental group had better creative thinking skill rather than the students in the control group. It can be concluded that project based learning can effectively improve creative thinking skill of primary school students in science class.

Keywords: Project based learning, science education, creative thinking

Topic: 2. Science Education

Lecturing of physics for environment using multiple representation approach based on active-learning lecture for scientific communication improvement in pre service physics teacher

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Abstract

Multiple representation on Physics for Environment subject was implemented to improve the students scientific communication. Multiple representation is one of approaches in active-learning lecture which is oriented on the student. The students was given a chance to understanding the topic in their own way, included the idea and describing visual observation in scientific manuscript and oral presentation. This subject was undergraduate physics education students enrolled in Physics for Environment in 2018. Our data showed that multiple representation has been relatively well implemented, it was observed to be improved by 8%. This percent was achieved by scientific skills indicator, such as scientific bright ideas, describing scientific observation in manuscript, explaining scientific phenomena, designing scientific in research, and interpreting the data. The percent indicated positive response on multiple representation approach.

Keywords: multiple representation, scientific communication

Topic: 3. Physics Education
Implementation of Project Based Learning by Utilizing Mangrove Ecosystem to Improve Students Creative Thinking Skills

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Abstract

Project-based learning (PjBL) is an innovative approach in learning process that teaches important strategies to achieve success in the 21st century. This study aimed to describe the influence PjBL models by leveraging the local potential of mangrove forests towards the improve the students creative thinking skills in ecosystem learning. Using quasi experimental method with nonequivalent pre-test post test control groups design. Research subject involved 35 students (with PjBL) and 38 students (direct learning) in SMAN 1 Parigi at the District of Pangandaran, West Java. The results show a significant difference in students creative thinking skills between PjBL classes and direct learning (p-value= 0.000). The conclusion that PjBL influence on students creative thinking skills so that can be used as an alternative model of learning for teachers in refining the process of biological learning to improve students creative thinking skills.

Keywords: Project based learning, creative thinking skills, mangrove ecosystem

Topic: 5. Biology Education

Chemistry Module Based on Guided Discovery to Improve Critical Thinking Ability: Development and Trial Results

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Abstract

The aim of this research is to know the results of trials on chemical modules on thermochemistry chapter developed. The method used in this research is descriptive qualitative and quantitative. Techniques used by giving a questionnaire with 12 statements include content, language, presentation, and graphics. In the end of questionnaire, the respondent allowed to write his/her suggestion to improve the better module. The trials are conducted in two stages: minor and major test. The test subjects were chemistry teachers and students in three public senior high school. Minor trial used 15 students and 3 teachers, while major trials have 30 students and 5 teachers. Quantitative method obtained results of minor test calculations 73.3% with good category for students and 73.6% for teachers with good category, major test results obtained 80% with very good category for students and 81.6% for teachers with very good category. Qualitative methods based on advice provided by teachers and students. There were revisions that obtain during these two stages those are the changing of covers colour and improving the icon in module.

Keywords: Module; Guided Discovery

Topic: 4. Chemistry Education
[ABS-472]
Paradox between students learning needs and learning strategy of teacher mathematics in Indonesia

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Abstract
During this learning is given by the teacher to his students. Teachers only provide material by using learning strategies based on certain learning theory without wanting to know that learning has been appropriate or not. Then the question arises again, whether the desired student learning is desired by the teacher? Because the teacher may be more aware of the condition of all students and learning environment. This becomes a paradox about the truth of a suit that some people think is appropriate but not for others. This study aims to determine which learning theory is considered appropriate according to the perspective of teachers and students. It is expected that mutual understanding of teachers with students will improve student achievement. This study will explore and compare the perceptions of students and teachers in Indonesia with the theory of learning behaviorism and constructivism. Using qualitative survey research methods, students and teachers describe the advantages and reasons why learning with learning theory is appropriate. The results of this study showed that most students and teachers perspective like learning with constructivism theory, but factors such as time allocation and student confidence are so influential that learning theory of behaviorism is used more often.

Keywords: Students Learning Needs; Learning Strategy; Behaviorism; Constructivism

Topic: 1. Mathematics Education

[ABS-473]
The Preliminary Study of Interaction in Physics Concepts for Developing e-Learning to Promote Students Critical Thinking

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Abstract
Interaction has become one of the important strategies in e-learning for teaching the students to think critically when they conveying their ideas and to make them become more proactive. This paper describe interaction in physics concept between student-student, student-teacher, and student-content. Data were collected through three times observed e-learning system in physics course. Data were analyzed by using quantitative descriptive technique. Based on the results of data analysis, it was concluded that generally interaction in physics concept can be categorized on low category, student-student 14 %, student-content 38% and student-teacher 25%. The interaction result will be used as a reference to develop e-learning design in the physics learning context and it will be used to promote students critical thinking.

Keywords: interaction, eLearning, physics concept, critical thinking

Topic: 3. Physics Education
Impact of quantitative literacy on student reasoning in plant anatomy course

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Abstract
Research about the impact of quantitative literacy on prospective student reasoning on Plant Anatomy Course has been done. This study implemented lectures program that develop quantitative literacy and analysed its impact on student reasoning. The participants were 24 Biology students and 35 Biology Education students. The development of quantitative literacy in the lectures was done through the activity of quantification of plant anatomical variables through observation. Students observed quantitative aspects including cell size, cell ratio with organelles and crystals, intercellular space size, density and stomatal index. Observation activities continued with discussion based on data obtained. At the end of the lecture the students tested their conceptual reasoning with the instrument of multiple choice questions referring to Marzano indicators and Quantitative literacy. A Correlational analysis indicates that the quantitative literacy of students correlates positively and significantly to the reasoning of plant anatomical concepts.

Keywords: quantitative literacy, reasoning, plant anatomy
Topic: 5. Biology Education

the correlation between metacognitive skill and cognitive learning result of students in animal physiology learning program based on vee diagram framework

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Abstract
Metacognitive skill is one of factors that influence the cognitive learning. Relations metacognitive skills and cognitive learning outcomes can be achieved through a specific instructional strategies. However, the study of the relationship of metacognitive skills and cognitive learning outcomes in learning Animal Physiology is still lacking. This study is a correlational study revealing the relationship metacognitive skills with cognitive learning outcomes of biology education student on the use of learning strategies based on Vee diagram framework. The study was conducted during the semester. The participants were biology education student of Universitas Pendidikan Indonesia. The results show that there is a relationship between metacognitive skills of with cognitive learning outcomes in the application of scientific learning. The regression equation based on the results of the data analysis was y = 0.493x + 20.37 with the reliability value of 0.529 which means contribution of college students on the cognitive learning is 52.9%, while 47.1% are other factors besides metacognitive skills. Conclusions based on these results that the student metacognitive skills associated with cognitive achievement on the use of learning based on Vee diagram framework.

Keywords: metacognitive skill, the cognitive learning, Vee Diagram, Animal Physiology
Topic: 5. Biology Education
Analysis of mathematical communication skill of junior high school students in geometry topics based on early understanding of mathematics

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Abstract

The purpose of this study is to analyze the results of the test of students mathematical communication skills on the topic of geometry. This research method is a qualitative research with the participants as many as 25 students in 7 grade of a junior high school in Bandung, then grouped based on early understanding of mathematics. Instrument used in this research are interview and written test with problem which presented refers to indicator of students mathematical communication skill. The results showed that upper-level students were able to describe the answers correctly, not yet structured in the presentation of the answer, it therefore can cause the skill in using mathematical terms and the presentation of mathematical ideas are still weak. While middle-level students experienced barriers in describing relationships and situations models, and connecting real objects, images, and diagrams into mathematics. In addition, lower-level students have not been able to interpret the problems of communication in correct answers yet. The conclusion is that the mathematical communication skill of students is still lack. So that there needs appropriate learning strategy to improve students mathematical communication skill.

Keywords: mathematical communication skill; early understanding of mathematics; geometry

Effect of application of dilemmatic problem solving oriented learning model in physics teaching on improvement decision making skills senior high school students

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Abstract

This aim of study is to obtain an overview of the improvement decision-making skill of senior high school students as the effect of applying dilemmatic problem solving oriented learning model in physics teaching. The research method used is pre-experiment with one group pretest-posttest design. The subjects of the study were 38 students in one of the high schools in West Bandung district. The subjects were chosen by random sampling technique. Instruments used for decision-making skill data collection at before and after learning is a test of decision-making skills in the form of essay test. The improvement of decision-making skills of high school students was analyzed using the concept of normalized average gain scores, <g> formulated by Hake. The results showed that 58% of students reach a high gain, 29% of students reach a moderate gain and 13% reach a low gain in decision-making skills. This shows that the use of dilemmatic problem solving-oriented learning model in Physics learning has a moderate effectiveness in facilitating the improvement of decision-making skill of high school students.

Keywords: dilemmatic problem solving, decision making skills

Topic: 3. Physics Education
The Effect of Guided Discovery Learning Model against Junior High School Students Mathematical Problem Solving Ability

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Abstract
This research aimed to examine the effect of guided discovery learning model against Junior High School students mathematical problem solving ability and the difficulties experienced by students in solving mathematical problem solving test. Quasi-experimental research was conducted in SMP Negeri 6 Karawang Barat by taking two classes as the research samples. First class is VIII B amounted to 32 respondents as the control class and VIII E amounted to 34 respondents as the experimental class. Researcher provided treatment that guided discovery learning for the experimental class and conventional learning for the control class. After being given the treatment, then researcher conducted posttest for mathematical problem solving ability in both classes. This research quantitative data analysis using Microsoft Excel aid. The results showed that there are significant effect of guided discovery learning model against Junior High School students mathematical problem solving ability, it is seen from the average of students mathematical problem solving ability who learned with guided discovery learning is higher than the average of students mathematical problem solving ability who learned with conventional learning and the results of effect size test in high category.

Keywords: Guided Discovery Learning, Mathematical Problem Solving Ability

Critical Thinking Ability Junior High School Students with Process Oriented Guided Inquiry Model

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Abstract
The aim of the study was to investigate the influence of POGIL model on the student critical thinking ability. This study was conducted at a school on primary education in Pati. The theme used in this research was changing objects. The research constituted quasi experimental study with post test only design implemented in grade VII of the junior high school. The sampel was taken by random sampling technique. A total of 68 students participated, and divided in two groups, experiment group consist of 34 students and control group consist of 34 students. The data collection was done by post test for critical thinking ability students to the POGIL model. The students critical thinking test used essay questions consist of basic explanations, basic skills building, concluding, explaining further, and managing strategies and tacticThe data was analyze by t test, biserial correlation analysis, and coefficient of determination. Based on the data it was the influence of POGIL model on critical thinking ability students. coefficient of determination result showed that POGIL model gived influence 30% on critical thinking ability students.

Keywords: Critical Thinking Ability;Process Oriented Guided Inquiry Model;changing objects

Topic: 1. Mathematics Education

[ABS-481]
The Practicality of Practicum Guidance Based Guided Inquiry Approach on Animals Physiology Course

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Abstract
Development of practical guide is based on the lack of activity, independence, and involvement of students in the implementation of the lab so difficult to construct the understanding of physiological concepts and processes according to the demands of learning achievement. This study aims to analyze the practicality of Practicum Guidance Based Guided Inquiry Approach on Animal Physiology Course. This study uses 4-D model, which consists of four stages, namely define, design, develop and disseminate. The practical analysis is one of the developing stages. Practicality analysis is based on results or data collected through a questionnaire of 62 students and 2 lecturers of Animal Physiology. Practical analysis includes aspects of ease of use, time of execution, interpretation and equivalence. The results showed that the average of practicality percentage of lecturers was 79.47% and students were 77.00% and both were on practice criteria. The conclusion of the research is Guided Practicum Guidance Based Guided Inquiry on Animal Physiology Course practically used in the implementation of Physiology of Animal Practice in Biology Education Studies Program STKIP PGRI West Sumatra.

Keywords: Practicality, Practicum Guidance, Guided Inquiry, Animals Physiology

Topic: 5. Biology Education

[ABS-483]
The influence of problem solving ability, emotional intelligence and formative tests on learning outcomes of mathematics

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Abstract
This study aimed to examine the influence of problem solving ability, emotional intelligence, and formative tests on learning outcomes of students mathematics. This research was a Cross Sectional Survey Method study with a qualitative descriptive approach. The population in this study was all students of the eighth graders at junior high school in Kulon Progo with the number of samples taken was 255 people by using Krejcie & Morgan. Data collection used test and questionnaire as instruments. The results showed that (1) the fulfillment of all assumptions of the regression model, (2) there was a significant effect between problem-solving ability, emotional intelligence, students formative tests on students mathematics learning outcomes, (3) there was no interaction between variables either problem solving ability and emotional intelligence, problem solving ability and formative student test as well as emotional intelligence and formative student tests.

Keywords: Problem solving abilities, emotional intelligence, formative tests, learning outcomes.

Topic: 1. Mathematics Education
[ABS-485]
The Effect of Guided Discovery Learning on Student Self-Efficacy

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**Abstract**
The aimed of this research is to describe the effect of guided discovery learning on student self-efficacy. This research is quasi-experiment with pretest-posttest design. The research samples consisted of 34 of 200 students. The data collected by using self-efficacy questionnaire that has been declared valid by the expert team. The data analysis used t-test. The criterions of effective are: 1) posttest score is higher than pretest score; 2) the average of self-efficacy score is higher than medium category; and 3) the proportion of student self-efficacy that reaches very high and high category is more than 70%. The result of this research showed that guided discovery learning is effective on student self-efficacy based on those three criterions.

**Keywords:** Guided Discovery Learning, Self-efficacy, Mathematics

**Topic:** 1. Mathematics Education

[ABS-486]
The Efforts of Improving Mathematical Connection Ability of Senior High School Student with Learning Cycle 7e Model

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**Abstract**
Mathematical connection ability has important role in the success of students mathematics course. In fact, the mathematical connection ability of senior high school students is not quite good, thus a learning models is needed to improve mathematical connection ability. The purposes of the research are; (1) find out if Learning Cycle 7e Model could improving students mathematical connection ability; (2) determine whether the improvement of mathematical connection ability of student who obtain Learning Cycle 7e Model compare than student who obtain the conventional learning; (3) and find out how students attitude toward Learning Cycle 7e Model. The method applied in this research was a quasi-experimental design by using non-equivalent control group design. Result for this research are quantitative data and qualitative data. Quantitative data obtained from mathematical connection ability of student before and after the implementation of learning while qualitative data obtained from analysis of data from student questionnaires and observation sheets. The result of this research are: (1) Learning Cycle 7e Model could increasing mathematical connection ability, (2) increased mathematical connection ability student who obtain Learning Cycle 7e better than student who obtain the conventional learning, (3) and most students give positive attitude toward Learning Cycle 7e

**Keywords:** Learning Cycle 7e Model, Mathematical Connection Ability

**Topic:** 1. Mathematics Education
Scaffolding Trajectory: Depicting Teacher Thinking

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Abstract

Contingency is the main condition of scaffolding, where scaffolding is provided in accordance with the students understanding so that the relationship between teacher and student in the problem solving process is very close. In that condition, it is worthy to learn about how the teacher thought is in diagnosing students obstacle in dealing with the problem in mathematics learning. This qualitative research aims to investigate the scaffolding trajectory in solving mathematics problems, that is limit of trigonometric. Scaffolding trajectory is used to analyse how the teacher thinks in providing assistance. Subjects in this case study were consisted of two teachers and two students of grade XII from two schools in Malang, Indonesia. The results showed that there were differences in the teachers scaffolding trajectories. There are two categories of teachers thinking in guiding students; diagnosis and lack diagnosis.

Keywords: Scaffolding; Trajectory; Teacher thinking

Topic: 1. Mathematics Education

Exploration of Mathematics Conceptual Understanding Behavior of Junior High School Students

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Abstract

This study aims to explore mathematics conceptual understanding behavior of junior high school students. Six participants were taken from grade VIII students with high, medium and low ability. The method used in this research is qualitative with grounded theory approach. Five questions were given to the participants to measure students' conceptual understanding of mathematics. Then students were interviewed by questions referring to behavioral aspects. All the interview processes were documented in the video. The video was transcribed and then combined with the test result to be classified into predefined rubric. Based on the analysis of video and test results, three categories of students' mathematics conceptual understanding behavior were obtained: “instrumentalist”, “semi relationalist” and “relationalist”. Also found the consistency of response performed by students in each category. These three categories of behavior will be presented in this paper.

Keywords: Behavior, conceptual understanding, instrumentalis, semi relationalist, relationalist.

Topic: 1. Mathematics Education
[ABS-490]
The application of scientific approach to improve scientific literacy on domain competency at secondary school on dynamic electricity topic

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Abstract
Scientific literacy is the ability to make decisions which are used to solve many problems in society based on knowledge and understanding concepts and processes of science. This study is advance research that adopted previous learning designs which are using scientific approach to improve scientific literacy in domain competency. The method of research is using pre-experimental design with one group pre-test post-test design. The sample is taken by using non-probability sampling with the type of purposive sampling. Essay test that has validity 0.4-0.7 and reliability 0.75 is used to determine the improving of scientific literacy competence on the Dynamic Electricity topic. Scientific literacy is measured on three competencies: explain phenomena scientifically, evaluate and design scientific enquiry, also interpret data and scientific evidence. The result of this research shows that each competencies has improved with n-gain: 0.8; 0.68; and 0.61.

Keywords: Scientific literacy, learning design, scientific approach, domain competency
Topic: 3. Physics Education

[ABS-491]
Analysis of elementary school students misconception on force and movement concept

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Abstract
Mastery of students science concepts reflects a basic understanding about science. Misconceptions occur because of a discrepancy between students conceptual understanding and the actual concept. The purpose of this study is to analyze the misconception of fourth grade students of elementary school on force and movement concept. Based on the results of field analysis, the researchers found data revealing that there was a misconception related to the force and movement concept of fourth grade students. The existence of students misconceptions will have an impact on misunderstanding in the next lesson. This research uses descriptive research type. Data were collected from 20 students using test instruments and interview. Based on the data analysis, the result shows that students have misconception on force and movement concept, especially about free fall movement, friction force, and force on a non-moving object. This shows that there is still a lot of students understanding that has not been in accordance with the actual concept of science.

Keywords: analysis, misconception, force and movement concept
Topic: 2. Science Education
[ABS-492]

Math anxiety performance of junior high school students class VIII

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Abstract

The problem of this research is how to identify the level of students mathematical anxiety in junior high school. The purpose of this research is to find out descriptively the level of anxiety owned by junior high school students and the difference between students anxiety based on gender and class. The method used is descriptive quantitative study using anxiety questionnaire. The population of the study were all students of Class VIII consisting of 7 classes. The number of samples was 95 students taken with cluster random sampling technique. The research data is a statement that measures students anxiety. Data were analysed using descriptive statistical, t-test and Kruskal Wallis. The results showed that the condition of mathematical anxiety level is in a low category. There is a difference in mathematical anxiety level of students seen from the class category. There is no difference in the mean mathematical anxiety of students seen from gender. The novelty and impact of the results of this study are, it turns out the results of previous research which states that women tend to be more anxious than men is not proven. A low level of student anxiety is expected to improve the quality of student learning.

Keywords: Mathematical Anxiety, Gender, level.

Topic: 1. Mathematics Education

[ABS-494]

Lake as a Topic of Integrated Science Teaching Materials Scientific Literacy Oriented for Junior High School Student

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Abstract

This study implements developmental research (DR) that aims to develop integrated science teaching materials by using Four Steps Teaching Materials Development (4STMD) for junior high school student on lake as a theme. This developmental method consists of four steps such as selection, structuralize, characterization and didactical reduction. This paper investigates only the first step of teaching materials development. The selection step emphasizes on the development of teaching materials that begins with collecting material of lake as a theme that appropriate with curriculum demands as a guidance to determine material scope and depth, then the development of basic concept from selected textbook resources in order to avoid students wrong conception. The last stage is the integration of moral values or competences in teaching materials. The competences that integrated on the teaching materials are scientific literacy competences for promoting students scientific literacy since the low result of PISA for five years show that Indonesian student scientific literacy score is under 500. This selection steps produces nine basic competences which integrated on lake as a theme and 23 teaching materials indicators according to scientific literacy competences in a draft of collected material that has been evaluated by several experts.

Keywords: Integrated Science teaching materials; scientific literacy

Topic: 2. Science Education

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**Abstract**

The use of digital technology is highly recommended in current situation. The purpose of this study was to investigate the feasibility of digital media for learning integrated science. Three science topics were included in the media which are Temperature, Heat, and Human Digestive System. Research participants were twenty pre-service science teachers taking integrated science course in a university in Indonesia. Data collected through the use of questioner regarding the digital media performance and integrated science contents. The finding reveals that the digital media has excellent performance to support integrated science learning. Meanwhile, the integration model employed in the media is combination between web and connected. Furthermore, an experimental study is needed to completely depict the digital media characteristics.

**Keywords:** Integrated science learning, Digital teaching media, Model of curriculum integration

**Topic:** 2. Science Education
Gesture of slow learner student in mathematical communication

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Abstract
This article discusses the gesture of slow learner students in solving the problem of mathematical communication. Gesture aims to understand and deepen the thinking process of students who have difficulty conveying ideas either with oral or written. This research is a qualitative research. Data were collected by giving two items of mathematical communication test to a fourth-grade slow learner student of elementary school, then the student gesture was observed through video recording which was obtained when students did the question. The results of this study reveal the pattern of slow learner gesture, i.e.: Iconic gesture: using the fingers and toes in counting. Representational gesture: the student could not answer a question with a clear rational, student was less able to explain her ideas, but did not feel embarrassed to ask. Writing gesture: student could write her ideas in writing after a given direction, but she still made a mistake in writing the mathematical symbols (like numbers) and forgot to write arithmetic operations (addition operation). For further research it is necessary to look at gestures with a greater number of samples and variations, both in terms of gender, grade, or cases of other children with Special Needs.

Keywords: Gesture; slow learner; mathematical communication

Model of educational reconstruction of solid state chemistry: students view nature of science and technology

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Abstract
Develop an adequate conception of the nature of science and technology (NOST) is one of the goals of science education. A good conception of NOST is related with how students understand and perceive science concept. Solid state chemistry is one of science concept that has many applications in daily life and advance technology. Unfortunately, this concept is contains abstract concept. Therefore, need an effort to make it easily understood by students. Model of educational reconstruction (MER) is adopted to define learning design in order to make a connection between concept and its applications based on students and scientists conceptions. Students view of NOST is analyzed before and after intervention. Their conceptions about NOST are categorized into realist (R), has merit (HM), and Naive (N). The majority of students held R view of a majority of the target NOST aspects after the intervention. These results showed that learning based on MER could support to develop students conception of NOST.

Keywords: Nature of Science and Technology, Model of Educational Reconstruction, Solid State Chemistry

Topic: 4. Chemistry Education
[ABS-499]
The Ability of Biology Teacher on Pedagogical Content Knowledge in Farms Vocational High School Pangalengan and His Perceptions on STEM Education

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Abstract
This study aims to describe the ability of biology teacher (teaching < 2 years) on Pedagogical Content Knowledge (PCK) and his perceptions on STEM education. The method of this study was qualitative research and the participant was one biology teacher in Farms Vocational High School Pangalengan. PCK of biology teacher was measured by asking teachers to make CoRes on wastes recycling substance then followed by interview and the perceptions of STEM Education was measured by filling the questionnaires. Data were analyzed with descriptive techniques. The study showed that biology teachers raises 5 important concepts that should be taught and focused of the material, the importance of material and student engineering design process skill, assessment of ascertaining students understanding that influence his teaching but he was not more flexible in the use of teaching strategies, knowledge that was not owned by students yet, difficulties that influence the teaching, students knowledge that influence the teaching, and the way to anticipate the lack of facilities in the school. Beside that, the biology teacher also was interested in STEM Education although according to him, his students interest in subject matter related to STEM is still considered low.

Keywords: Pedagogical Content Knowledge, STEM Education, Biology Teacher
Topic: 6. STEM Education

[ABS-500]
Development of Active Learning Strategy Integrated with Computer Simulation in Physics Teaching and Learning on Makassar State University

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Abstract
One of the physics learning strategies in the university is active learning. Active learning strategy requires students to be able to learn independently, so that this can be realized learning should be integrated with computer simulation. This research aims to produce learning instrument of active learning strategy integrated computer simulation which is valid, interesting, practical, and effective on Physics Department, Makassar State University. This research is a research and development at (R&D) type. The development procedure was referred to Four-D model consisted of definition phase, design phase, development phase and dissemination phase. The data analysis used Content Validity Ratio (CVR), Content Validity index and continued with reliability analysis. Before used in the real class then first was conducted a limited trial test. a limited trial test aimed to avoid biased data by taking 5 students as a limited trial sample. The results obtained that physics learning instrument of active learning strategy integrated computer simulation were valid, reliable, interesting, practical, and effective assessment.

Keywords: Active Learning Strategi, Computer Simulation
Topic: 3. Physics Education
[ABS-501]
Analysis of students difficulties in chemical bonding based on computerized two-tier multiple choice (CTTMC) test

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Abstract
Student learning difficulties occurred from two factors those are internal and external factors. To detect learning difficulties in students one of them by using diagnostic tests. The aims of this study are to identify students learning difficulties and map the student profile categories. The formative assessment post-test was administered to 166 students grade 11 using computerized two-tier multiple choice (CTTMC) instrument to find out their learning difficulties. The instrument contained 20 items computerized two-tier multiple choice (CTTMC). The results showed that learning difficulties experienced by students in high, medium and low grade schools were the metal bond, the molecular shape, and the covalent bond, while the easiest part of the chemical bond were the stability of electron, the Lewis structure and ionic bond. One of the them factors cause students learning difficulties that chemistry contains three levels of understanding that are macroscopic, sub microscopic and symbolic. Most students find it difficult to connect the three. For the future research, students learning difficulties can be used as for the teachers to know good steps in overcoming students learning difficulties.

Keywords: Students Difficulties, Chemical Bonding, CTTMC
Topic: 4. Chemistry Education

[ABS-502]
Development of Teaching Materials Solubility and Solubility Product to Improve Science Literacy

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Abstract
This study aims to develop teaching materials that can improve science literacy. The method used in this research is Four Steps Teaching Material Development (4S-TMD). 4S-TMD consists of the selection step, the step of structuring, the characterization step and the didactic reduction step. This paper is the first part of the development of teaching materials that includes the step of selection and structuring. At the selection step, an indicator is developed in accordance with the curriculum requirements, explaining the concept, and analyzing the value of skills based on the criteria of science literacy. Furthermore, in the structural step developed concept maps, macro structures and multiple representations that connect between macroscopic, submicroscopic, and symbolic level representations. The results of the selection and structuring steps were evaluated by an expert lecturer in the chemical education department. The results show that the materials developed have been in accordance with the curriculum, in accordance with the students cognitive development, scientifically correct, there is the use of interdisciplinary concepts and the appointment of conceptual interrelationships so as to improve students science literacy. This first part of the development of teaching materials produces a draft of solubility and solubility product materials to improve science literacy.

Keywords: teaching materials, solubility and solubility product, Four Steps Teaching Material Development, science literacy.
Topic: 4. Chemistry Education
Picture representation of biology prospective teachers practical work based on gender

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Abstract
In practical work, biology prospective teachers often draw the picture which is resulted of their observation about object or phenomena. This study objectives is to describe picture representation of biology prospective teachers practical work on plants anatomy topic based on gender. The research method is a descriptive. The study involves 33 biology prospective teachers of one university in Bandung. The research instrument used rubric of picture assessment and guidance interview. The data were obtained and analyzed qualitatively. The results show that the picture representation of biology prospective teachers generally can be categorized as less category (52%). In five aspects of picture assessment, only completeness aspect of picture that can be categorized as sufficient category, the other aspects of picture can be categorized less. Completeness aspect is drawing the picture with complete information. The other aspects of picture involve authentic, details, proportional size, and the accuracy of picture. Based on gender, the results show that there are difference between male and female of their picture representation. Male can be categorized very less category, whereas female can be categorized less category in the picture representation.

Keywords: Picture representation, Gender, Biology prospective teachers, Plant anatomy

Succeed or failed: diagnostic of students ability to passed basic learning material on liquid pressure, respiratory system and its application based on integrated sciences test in school

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Abstract
This research performed to analyze students ability to mastering the liquid pressure and body breathing system materials on integrated science learning. Both of the materials in integrated learning include blood pressure, diffusion of respiratory events, osmotic pressure, fluid pressure at a different depth, buoyancy, and capillarity expressed in a specific test. The study covered 144 students in the Integrated Islamic Junior High School. We organized a students ability assessment based on midterm semester exam conducted in March 2018. Data analysis applied by Rasch modeling. The results of this study indicated that students have difficulty in understanding the pressure on liquids, notably in bringing water process from root to leaf (capillarity on plants). Conversely, students are qualified to figure out the operation of the mucous membrane in the nasal cavity in the body respiratory system. Other interesting points discussed in this article are quality of the test related to measure students ability and traces of student misconceptions in learning materials on integrated science. It is prerequisite for teachers to promote the quality of learning in the integrated science, and to develop a quality test for student in the future.

Keywords: students ability, liquid pressure, respiratory system, integrated sciences test

Topic: 2. Science Education
Case study : analysis of senior high school students scientific creative, critical thinking and its correlation with their scientific reasoning skills on the sound concept

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Abstract
This research aims to analyze the correlation between students scientific creative and critical thinking to their scientific reasoning skill related to sound concept. The participant of this research were 42 students from eleventh-grade of science in one of the Private School in Bandung. In this research we use one package scientific creative-critical thinking to solve sound problem and in term of open ended question and scientific reasoning skills instrument in term of multiple choice question related to sound concept. The result of this research showed that the students average score of scientific creative and critical thinking respectively is 30,50 and 27,40 from maximum score 100. Both of them are in low category achievement. And for average score of scientific reasoning skills is 35,80 from maximum score 100 and its in low category achievement. Meanwhile, for the correlation between scientific creative and critical thinking respectively are 0,36.

Keywords: Case study, Scientific Reasoning Skills, Scientific Creativite, Critical Thinking Skills, correlation, sound concept

Analysis of Problem Solving Ability in Social Arithmetics

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Abstract
Problem solving is additional curriculum important because in the learning and completion process, students use to the knowledge and skills they have mastered to solve problems in life everyday. Therefore, purpose this research how the problem solving ability of students and the factors influence for the problem solving skills. The renovation used in this research is the mix quantitative and qualitative and type of research is descriptive. Sample research involved 28 students, grade VII students of state junior high school 7 Banda Aceh and data collected through tests and interviews. The data obtained were analyzed using Chi Square test. The results of this study indicate that grade VII students of state junior high school 7 Banda Aceh have good problem solving skills. When looking at the steps model problem solving Polya, the student not competent divising a plan the problem solving and checking again. Factors that influence student problem solving skills include cognitive factors (reading ability, analysis and logic, as well as skills appropriately), experience factors (background integration and familiarity with non-routine issues and strategy problem solving) and affective factors (interest in the given problem, motivation and perseverance).

Keywords: Problem Solving; Polya; Social Arithmetic

Topic: 3. Physics Education
Influence of RMS model (reading, mind mapping, and sharing) on student learning outcomes in school laboratory course

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Abstract

This study aims to determine the effectiveness of the RMS model (reading, mind mapping and sharing) in the school laboratory course on student learning outcomes. This study is quasi-experiment. The sampling technique was done through saturated sampling technique. The population, as well as the sample in this research, were 13 students of semester 2 in Jurusan Pendidikan Fisika Universitas Papua which contract the course of the school laboratory even semester 2017-2018. To measure and know the student learning outcomes conducted tests using multiple choice questions amounted to 50 questions. The result of the analysis showed that there was a significant difference in the average of student learning outcomes before and after learning using the RMS model evidenced by the acquisition of sig. <0.05. The effectiveness of RMS model could be known from the value of effect size is 1.36 which is in the high category. So it can be concluded that physics learning through effectively RMS model applied to student learning outcomes in the school laboratory course.

Keywords: RMS, learning outcomes, and school laboratories

Topic: 3. Physics Education

Students mathematical understanding reviewed by gender through discourse learning assisted by mathematical bet line strategy

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Abstract

Mathematical understanding is one of process skills which needs to be mastered by students in Mathematics. Mathematical understanding ability is important for students to develop as a problem solving skill in real life context through the implementation of acquired mathematics knowledge. Nevertheless, mathematical understanding ability of primary school students at the present time has not brought forth satisfactory achievement yet. Consequently, this research aims to practice discourse learning assisted by mathematical bet line strategy and its impact towards gender regarded students mathematical understanding. This research employed pre experiment method with grade fourth students as its target population. Test experiment was used to collect data of mathematical understanding ability. As for the result, the average male students and female students mathematical understanding ability showed no difference after participating in discourse learning assisted by mathematical bet line strategy. It implies that male and female students both have same mathematical understanding ability. However, there was a difference shown in problem solving strategy. Male students solved problem with the help of drawing or diagram, while female students solved problem by finding patterns and words explanation.

Keywords: discourse learning assisted by mathematical bet line strategy, gender, mathematical understanding

Topic: 1. Mathematics Education
[ABS-517]
Maple-Assisted Accelerated Learning to Enhance Learning Interest of Senior High School Students

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Abstract
This research was motivated by the importance of learning interest of students. Learning interest of students is still low. In order that this problems can be solved, a learning model that can enhance learning interest of students is required. In this research, Maple-Assisted Accelerated Learning was selected. This study aims to analyze the enhancement learning interest of students. This research was a quasi-experimental with pretest-posttest control group design. The population was students at tenth grade in one of senior high schools in Purwokerto, Central Java. The sample consisted of two classes which was selected by purposive sampling. This research used four instruments: learning interest questionnaire, observation sheets, and interview guide. Data analyzed was done quantitatively. The data were analyzed by using Mann-Whitney U Test and Chi Square test. Based on the data analyze, it is found that: (1) the achievement of learning interest ability of students who received the Maple-Assisted Accelerated Learning is better than the achievement of students who received conventional learning; (2) the enhancement of learning interest of students who received the Maple-Assisted Accelerated Learning is better than the enhancement of students who received the Maple-Assisted Accelerated Learning.

Keywords: Software Maple, Accelerated Learning, Learning Interest
Topic: 1. Mathematics Education

[ABS-518]
Teachers perspective on values of mathematics

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Abstract
This study aims to investigate how teachers view the values of mathematics. This research was done because mathematics education conducted in Indonesia only develops cognitive factor without involving affective factor. This research is still uncommon in Indonesia. Therefore, this research was done in one of the schools in Bandung using qualitative analysis. During the math lesson, teachers taught math and character separately. After a series of qualitative analysis, this study concludes that the ideal mathematical learning is teaching mathematics by integrating values of mathematics, where the values are affective values.

Keywords: values of mathematics, teachers perspective
Topic: 1. Mathematics Education
[ABS-519]
Development of Instrument Critical and Creative Thinking Skills on Fluids motion

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Abstract
21st century skills focus on critical thinking skills, creative thinking skills, communication skills and collaboration skills. The student critical and creative thinking skills are defined as the ability of student use their knowledge to solve problems of everyday life and create a new innovation. The main goal of this study developed to measured critical and creative thinking skills for student in senior high school. The instrument has 34 items consist of 18 items critical thinking skills and 16 items creative thinking skills. All instrument have been validated by three expert judgement. So, the instrument obtained 17 items consist of nine items critical thinking skills and eight items creative thinking skills. This research use descriptive qualitative research method. The results development instrument test show all items are valid through the Pearson moment correlation coefficient test. Based on expert assessment and data collection, instruments were well developed and could be used to measure students critical and creative thinking skills on the concept of fluids motion.

Keywords: critical and creative thinking skills instrument, fluids in motion concepts
Topic: 3. Physics Education

[ABS-520]
Classifying the Challenges of using Storytelling in the Elementary Science Classroom

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Abstract
This study investigated the use of storytelling in teaching elementary science on the topic of Sense Organs at the Grade 1 level. A total of 21 students from one of the elementary schools in Brunei Darussalam participated in the study. The qualitative analyses of the observations and video recordings resulted in the classifications of the challenges faced when storytelling was used in the lessons. The four identified categories were the language aspect, development aspect, external challenges and existing knowledge. These categories were then used to investigate further any aspect that would develop the challenges into the teaching and learning of science using storytelling. Despite identifying the challenges in using storytelling in teaching science, storytelling may enhance the students understanding of science concepts.

Keywords: Challenges, Storytelling, Elementary Science
Topic: 2. Science Education
Self regulated learning of prospective mathematics teacher in solving linear program problem: a case of visual learning style

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Abstract
This research is to knowing self-regulated learning of the prospective mathematics teacher with visual learning style in solving math problem. Self-regulated learning ability of a teacher or prospective mathematics teacher in solving math problem is too important to increase self-regulated learning of the students in solving math problem. The data collected by self-regulated learning questionnaire, problem solving test in mathematics and semi structured interview from prospective mathematics teacher with a visual learning style at Universitas PGRI Semarang. The result showed that the subject of self-regulated learning ability in solving math problem in planning stage, forethought and activation of the subject, have a good understanding of a problem, can identify the information that appears on the problem and can estimate the completion and procedure required. At the stage of monitoring the subject does monitoring activities in the process of solving the problem well. At the control stage the subject control in the process of solving the problem pretty well. At the reaction and reflection stage the subject does an evaluation in solving the problem well.

Keywords: self regulated learning, problem solving, visual learning style

[ABS-523]
Dot Plot Supports 7th Grade Students in Learning Informal Inferential Reasoning (IIR)

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Abstract
In recent years, there have been many changes in the educational world that have been done a research in stages. The changes can be found out in term of material content, methods, models, and strategies. The changes refered to in this study are in the sense of statistics known as Informal Inferential Reasoning (IIR). Simply put, IIR can be interpreted as a withdrawal of inferences from samples that apply to the population. Therefore, the researcher suggests the need for a visual representation in studying IIR in order to draw conclusions from a given data. The visual representations referred to in this research report focus on the dot plot. In addition to the dot plot, a series of learning activities in learning IIR has been designed using Realistic Mathematics Education (RME) as an approach in learning. The method used in this research is design research. This research was conducted in SMPN 7 Tangerang Selatan with research subjects as many as six students taken from one of the 7th grade in the school. As for the results obtained in this study, dot plot is able to help students to draw conclusions from samples to populations based on data presented on the graph.

Keywords: Dot Plot, Informal Inferential Reasoning (IIR), Realistic Mathematics Education (RME), Design Research

Topic: 1. Mathematics Education
Analysis science process skills high school students on electric circuit concepts in Districts Panjalu Ciamis

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Abstract
This research aims to analyze the science process skills of high school students on the concept of electrical circuits in districts Panjalu Ciamis. This research belongs to descriptive research. Research subjects are 100 high school students at five school in district panjalu academic year 2017/2018. The instrument of the research was multiple choices. Based on the result of answer analysis, students science process skills on electric circuit concept on each indicator is still low, this is indicated by the average skill level of the electrical circuit concept under 25%. While the highest level of science process skills on predicting indicator with the percentage of 29% and the lowest level of science process skill in the indicators formulate the hypothesis with the percentage of 10%. Due to the students scientific process in the concept of electrical circuits is still low, it is suggested that teachers can develop science process skills oriented learning on the concept of electrical circuit in schools, so enable the students to be prone to creativity, problem solving, reflective thinking, originality and invention which are vital ingredients for science and technological development.

Keywords: science process skills, electric circuit concepts
Topic: 3. Physics Education

Restructuring of STEM-Based Student Thinking in Constructing The Concept of a Function Definition

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Abstract
The error in constructing the definition concept of function definition formally can lead into a failure in their thinking structure to understand the concept of function definition scientifically. The efforts to correct the errors that occurred through the restructurisation of thinking process. Restructuring the thinking process is STEM-based so that students can understand the definition of the function as a whole, critical and creative in solving problems. This study is qualitative research to restructure of STEM-based students thinking in constructing of function definition concept based on the assimilation and accomodation process through the provision of scaffolding. The research subjects are 2 students choosen from 18 students by consideration that the students meet the determined criteria. The result are restructuring of S1 on relation error with Cartesian product scaffolding, the general definition of function with relation scaffolding, and function representation through scaffolding of function example. The restructuring of S2 thinking on cartesian product error with identifying set scaffolding, relation error with cartesian product scaffolding, general definition of function with relation scaffolding, and function representation through scaffolding of function example. The restructuring of student thinking is still weak because of the many scaffolding needed to achieve the learning objectives.

Keywords: Function Definition, STEM, Assimilation, Accomodation, Scaffolding
Topic: 1. Mathematics Education
[ABS-528]
Description of meta-analysis of science learning through inquiry model in improving science process skills of students

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Abstract
This meta-analysis was the result of the preliminary study aimed to describe the analysis of science learning through inquiry model in improving science process skills of students. This study analyzed ten national research journals and five international journals. Analysis of data used a description of the results of the average effect size (ES) of any studies that were sampled, and then categorized based on the interpretation of the criteria of Cohens. The results showed that science learning which was conducted through inquiry model could improve science process skills of students which was indicated by the average effect size was 0.51 with category medium. Based on the criteria of Cohens also analyzed about the differences in science process skills based on group of countries, fields of study, and levels of education. The results of this study could be concluded that inquiry-based learning can be applied to the development of science learning in order to improve science process skills of students.

Keywords: Inquiry; Meta-analysis; Science process skills

Topic: 2. Science Education

[ABS-530]
Translation Among Modes of Representation by Pre-service Physics Teacher on concept Magnetic Force on a Particle

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Abstract
In the 21st century, communication skills are the core of some competences required in a globalized world. Communication skills encompass the ability to speak and write confidently and to handle complex multimodal information. For effective teaching a teacher need to be highly skilled in all these generic skills areas. In physics, more than only one representational format is often used to convey information and support knowledge construction. Pre-service physics teachers often find these use of representations both verbal and visual, and the translation between them difficult. This study was aimed at investigating translation among modes of representation skills of the pre-service physics teachers. The study involved 36 pre-service physics teachers. A test was constructed to measure their skills in translation among modes of representation. In this test, pre-service physics teachers were asked to explain concept in magnetic force on a particle. This finding support the necessity of developing skill of pre-service physics teachers in translation among modes of representation as a part of communication skills.

Keywords: translation among modes of representation, magnetic force on a particle

Topic: 3. Physics Education
High-school students perceptions of the effects of usage course lab in improving ICT literacy

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Abstract
Course Lab, a free e-learning authoring tool created by a Web Soft, offers What You See Is What You Get (WYSIWYG) environment to produce an interactive learning media. Chemistry is the difficult subject for high school students. The students need an interactive learning media to improve their knowledge. Considering students perception toward interactive learning media is important in successful development ICT literacy student. This study aims to determine students perceptions of using course lab for chemistry subject. Students perceptions are closely related to their achievement. The learning media in accordance with the desire of students will make them motivated. This research is qualitative data analysis was done descriptively. The subject of this study were 176 students from 4 schools. The data obtained in this study comes from researchers as the main instrument, the data questionnaire and interview data is unstructured. The results are students perceptions of using course lab for chemistry subject are in the positive category to improve ICT literacy.

Keywords: courselab, ict literacy, chemistry
Topic: 4. Chemistry Education

Rigorous Mathematical Thinking (RMT) Based on Gender in the Real Analysis Course

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Abstract
Real analysis is a course that is abstract level. The interviews with some students reveal those perceptions. Male students are weak in understanding basic concepts, while women are always follow on examples of questions and answers from lecturers. Consequently, their abstraction abilities do not develop. As a result, regular lectures of Real Analysis have not been able to elevate students rigorous mathematical thinking abilities efficiently for both genders. To provide appropriate treatment to each student, the lecturer should know the rigourous mathematical thinking ability of the students. Therefore, this study aims to identify students rigourous mathematical thinking abilities in Real Analysis courses. The research method is descriptive qualitative. The research instruments are test questions and interview sheets. This study concludes students with top cognitive skills are at the RMT level 3 cognitive function of abstract relational thinking. Medium at level 2, which is quantitative thinking with accuracy. Finally, the low cognitive skills are at level 1, namely qualitative thinking. Male students of all three levels of cognitive ability have a simple way of thinking impacting on a short answer pattern. While female students, the way of thinking systematic so that the pattern of the answer is long but sorted.

Keywords: Rigorous Mathematical Thinking, Gender, Real Analysis
Topic: 1. Mathematics Education
[ABS-534]
Prospective biology teachers inquiry ability in free inquiry learning of molecular biology

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Abstract
The inquiry ability required by biology teacher in understanding and discussing the concepts of science in the classroom. This ability can be developed by prospective biology teachers during the learning process in college. Qualitative research method with one-shot case study design aims to assess the inquiry ability of 29 prospective biology teachers in free inquiry learning of molecular biology, especially on the DNA Isolation concept. The instrument of data collector is the inquiry ability test with five inquiry indicator, activity observation sheet and practice performance rubric. Data were analyzed by quantitative descriptive technique. The data analysis showed low performance test results for all indicators, average scores for inquiry activity and high scores for practice performance. Based on the results can be concluded that free inquiry learning is not maximal in shaping the prospective biology teachers inquiry ability; low category based on inquiry ability test results, average category for inquiry activity aspect and high category for performance of lab work aspect.

Keywords: Inquiry ability; free inquiry learning; molecular biology

Topic: 5. Biology Education

[ABS-535]
The development of flash-based physics learning media

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Abstract
This study aims to produce Flash-based physics learning media, knowing the feasibility of Flash-based physics learning media on the subject of Newtons Laws. Type of research and development. The product development model adapting the ADDIE development model developed by Lee & Owens (2004) consists of analysis, design, development and implementation, evaluation. The feasibility of learning media involves 2 media experts, 2 material experts, 5 students on small group trials, and 22 students of grade VIII on field trials. Data analysis technique used in this research is descriptive. The results of this study are: To produce Flash-based physics learning media products. Knowing the feasibility of instructional media, resulting in a mean total score of 4.14 in the eligible category. The material experts eligibility earned an average total score of 3.73 in the eligible category. The results of the assessment by the students resulted in 40% of students declared this learning media in the category very feasible, 60% of other students were in a decent category. Thus, Flash-based physics learning media can be applied in the learning process.

Keywords: Learning media, Flash-based

Topic: 3. Physics Education
[ABS-536]  
Profile of Mathematical Knowledge for Teaching of Prospective Mathematics Teachers in Development Set of Equipment Mathematics Learning  

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Abstract  
The purpose of this case study is to obtain description of mathematical knowledge for teaching (MKT) of prospective mathematics teacher in development set of equipment mathematics learning, in the form of lesson plan and lesson material linear equation of two variable. Subjects in this research are prospective mathematics teacher of Mathematics Education Study Program Universitas Kuningan Semester V academic year 2017/2018. Data analysis used in this research is qualitative data analysis technique that include data reduction, data display, as well as drawing conclusion and verification of pre-service mathematics teacher work sheet, observation and interview. MKT consisting of Mathematics Content Knowledge (MCK) and Mathematics Pedagogical Content Knowledge (MPCK). MKT is contributes to the ability of prospective mathematics teacher in developing set of lesson design of mathematics learning. Based on the case study, it can be concluded that: Students with good MCK can develop lesson materials properly. Students with MCK have less difficulty in developing lesson materials because they lack material understanding well. Students with good MPCK can be directed to develop lesson plan well. Most students have difficulties in formulating learning objectives and in making scenarios of teacher and student activities according to the learning model used.  

Keywords: Mathematical Knowledge for Teaching, development set of equipment mathematics learning  
Topic: 1. Mathematics Education  

[ABS-537]  
Attitude of Student Openness toward Relational Thinking  

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Abstract  
The purpose of this study on determine the attitude of student openness on relational thinking in terms of arithmetic ability. Five questions were given to three students through a interview. The interview results were analyzed to determine the students openness on relational thinking that has been previously taught. Students who have high and low arithmetic ability have an openness to relational thinking, while students moderate are reluctant to accept relational thinking.  

Keywords: relational thinking, attitude of student openness, algebra  
Topic: 1. Mathematics Education
**Effectiveness of National Qualification Framework Indonesia based Curriculum and Higher Education National Standard behaviour assesment rubric**

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**Abstract**

Non-objective assessments and poorly-defined assessment indicators are known to be the underlying causes of behaviour assessment in the teaching and learning process. This study aims to determine whether the use of National Qualification Framework Indonesia Based Curriculum and Higher Education National Standard Behaviour Assessment Rubric is effective in improving the learning process. The study used 4-D model that are Define, Design, Develop, and Disseminate. Population was students of STKIP PGRI Sumatera Barat. The subjects applied purposive sampling. The instruments were observation sheets and interview guideline. Technique of analysis was quantitative and descriptive analysis. The results show that each of observed dimensions has a significant improvement both pre-test and post-test scores where the average pre-test score is 40% and post-test score is 85%. It is concluded that National Qualification Framework Indonesia Based Curriculum and Higher Education National Standard Behaviour Assessment Rubric is effective in improving the learning outcome. It is expected that the rubric can be used as an assessment instrument to measure students competence both on affective and psychomotor aspects.

**Keywords:** Effectiveness, Assesment Rubric, Behaviour Assesment, KKNI, SN-DIKTI

**Topic:** Other Relevant Fields

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**The effect of process oriented guided inquiry learning (POGIL) model toward students logical thinking ability in mathematics**

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**Abstract**

The aims of this research is to investigate the effect of Process Oriented Guided Inquiry Learning (POGIL) Model toward the students logical thinking ability in mathematics. This research was conducted at one of Junior High School in Bumi Nabung, Indonesia. In this research we set up a quasy experimental design. The experimental groups was taught by Process Oriented Guided Inquiry Learning (POGIL) Model. The control group was taught in a conventional learning model. The population of this research are students from seventh grade (n = 128). The sample of this research are 49 students, which consists of 24 students in experimental group from VIIB and 25 students in control group from VIID. The results showed that students logical thinking ability in mathematics which taught by Process Oriented Guided Inquiry Learning (POGIL) Model are better than the students which taught by conventional learning model. Process Oriented Guided Inquiry Learning (POGIL) Model can be applied as the innovative learning process to increase students logical thinking ability in mathematics.

**Keywords:** Process Oriented Guided Inquiry Learning (POGIL) Model, logical thinking ability in mathematics

**Topic:** 1. Mathematics Education
[ABS-540]
The effectiveness chemistry module based on search, solve, create, and share (SSCS) to increase science generic skill

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Abstract
This study aimed to determine the effectiveness of chemical module based on Search, Solve, Create, and Share (SSCS) to increase science generic skills. This study was conducted at one of Senior High School in Surakarta academic year 2017/2018 with used quasi-experiment with pre- and post-test design. There were control and experimental class while the control class taught by using an instructional material that teachers developed in this school and the experimental class was used module based on SSCS. As the concluded, module based on SSCS was effective to increase science generic skills in the learning process.

Keywords: SSCS, science generic skill, chemistry module
Topic: 4. Chemistry Education

[ABS-541]
Learning Obstacle Student in Factoring Quadratic Form

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Abstract
The purpose of this study is to understand students mistakes in using the cross method to factorize the squared form. Eight quadratic form factoring is given to students to obtain student learning barrier data. The data were analysed in accordance with the phase of the cross method, followed by the interview to validate the alleged category of learning obstacle types that occurred in each student. The results of this study indicate that the obstacle learning that many students experience using the cross method is didactical obstacle which is one example of the mistake that students fact squared form by not involving variable x.

Keywords: learning obstacle, cross method, quadratic factoring
Topic: 1. Mathematics Education
Gender and Mathematical Reasoning Ability

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Abstract

This research is motivated by the low mathematical reasoning ability experienced by the students, considering the importance of mathematical reasoning ability for male and female students needed a study on gender factors to the ability of mathematical reasoning. The purpose of this study is to determine whether there is a significant difference in students' mathematical reasoning abilities between male and female students after using the problem-based learning approach on learning. This research as conducted at 24 female student and 20 male student in the 8th grade in one of junior high school in Cimahi city. The method in this study is quasi experiment that is by comparing the reasoning ability of male and female students after getting learning with problem-based learning and instrument as much as 3 pieces about mathematical reasoning ability test. The result of this research is there is no significant difference of mathematical reasoning ability between male and female students after using problem-based learning approach in their learning. It means that the problem-based learning approach can reduce the difference in mathematical reasoning ability among male and female students.

Keywords: Gender, Mathematical Reasoning Ability
Topic: 1. Mathematics Education

Comparison of Argumentation skills in science and non-science undergraduate students

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Abstract

This research is aimed to evaluate and compare the argumentation skill in science and non-science students. This research is quantitative research which involved two class including 30 science students who taught human physiology subject and 30 social and humanities students who taught curriculum development subject. Both class using blended learning with arguweb for online learning and debate for offline learning. The data collected from argumentation score using argumentation observation sheet. The data collected then analyze descriptively and statistically using t-test. The result showed that there are differences between argumentation skill in science and non-science students. There are differences in the quality of argumentation in science and non-science students. Science students showed good and clear backing with so many evidences. While non-science students provide strong and arguable warrant. Thus the quality of both science and non-science students argumentation need improvement to achieve better argument and learning outcomes.

Keywords: argumentation, science, non-science
Topic: 2. Science Education
Profile of information literacy on the 21st century through implementation of portfolio assessment

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Abstract

Information literacy is a set of capabilities that a person needs to be aware of when information is needed and the ability to locate, evaluate and use the information needed effectively. An effective and worker in the 21st century should be able to demonstrate a variety of functional and critical thinking ability related to information, media, and technology. The demand for IL ability does not exist in science learning. Whereas science is related to the technology and the surrounding environment associated with renewable and authentic issues. This DR research tries to develop ways of training IL by applying the ADDIE model. The research model design uses population of SMP N 4 Lembang class VII, sample 35 students are taken as cluster random sample. The task essay instrument developed from the P21 domain analyzes the validity and reliability using anates. The results of the study indicate that the question of the indicator that students are not achieving is evaluate information critically and competently 85.7% (n = 35) and apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information 88.57% (n = 31) and the best achievement is to Access information efficiently (time) and effectively (sources) 20% (n = 7). This is because there are constraints in aspects of teachers, students and schools. Therefore the draft design needs to be improved by simplifying the reading and task questions, integrating the science and Indonesian curriculum, providing a hotspot area.

Keywords: Portfolio Assessment; Information Literacy

Topic: 2. Science Education

Epistemological Obstacles in Solving Equation of Straight Line Problems

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Abstract

Epistemological obstacle is one of the learning obstacles that need enough attention in overcoming it. Epistemological obstacle is the learning barrier that occurs because of the limitations of the context possessed by the students. This study aims to analyze epistemological obstacle that occurs when students solve the problem on the topic of equation of straight line, the method in this research is qualitative descriptive involving 32 students in class 9th grade and the test instrument used is 4 problem description of equation of straight line, Result from research most students experience epistemological obstacle in solving straight-line equations, especially in determining the equation of lines if the gradient is unknown, this is because students only know the general form formula of straight-line equations only, by knowing the obstacle epistemology that happens is expected to help the teacher to make the design didactic material of a straight-line equation that corresponds to the epistemological obstacle that occurs.

Keywords: Epistemological obstacle, Equation of Straight Line

Topic: 1. Mathematics Education
Lifelong learning student profile in biology learning

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Abstract
Instead of constructing knowledge, learning also debriefs the students' skills to survive in life. Especially in biology learning which has a conceptual structure about life, it is very relevant if life-long learning oriented. Therefore, debriefing life-long learning is important. As preliminary study, the focus of this article is to investigate the profile of student life-long learning in biology instruction. A number of students in Plant Physiology course from Biology education department in one teacher college in Central Java was involved as participant (n=22). Data were collected by using questionnaire with 30 statements representing five standard life-long learning (complex thinking, information processing, effective communication, collaboration, and habits of mind standards). Research result shows that overall, the average score of life-long learning student profile is 2.91 from a maximum score of 4.00. From each standard, the average scores of complex thinking standard (3.14), information processing standard (2.77), effective communication standard (2.89), collaboration standard (3.08), and habits of mind standard (2.69). Based on the data collected, life-long learning profile of students is still quite low especially for habits of mind, information processing, and effective communication. Thus, it is very urgent to develop a program of debriefing life-long learning for next biology courses (Plant Biodiversity and horticulture) for them in near future.

Keywords: life-long learning, prospective biology teachers, profile

Topic: 5. Biology Education

Epistemological Obstacle on the Topic of Triangle and Quadrilateral

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Abstract
This study aims to investigate how students understanding of triangle and quadrilateral topic. It was part of didactical design research which was conducted on 33 students who have learned about triangle and quadrilateral. Data were collected through the students answers and interview related to how students find solution to problems on the topic of the geometry. The result found of the type of learning obstacle that is epistemological obstacle that impact on the concept error in solving the problem.

Keywords: Epistemological Obstacle, Triangle and Quadrilateral

Topic: 1. Mathematics Education
[ABS-548]
Inquiry-Based Learning Through Lesson Study to Improve the Students Mathematical Problem-Solving Ability

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Abstract
Today, one of the skill that student needed to be success in mathematics is problem-solving ability. As educators we are charged with the great challenge and responsibility of engaging students in learning so that they develop the skills and knowledge they need to function in today's world. Inquiry-based learning is an approach to teaching and learning that places students questions, ideas and observations at the centre of the learning experience. Lesson study (jugyo kenkyu) is an inquiry model of teacher professional development used extensively throughout Japan and has begun to capture the attention of the American educational community as a potential strategy for enhancing teacher professional development in America. There would be implemented inquiry-based learning through lesson study about composition function and inverse function to improve the students mathematical problem-solving ability and used tests and questioners to know the students improvement. In this research, there was an improvement of students mathematical problem-solving ability after implemented these methods. So, we could know that inquiry-based learning through lesson study were successful to improve the students mathematical problem-solving ability.

Keywords: Inquiry-Based Learning, Lesson Study, Mathematical Problem-Solving Ability

Topic: 1. Mathematics Education

[ABS-550]
Philosophy of Mathematics Education for Sustainable Development

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Abstract
This article aims to examine the philosophy of Education for Sustainable Development (ESD), particularly on mathematics education. This study is important because education is a key element in realizing the best implementation of Sustainable Development (SD), while Mathematics is known as base knowledge of science. In other words, mathematics education plays an important role in realizing Education for Sustainable Development (ESD). Therefore, this article will depict (1) the importance of Education for Sustainable Development (ESD) based on philosophy and psychological studies of Skills, attitude, and value as essential aspects of Sustainable Development (SD), and (2) the role of mathematics education in accomplishing Sustainable Development objectives. This literature study works on metaphysics, epistemology, and axiology aspects through deep analysis of relevant sources about Education for Sustainable Education (ESD). Afterwards, a competency-based mathematics competence Education for Sustainable Education (ESD) will be designed and followed by providing training to enhance research subjects understanding in designing mathematical competency-based evaluation instrument. Then, the last but not least, the designed evaluation instruments will be quantitatively analyzed by considering creative thinking ability. Lastly, a strategic guidance for designing evaluation instruments based on Education for Sustainable Education (ESD) can be revealed.

Keywords: Mathematics Education, Education for Sustainable Development

Topic: 1. Mathematics Education
[ABS-551]
Content validity study: instrument development to measure professional learning communities through lesson study

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Abstract
Professional Learning Community (PLC) in lesson study (LS) is a teacher professionalism development that very important to support the learning process in 21st century. The research aims to develop a practical instrument to be used to measure affectivity and achievement of PLC-LS from group of teachers during lesson study activity. This research have carried out of two-step validity content process namely, development and evaluation. The first step was done through determining the indicator and descriptor. The second step was done through obtaining feedback from the expert related to the developed instrument. This research produced an instrument with six indicators outlined in 46 questions related to PLC namely, six reflective questions, seven collaborative questions, seven learning outcome questions, nine share value and vision questions, eight collective responsibility questions, and nine development effective leadership questions which have been validates to be implemented. Based on the CV1 analysis, there are 7 items that show below 0.6 score which is then being left out while 11 others with the score more than 0.6 were revised according to experts recommendations. The result of CVR is 0.82 which shows that the instrument of PLC-LS is valid and can be used.

Keywords: Content Validity Study, Professional Learning Community, Lesson Study
Topic: 5. Biology Education

[ABS-552]
Students Learning Achievement using Knisley Learning Model with Brainstorming Method

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Abstract
This study aims to determine whether there is an influence of using Knisley learning model with Brainstorming method toward students mathematics learning achievement. This experimental research conducted in one of junior high schools in South Sulawesi, Indonesia by taking a class randomly from the eight grade. The research was carried out during seven meetings consisted of one pre-test meeting, one post-test meeting and five preferential treatment meetings. Data were analyzed using descriptive and inferential statistical analysis. Based on the score of pre-test and post-test, the students scores show an improvement from low to high category. While the average of students score reached learning score more than minimum completeness standard of test value that was approximately three-fourth of the total percentage. Furthermore, gain normalization analysis illustrated a well increase of students learning achievement because its values experienced high category. According to those progress and supported by the result analysis of teacher and students activities sheets and students responses sheets to the learning, it can be concluded that that there is an influence of using Knisley learning model with brainstorming method as its result shows a positive change toward the students mathematics learning achievement.

Keywords: Knisley Learning Model, Brainstorming Method
Topic: 1. Mathematics Education
[ABS-553]
Students Worksheet Based on Realistic Mathematics Education: How The Effect Toward Reasoning Ability?

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Abstract
The aim of this research is to know the effectiveness of students worksheet based on Realistic Mathematics Education toward reasoning ability. The research was conducted with a quantitative methodology via non-equivalent control group quasi-experimental design. The population is the eighth grade students of middle school in Pangkalpinang, Indonesia. The experimental class is treated by using students worksheet based on RME and the control class is treated by using the conventional students worksheet. The instrument used in this research is reasoning ability test. Data analysis is done with t test. The results of this research proves that students worksheet based on Realistic Mathematics Education is effective toward reasoning ability. RME has the characteristics that are starting learning by using real-world context, construct student knowledge, using mathematization process, the existence of student interactivity and integrated learning.

Keywords: worksheet; realistic mathematics education; reasoning ability

Topic: 1. Mathematics Education

[ABS-554]
Constructing secondary students critical thinking skill test on heat concept

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Abstract
The major goal of education is development critical thinking skill and physics education needs to instrument test to measure students critical thinking skill. This study aims to construct secondary students critical thinking test (CTS) on heat concept. The instrument test is constructed by Halperns critical thinking framework with five domains specific critical thinking. The method which is utilized in this study is 3D-II (Define, Design, Develop and Implementation) conducted to secondary students who have studied heat concept. The respondents are 30 students of eleventh grade in secondary school. The result of this research was domain specific critical thinking got highest score and the lowest score in domain specific was predict the probability event. In conclusion, secondary students critical thinking test could measure critical thinking of students on heat concept.

Keywords: critical thinking skill, heat concept

Topic: 3. Physics Education
The effectiveness of conceptual change texts on reducing pre-service physics teachers misconceptions in photoelectric effect

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Abstract
There are many misconceptions on the concept of photoelectric effect so it is important to reduce these misconceptions using conceptual change texts. In this study, the effectiveness of conceptual change texts on reducing pre-service physics teachers misconceptions of photoelectric effect will be explained. The conceptual change texts (CCT) are enriched by using animation, simulation video, and data from photoelectric effect experiments in modern physics laboratories. Two texts were tried out on two groups, one experimental group (n=32) and one control group (n=32). Experimental group were given CCT, whereas the control group was given text of modern physics book. Data will be collected by four-tier test and questionnaire. The result of this study will compare two texts in reducing pre-service physics teachers misconceptions of photoelectric effect.

Keywords: conceptual change texts; misconception; photoelectric effect; four-tier test
Topic: 2. Science Education

Students profile about analytical thinking skills on respiratory system subject material

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Abstract
Analytical thinking skills are important for students to learning of respiratory system material. This does not only requires students to understand the concepts and principles, but also the applications in life. The aim of this research is to determine the analytical thinking of student in working on the question concept of the respiratory system. It used the descriptive method with 74 students as subjects. The instruments used test that based on the Facione analytical thinking skills indicator. The data process techniques used: score on each question, change the score and grouping the subject levels obtained by value and conclusion. The results show that percentages of students with the category of analytical thinking skills were: the very poor 49%, poor 42%, fair 9%, and there were not obtain students with a good or excellent score of analytical thinking skills. Achievement of students analytical thinking skills indicators: Interpretation 34.97%, Identifying 41.89%, Generating Hypothesis 11.15%, and Inference 18.24%. In conclusion that the analytical thinking skills of students relatively low. Based on this research suggested needs teacher effort by practice the students to answer analytical questions or using the right strategies that can foster students analytical thinking skills.

Keywords: analytical thinking skills, Respiratory system
Topic: 5. Biology Education
A Potential Instructional Theory for Meaning of Minus Sign

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Abstract
This study presents the results of teaching experiment of 7th-grade students about the meaning of the minus sign as the initial knowledge toward the concept of negative integers and its operations. A hypothetical learning trajectory (HLT) was designed on the basis of findings in a preliminary study showing that most students did not understand the meaning of the minus sign that resulted in students ability in operations involving negative integers. Implementation and revision of HLT were carried out by involving 32 seventh grade students and a math teacher by taking into account the stages of the didactical situation. Furthermore, group learning can encourage students to identify the meaning of minus sign encountered in a context. All data in the form of learning video recording, interview, and students worksheet are analyzed qualitatively based on the perspective of the theory of didactical situation to get the instructional design according to the condition and requirement of the students. The learning practices indicate that the students can differentiate the meaning of the minus sign according to the context of the given problem.

Keywords: minus sign, negative integers, theory of didactical situation

Topic: 1. Mathematics Education

Characteristic Profile of Analytical Thinking on Solving Mathematical Problems

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Abstract
Analytical thinking is a thinking ability to help individuals in solving problems of mathematics. It is important for understanding the parts of situation, the ability to scrutinize and breakdown facts. However, there is a differentiation or variation in the way to solve these problems. The differentiation or variation is described as the characteristics of analytical thinking. The characteristics consisted of pre-analytical, partial-analytical, semi-analytical, and analytical. This study aims at describing an analytical thinking characteristic profile of high school students in problem solving using two dimension materials. This is a qualitative study. The participants of this study are the high ability students at eleventh grade of Public Senior High School 1 Kedungwaru Tulungagung. Think Aloud Method is applied to collect the data. The findings showed that the high-ability students have pre-analytical thinking characteristics when they are planning, then they have semi-analytical and pre-analytical thinking characteristics when they are implementing the plan. Thus, it can be concluded that high ability students have two of four analytical thinking characteristics, that are pre-analytical thinking and semi-analytical thinking.

Keywords: Analytical thinking; Think aloud method; Problem solving

Topic: 1. Mathematics Education
[ABS-560]
A Preliminary Study on Chemical Literacy Level of The Students as The Basis of Developing NOSI Learning Model in Acid Base Concepts

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Abstract
This study aims to obtain information about important things that should be developed in NOSI learning model which is aimed to increase chemical literacy of students. The method used in this study is survey. The Scientific Literacy tests from PISA and VASI questionnaire used as the instruments of the study. The subject of this study is the students in one of classes in SMAN Sindang Indramayu. The result of this study reveals that students have low ability in chemical literacy in terms of: (1) explaining everyday scientific phenomenon; (2) Evaluate and design scientific enquiry; and (3) Interpret data and evidence scientifically. Based on the preliminary study, the NOSI learning model which is going to be developed should be emphasizing: concepts, process, creativity, attitudes and application, connections in a world view context and communications.

Keywords: Chemical Literacy, NOSI
Topic: 4. Chemistry Education

[ABS-562]
Pre-service chemistry teachers view about the nature of science and technology

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Abstract
This study aims to determine the view of pre-service chemistry teacher on fourth, sixth and eighth semester about the nature of science and technology. The aspects of View of Nature of Science and Technology (VNOST) include: (1) the characteristics of science and technology; (2) the purpose of science and scientific research; (3) characteristics of scientific knowledge and scientific theory; (4) how to acquire scientific knowledge and scientific theory; and (5) the relationship of science and technology. This study uses descriptive method, which involves 59 students of one State University in Ambon City, Indonesia. Data were collected by VNOST questionnaire. At the first aspect, students view science as a knowledge, such as principles, laws and theories, while technology as the application of science. The second aspect is seen as a part of explaining the change of nature. The third aspect, students consider as the scientific perspective of the scientists. The fourth aspect is regarded that scientific knowledge is obtained by re-examining previous knowledge. At the last aspect, students hold that the relationship of science and technology can affect society. The implications will be used as a rationale for developing a NOST-oriented chemistry teacher education.

Keywords: Pre-Service Chemistry Teachers, View of Nature of Science and Technology
Topic: 4. Chemistry Education
Analysis of Students Mathematical Communication Ability

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Abstract
This study aims to (1) analyse and describe the difficulties by students in solving problems of mathematical communication test in circle material; (2) analyse the factors that causing the students have difficulty in solving mathematical problems in circle material. The type of research in this study is qualitative descriptive. The data collected in the form of writing, words, and pictures. The research was conducted at SMA Negeri 1 Tuulang, Riau. The subjects in this study are 36 students of class XII. Data collected methods used in this study is a test mathematical communication ability indicator in circle material. Based on the research which are found three factors that cause students difficulties in solving problems include: (1) students have not been able to understand the concept of the problem and students have not been able to interpret the sentence about the presented questions; (2) students are less precise in performing calculations on algebraic form operations such as subtraction, multiplication, and division and while working on students in a hurry; (3) students not yet understand the concept of drawing circles from known elements or otherwise resolving questions from the presented images.

Keywords: students learning difficulties, mathematical communication ability
Topic: 1. Mathematics Education

Profile of Mathematics Communication Skills of Junior High School Students in Solving Problems

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Abstract
Mathematical communication skills of students is the ability of students to understand, express and interpret mathematical ideas using language and mathematical representations either in writing or orally. The ability to communicate ideas, thoughts, or opinions is very important in learning mathematics. Each student is likely to have different mathematical communication skills in solving problems. This research aims to determine the communication ability of junior high school students in solving problems. This research is qualitative type that is a research process that is done naturally and natural in accordance with objective condition in the field without any manipulation, where in this case data retrieval is done through student written test, oral test delivery, and in-depth interview. In this research, using triangulation of time in which the written tests, oral tests, and interviews were carried out twice in different times. The result of mathematics communication ability on junior high school students in solving problems shows that there are some differences in each student where there are students who more detail in doing and also can remember things that are taught while the other students are more likely to do briefly and precisely. So it can be said that each student has different mathematical communication skills in solving problems.

Keywords: Mathematics Communication Skills, Profile, Solving Problems
Topic: 1. Mathematics Education
The plant anatomy practicum uses a smartphone-assisted digital microscope in improving student compound intelligence

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Abstract

The background of this research is that the activity of students at the time of plant anatomy practice is not conducive and the learning process given is not oriented to explore students multiple intelligence ability, so that the visual, logical-mathematical, physical-kinesthetic and naturalistic ability of students is still low. This is evidenced through reports of their lab results and their learning activities are still low, but notabennya plant anatomy merupkan windows to explore science or science curiosity curiosity is not limited. The purpose of this study is to increase student learning activities, improve students multiple intelligence, and to find out students responses to the application of digital microscope assisted smartphone dalam practicum of plant anatomy. Student learning activity is assessed by using observation sheet, the ability of multiple intelligences is measured by using test in the form of description , and student responses were assessed using a response questionnaire. The result of the research shows that the increase of students learning activity has very good criteria. The use of digital assisted microscope can improve students intelligence ability, and the student response to the use of digital microscope with the aid of smartphones in the plant anatomy practice has very good criteria.

Keywords: Smartphone-assisted digital microscopes; student learning activities; multiple intelligences

Innovation in Assessment: True-False Reasoning Diagnostic Instrument for Measuring Problem-Solving Skills

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Abstract

This research purpose is to create the true-false reasoning (TFR) instrument for measuring problem-solving skills students. Research procedure used descriptive qualitative to show a 45-items TFR diagnostic instruments to evaluate secondary ability of students for solving complex questions about immune system. TFR diagnostic instruments are specifically designed based on interaction of problem solving and scientific reasoning aspects. Result indicates that students answer TFR consist of claim, it means students reasoning does not required ground and rebuttal aspects. Ground is the evidence for claim and consists of empirical data or facts that are objective to give solutions. Rebuttal is the counter-argument of the claim. Ability to solve a problem by scientific reasoning is one of indicator as a good problem solver. Scientific reasoning was developed through many arguments that appear inside the classroom, specifically by using assessment called TFR diagnostic instrument.

Keywords: Assessment; True-False; Scientific Reasoning; Problem-solving

Topic: 5. Biology Education
Thermodynamics Interactive Multimedia to Improve Physics Prospective Teachers Generic Science Skills

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Abstract

This study aimed to determine the increase of generic science skills (GSS) as result of the implementation of the interactive multimedia thermodynamics. Research method used a quasi experiment with control group pretest-posttest design. The research subject was 34 students as experimental group and 33 students as control group of physics prospective teachers of the fourth semester, in one of the state university in East Kalimantan. The research instrument used multiple choice test embeded GSS. Data analyzed with the differences of two averages. The result showed that after the implementation of interactive multimedia increased of GSS of physics prospective teachers quite effectively. The highest of normalized gain of GSS indicator of mathematical modeling (0.67), and the lowest for causality (0.53). These results indicated that the interactive multimedia increase the GSS of physics prospective teachers.

Keywords: thermodynamics interactive multimedia; generic science skills; physics prospective teachers

Topic: 3. Physics Education

How well Indonesian Schoolchildren Proficiency in Mathematics Based on The Result of Ujian Nasional 2017

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Abstract

Public concern about how well Indonesian schoolchildren are learning Mathematics is abundant and growing. The globalization of markets, the spread of information technologies, and the premium being paid for workforce skills all emphasize the mounting need for proficiency in Mathematics. Media reports of inadequate teaching, poorly designed curricula, and low test scores fuel fears that young people are deficient in the mathematical skills demanded by society. This paper describes about Indonesian schoolchildren proficiency in Mathematics based on the result of Ujian Nasional 2017. The numerical computations talks that (1) the average math score nationally at any level is 46,38 - 57,94; (2) the mathematical proficiency of each district are very much different; (3) 46,8% - 53,3% district in Indonesia were below national average.

Keywords: proficiency, schoolchildren, mathematics

Topic: 1. Mathematics Education
Entrepreneurial science thinking approach in project-based learning

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Abstract
This 21st century, research and development related learning strategies have been widely implemented, one of which is the use of project-based learning model. This model has a positive effect on student learning outcomes. However, most of the use of this model focuses more on the appropriateness between the concepts and projects the students are working on. This is considered less hope to compete in the 21st century, especially in aspects of life and career skills. Thus, it is necessary to design a learning strategy that facilitates student to use the concepts that they learn to solve daily problems or even entrepreneurship by applying the Entrepreneurial Science Thinking (ESciT) approach. Therefore, this paper will describe the application of the Entrepreneurial Science Thinking (ESciT) approach in project-based learning as a learning strategy that is expected to provide more opportunities for students to further improve their skills not only on the mastery of concept but also on life and career skill.

Keywords: Entrepreneurial Science Thinking, learning strategy, project-based learning

Topic: 2. Science Education

The relation of students diagram comprehension, knowledge and cognitive activities while studying mosses metagenesis diagram

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Abstract
The students success in understanding the visual representation such as diagram, can be determined by cognitive activities that occurs in working memory. One of the diagrams that are abstract and difficult to understand when studying Biological material is a plant metagenesis diagram. This study aims to reveal the types of cognitive activities that relate to knowledge and diagram comprehension while students read mosses metagenesis diagram. 25 Biology education students completed mosses metagenesis knowledge test and diagram comprehension test (m = 48.9). Verbal data were collected by Think Aloud Protocol to find type of cognitive activities while students read mosses metagenesis diagram. Four types of cognitive activities that found and correlated strongly with diagram comprehension, were 1) identification of image detail (r = 0.917; p <0.01), 2) symbols interpretation (r = 0.862; p <0.01), 3 ) activation of prior knowledge (r = 0.703; p <0.01), and 4) inference (r = 0.773; p <0.01). These results indicate the high of frequency of identifying image detail, symbols interpretation, activation prior knowledge, and inference contributing to the high understanding of mosses metagenesis diagram. This study also reveals that students knowledge has contributed highly to students understanding of diagrams.

Keywords: Knowledge, Diagram comprehension, Cognitive Activities, Protocol Think Aloud, Mosses Metagenesis

Topic: 5. Biology Education
[ABS-571] Development of ICT integrated project based learning student worksheet

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Abstract

Inadequate text books, non-communicative languages and poor student understanding of material concepts were known to be contributing factors to the low level of student learning outcomes. This study aims to produce a valid and practical ICT integrated project based learning student worksheet. It used Plomp model of that were preliminary research, prototyping phase and assessment phase. The population was student of Mathematics Education Study Program STKIP PGRI Sumatera Barat. The research subjects used purposive sampling. The instruments used validity sheet, questionnaire and interview guideline. Technique of analysis used validity and practicality analysis. Validity and practicality result were analyzed descriptive quantitative and qualitative. The result of the validation sheet analysis shows that the average validity of ICT Integrated Project Based Learning student worksheet is 3.9 where it is included into a very valid category. The practicality can be seen from the average questionnaire where it results 3.8 and it is included into a very practical category. It is concluded that ICT integrated project based learning student worksheet in Geometry course is valid and practical. It is expected that this student worksheet can be one of the learning sources that is able to improve the student learning outcomes.

Keywords: Student Worksheet, Project Based Learning, ICT

Topic: 1. Mathematics Education

[ABS-572] Exploring undergraduate students mental representation and its correlation with information processing and their knowledge in learning plant transport using diagram convention

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Abstract

Application of diagram convention in learning helps students to understand biological concepts. This diagram is integrated in formation of facts of a concept. The aim of this study was to analyze the correlation between mental representation (MR) of undergraduate students when reading diagram convention with information processing and their knowledge. The 27 participants consist of undergraduate students of biology education in Bandung who are studying plant transport. MR data in form of causal network is obtained through worksheet instrument developed based on CNET protocol while information processing and knowledge through an essay instrument. There is a strong correlation between MR with information processing (r=0.578; p<0.01) and MR with knowledge (r=0.679; p<0.01). This result indicates that to represent a diagram being studied requires knowledge as a bridge to connect the information contained in the diagram. Important information in diagram is processed in working memory to form causal interactions between information elements and emerge in form of causal network. Two MR patterns are found namely linear (Markov chain) and simple branching (feedback control with a single measurement). Differences in MR patterns indicate the ability of students understand the information contained in the diagram.

Keywords: mental representation, information processing, knowledge, diagram convention

Topic: 5. Biology Education
[ABS-574]
Analysis of Ability to Use Microscope and Its Relation with Visual and Verbal Representation in Representing Microscopic Objects in Anatomy of Plant Lecture

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Abstract
Visual representation is a persons ability to represent objects visually while verbal representation is a persons ability to represent objects in writing or oral. This study aims to identify the ability to use a microscope and its relation to the visual and verbal representation of students in representing microscopic objects in anatomy of plant lecture. The type of research used in this research is descriptive research. Research subjects are Biology Education students who register the subject of plant anatomy. The instruments used are general visual and verbal skills tests, microscope usage rubrics, visual and verbal assessment rubrics, and questionnaires. At the beginning of the lecture 51% of students have the ability to use microscopes in the category of poor. After 5 lecture meetings, the students ability to use microscope increased to 60% in the category of good. The ability to use microscope is correlated with students ability to represent objects visually (visual representation) (r=0.373; p < 0.05) and verbally (verbal representation) (r=0.669; p<0.01). The result shows that the ability to use a microscope is not the only factor that contributes to the students ability to represent microscopic objects both visually and verbally. Several contributing factors are discussed in this paper.

Keywords: Visual Representation, Verbal Representation, Microscope, Anatomy of plant.
Topic: 5. Biology Education

[ABS-575]
Development of an Integrated Science Teaching Material Oriented Ability to Argue for Junior High School Student

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Abstract
The 21st Century Education focuses on the development of the competence in creativity, critical-thinking, collaboration and communication. Based on that reason, the argumentation can be one of the solutions to answer this issue since it facilitates the critical-thinking and communication competences. The argumentation is improved by the lesson that has the socio-scientific issue inside the teaching materials. Based on the observation, the teaching materials in Science lesson is still incomplete which has only the material collection from Physics, Chemistry and Biology. Therefore, holistically, those teaching materials has no the socio-scientific issue. This research has the purpose to develop the teaching materials for science through the plastic theme based on the argumentative skill orientation.

Keywords: argumentation; teaching material; plastic
Topic: 2. Science Education
[ABS-576]
The Comparison of Students Creative Thinking Skills between High and Medium Achiever in Independent School

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Abstract
The purpose of this study was to investigate the comparison between high and medium achiever in creative thinking skills in learning light and optics. The subject of this study were 44 students of independence school in Bandung Indonesia. A set of instruments consisting of 10 questions measuring students creative thinking skills was used to obtain the data. The study reveals that both high and medium achiever students are excellent in synthesis and elaboration aspect (97.6 % for high achiever and 91.3% for medium achiever). Meanwhile, in novelty aspect the students are not excellent (23.75% for high achiever and 21.7 for medium achiever), and for resolution aspect the students got 92.3% for high achiever and 72.05% for medium achiever.

Keywords: Students Creative Thinking Skills, High Achiever, Medium Achiever, Light and Optics

Topic: 2. Science Education

[ABS-578]
What can we learn from pupils dialogues? : Second Graders Learning about Division

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Abstract
Setting up lesson to introduce the concept of division by didactical situation for second graders student in one of private primary school in Bandung. We set the lesson with the theme of Lets help Mrs. Emma. The lesson design was sharing four packs of chocolate for 5 persons. The situation, Mrs. Emma got packages from her friends. The packs contain four packs of chocolate. The chocolates should be share for her families member, such as: father, Mrs. Emma, little sister, little brother, and grandma. Then, Mrs. Emma asked pupils to work in group and discuss about how to share the chocolates. The analysis was focus on group discussion, about phenomenology in the classroom then identifying pupils ethical orientations and decisions when dividing chocolates. We know that each pupils had their own tacit knowledge. It means that through this lesson design, pupils making dialogues for negotiating their argument to solve this problem. Moreover, pupils learned about collaborating and respecting each others tacit.

Keywords: dialogues, division, phenomenology

Topic: 1. Mathematics Education
[ABS-579]

Smart city design in learning science to grow 21st century skills in elementary school student

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Abstract
Progress era and technological developments impact on the development of the world of education. 21st century skills are the most important issue today. The competencies built in these skills are the hallmark of successful humans in this century. Indonesia is one of the countries that catch on to that progress, as evidenced by the curriculum innovation that includes 21st century skills as a spirit in it. Based on the results of the analysis in the field, there is an imbalance between the implementation and the outcome of the established curriculum. Factors affecting such inequality include; the learning process undertaken does not build the competence proposed, the lack of parental control in the child's education. The lack of good communication between students, teachers and parents is one of the main causes in this regard. On the one hand, parents do not know the condition of their children during the learning process, on the other hand the teacher does not know the characteristics of his child well. This makes the development of the child during the learning process is not optimal so that 21st century skills can not be developed. Innovation of science learning by using the concept of smart city to be an alternative solution to the problem posed by researchers. The concept of smart city indicates transparency in the learning process, so parents can contribute related to the progress of their children. This learning program consists of several features that enable the establishment of communication of students, teachers, and parents in synergy. Thus collaboration in implementing learning can be formed so that the education received by the child to be optimal.

Keywords: 21st century skills, smart city, smart city in science learning
Topic: 2. Science Education

[ABS-580]

Profile of Critical Thinking Skills of Pre-Service Physics Teachers: A Preliminary Study

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Abstract
Critical thinking skills is one of the high-level thinking skills that students must have in this era of technology and information. Critical thinking is needed for students who are preparing to enter a complex working field. This study aims to determine the profile of critical thinking skills of pre-service physics teachers at the University of Flores. The method used is descriptive survey method. The result of the study shows that: 1) The students critical thinking skills are spread in 5 categories, namely "very high" by 10%, "high" by 22.5%, "medium" by 32.5%, "low" by 10 % and "very low" 25%; 2) Students need to be familiarized with questions that stimulate critical thinking skills; 3) A physics-based thinking test tool is needed for critical students of pre-service physics teacher.

Keywords: Critical thinking skills, pre-service physics teacher
Topic: 3. Physics Education
A development of performance assessment instrument for measuring cognitive and psychomotor competence on vinegar titration practicum

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Abstract

Implementation of learning cannot be separated from the assessment activities. Performance assessment on chemical subjects are necessary to assess students cognitive and psychomotor aspects. The purpose of this study is to produce a performance assessment instrument that assesses the cognitive and psychomotor competence of a quality and tested titration practice of vinegar acids, in students of Class XI SMA. The research method used is Research and Development (R & D), which consists of (1) development stage of instrument making (2) validation and limited testing phase, and (3) application stage in the form of implementation in learning. Instruments in this study include validation sheet by expert team, assessment instrument sheet in the form of task and rubric, observation sheet and interview guide sheet. This research is only at the stage of instrument development. This research is essential to assist teachers in delivering quality student performance assessment instruments and can be used for further research in developing performance assessment instruments on other chemical concept.

Keywords: performance assessment, acid vinegar practicum

Topic: 4. Chemistry Education

Assessing early level of literacy: a case study on science literacy in biotechnology

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Abstract

This study aimed to know the early level of science literacy skills of 9th grade of SMPN 1 Campurdarat in biotechnology. The students who are the subjects of this study were one class consisted of thirty-five students. This study was a part of learning device development study to improve students science literacy skills. The science literacy test consisted of thirteen questions with details four questions were simple multiple choice, four question were complex multiple choice, and five questions were easy. The science literacy test consisted of all levels science literacy with details one question was level 1a, four questions were level 1a, three questions were level 2, three questions were level 3, three question were level 4, one question was level 5, and one question was level 6. The assessing showed results that 11.43% students were in level 1b, 65.71% students were in level 1a, and 22.86% students were in level 2. These results were appropriate with recent PISA survey which taken on 2015 that showed the ability of Indonesia students literacy skill were in low category.

Keywords: early level, science literacy, biotechnology

Topic: 2. Science Education
Misconceptions on protist in high school biology textbooks

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Abstract
Protist one of the difficult subject to be understood by students because it is an abstract and the objects are microscopic. Textbook is used in the teaching learning process as a resource for students to understand the concepts. If there are any error information are written in the textbook, it may cause misconceptions for the student. The aims of this study are to identify the misconceptions in high school biology textbook and predict the impacts of misconceptions. This study is a document analysis, two textbooks were selected purposively among the textbooks used in the high schools in Klaten Regency, Indonesia. Analysis of misconceptions based on five categories according to Hershey, namely undergeneralization, obsolete concepts and terms, oversimplification, overgeneralizations and misidentifications. The result show that there was found one misconception category in the textbooks, namely undergeneralization 14.28% in book D and 10.71% in book E. Undergeneralization will make the students only understand a part of concepts or problems in the material of protist.

Keywords: misconceptions; textbook; protists

Developing mathematical reasoning to reduce the wide-spread of hoax distributions

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Abstract
Social media platforms has influenced the way we run our life, we have been frequently buffeted by its changes as nowadays the big portion of population obviously rely on it to stay tune of the very latest updates. As the consequence, we give the misleading contents to fill the air, the hoaxes. Content can be relayed among users with no significant third party filtering, fact checking, or editorial judgement, and an individual user with no track record or reputation can in some cases reach as many readers as national or international media [1]. This study assesses possible positive correlation between developing mathematical reasoning and reducing the spreading of hoaxes through study literature. We start the study with defining and describing the characteristic of both mathematical reasoning and hoaxes. Furthermore, we examine a series of implication that shows a path that goes from mathematical reasoning towards reducing the hoaxes, at the end of the study we propose a brief method and content to be applied to Indonesian high school student by using logic in Mathematics topic.

Keywords: mathematical reasoning, hoax, logic.
[ABS-587]
Ability of Mathematical Critical Thinking, What about Learning Cycle 7E Model?

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Abstract

Mathematical critical thinking skills of Indonesian students are still not satisfactory, which is seen when students do the problem of reasoning in solving non-routine problems. One of the alternative solution to overcome the problem is through the implementation of the Learning Cycle 7E model. This study aims to describe enhancement of mathematical critical thinking skills of students who received the Learning Cycle 7E Model. This type of research is a literature review, so the method used is to summarize and analyze the relevant research results that have been done. Learning Cycle 7E model consists of seven stages, namely: elicit, engage, explore, explain, elaborate, evaluate, and extend. Each student activity at that stage involves students critical thinking potential, which consists of indicators: focus, reason, inference, situation, clarity, and overview. Thus, taking into account every stage of the Learning Cycle 7E on learning mathematics well will be able to improve the ability of students critical mathematical thinking.

Keywords: Critical Mathematical Thinking; Learning Cycle 7E Model
Topic: 1. Mathematics Education

[ABS-588]
Investigation of critical mathematical thinking ability, visual thinking and self-efficacy students in trigonometry

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Abstract

This study aims to investigate how students the ability of critical mathematical thinking ability, visual thinking and self-efficacy in the current trigonometry. Data were collected through the students answers, self-efficacy questionnaire and interview. The results obtained are then analyzed to see the students ability level in trigonometry. The result showed the students do not yet have the critical thinking ability are good but have good visual thinking ability in trigonometry. This is because students do not have the concept of underlying problem solving well. Furthermore, students feel less confident in their mathematical ability. This is evidenced of the analysis self-efficacy questionnaire. The results of this study encourage us as prospective teachers to find teaching methods that can help students understand the concepts of trigonometry well so that students love and eager to solve the problem of trigonometry.

Keywords: Critical Mathematical Thinking Ability; Visual Thinking; Self-efficacy; Trigonometry
Topic: 1. Mathematics Education
Views of pre-service chemistry teachers about NOST and their conceptions about the context of OLED and related chemistry contents

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Abstract

This study aims to analyze views of nature of science and technology (VNOST) of the pre-service chemistry teachers (PCTs), as well as to analyze their conceptions about the context of organic light-emitting diodes (OLED) and the related chemistry contents. As a part of a larger study, this study is the second stage of the Model of Educational Reconstruction, which involved 41 PCTs. A modified questionnaire of VNOST from Tairab and Aikenhead was administered to assess VNOST of PCTs. Meanwhile, a validated interview guidelines were used to gather some informations about the conceptions of PCTs about OLED as well as their understanding about chemistry concepts corresponded to OLED. The VNOST are classified into Realistic, Has Merit, and Naive. The result shows that most of the PCTs have the VNOST level as Has Merit. Furthermore, according to the interview results, the PCTs still have limited understanding about OLED and also suggest that the PCTs still have fragmented understanding about chemistry concepts such as electrochemistry, reduction-oxidation reaction, and the relation between chemical bonding to the physical properties. We believe that this research will be usefull in increasing the VNOST of PCTs, as well as their conceptions about OLED and the related chemistry contents.

Keywords: Organic light-emitting diodes; Pre-service chemistry teachers; Views of nature of science and technology
Topic: 4. Chemistry Education

Capturing Students Covariational Reasoning Levels while Solving Integrals Problem

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Abstract

Covariational reasoning is defined as the cognitive activities involved in coordinating two varying quantities while attending to the ways in which they change in relation to each other. Level of covariational reasoning will indicate how far students comprehend about varying quantities in tandem. This study investigates students covariational reasoning level while solving integrals problem. Thirty one undergraduate students were participated to complete written test. Interviews were conducted to reveal the students covariational reasoning level while solving covariational problems. The result show that students were able to construct the relation of dependent variable that changes in tandem with the independent variable, but they only stay in maximum level 3 out of 5 level in covariational reasoning. However, it has been captured that students appeared to have difficulty in applying the concept of integrals. These findings suggest that learning in calculus should place increased emphasis on coordinating images of two quantities changing in tandem and solving daily life problem about the application of integrals concept.

Keywords: Reasoning, covariational Reasoning, Integrals
Topic: 1. Mathematics Education
[ABS-593]

Vee Diagram and Mind Mapping Application for Better Understanding of Plant Reproduction Concept

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Abstract
Students lack of understanding plant reproduction concept becomes a common issue in Bioreproduction class. This study is lesson study based and aims to see which technique, Vee diagram or mind mapping, is more effective to be applied. The study was conducted in Biology Education Study Program, Faculty of Teacher Training and Educational Sciences, Pakuan University on March until May 2017. The second year students of class IVB and class IVC are chosen as the participants and team of Bioreproduction lecturers as the researchers as well as the observers. The lesson topic for the experiment is Plant Reproduction. The methodology of this study was quasi experiment. Vee diagram was applied in IVB, while mind mapping was applied in IVC. The study was conducted in two cycles with three steps (plan, do and see). Data was collected using observation, test and documentation technique. The result of data analysis shows \( t_{calculated} = 2.99 \) is higher than that of \( t_{table} = 1.99 \). It means that there is a significant difference in concept understanding using Vee diagram rather than mind mapping. The average score of class IVB is 70.07 better than class IVC which is 60.35. Based on the result and data analysis, it can be concluded that Vee diagram can improve a better understanding of Bioreproduction class, especially on lesson topic Plant Reproduction.

Keywords: Key Word: plant reproduction, Vee diagram, mind mapping, lesson study
Topic: 5. Biology Education

[ABS-595]

Undergraduate students ability to process information and its relation with visual and verbal representation in plant morphology laboratory activity

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Abstract
Laboratory activity of plant morphology requires students to process the information of specimen in their working memory and then represent it both visually and verbally. The aim of the study is to describe the relation between the students ability of information processing and their visual and verbal representation in plant morphology laboratory activity. This study was conducted in one of the state universities in Bandung Indonesia, in the class of pant morphology course with 31 students. Students ability of information processing was assessed by using task complexity which consist of component of information, integration of information, and application of information. The visual representation was analyzed based on authenticity and the detail of picture, propotional of picture, and suitability of the picture with the concept. The verbal representation was analyzed by the suitability of the description with the concept, completeness of the description, clarity of the description, terminology, and binominal nomenclature. The result shows that the students information processing ability has low correlation with visual and verbal representation ability. Based on the result, we can say that students with a good information processing ability can not always show that they have a good visual and verbal representation ability as well.

Keywords: information processing; visual representation; verbal representation
Topic: 5. Biology Education
Concreteness fading process of elementary school students based on mathematical ability

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Abstract

First grade students generally have difficulty in converting concrete to abstract thinking. This qualitative research is concerned with concreteness fading process of students. The study aimed at describing the concreteness fading process of 1st grade students in elementary school. In order to find out the concreteness fading process students can be seen based on enactive, iconic, and symbolic stages are known through learning, tasks and task-based interviews. The results generally show that students are still having difficulty solving mathematical equivalence problems in a symbolic stage objects. In general, first year students still have difficulty. Difficulties experienced that solve problems related to the sum of the natural numbers more precisely in a matter of mathematical equality.

Keywords: Concreteness fading; Mathematics learning; Math equivalence

Student Difficulties on Understanding Word Problem Based on ESD Goals

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Abstract

Education for Sustainable Development (ESD) is a government program to achieve sustainability. This study contains math lessons using the word problem that is integrated in ESD. The purpose of this study is to find out students response about sustainable development. This research uses a qualitative method. Written tests that integrate with issues of ESD objectives consist of several topics in mathematics that address environmental, social and economic issues are given. This test is followed by interview. The subject of the study were 32 students grade VIII in Bandung and 8 of them were interviewed afterward. Data analysis conducted many students who have difficulty in understanding the word problem. meanwhile the limited knowledge of students about the socioeconomic and environmental aspects becomes a challenge for the realization of ESD goals. From the results, we recommend for teacher to offend something happening in the social life, economy and environment in teaching mathematics so that students are more aware of the importance of sustainable development.

Keywords: Education For Sustainable Development, Word Problem

Topic: 1. Mathematics Education
The Difficulties of Students in Solving the Mathematics Word Problems with the Context of Education for Sustainable Development (ESD)

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Abstract
The purpose of this research was to know the difficulties of students in solving mathematics word problems with the context of Education for Sustainable Development (ESD). ESD was an educational concept proclaimed by UNESCO which purposed to fulfill the needs of the present generation without risking the needs of the next generation. In other words, ESD could be said to be an effort to achieve sustainable development. There are 3 ESD contexts: environment, economy and culture. ESD concepts are expected to be integrated in learning, including mathematics learning. Therefore the learning method, teaching materials, learning media and evaluation used should support the implementation of ESD. This research was a qualitative research involving 30 students of SMP grade VII in one school in Bandung. Data obtained from observation, interview and test. The test was about the number and comparison material. The result of this research was that students were able to solve problems in the form of algorithms, procedures, or routine problems. However, students have difficulty in solving the word problem with the context of Education for sustainable development.

Keywords: Difficulty, Education for sustainable development, word problem

Topic: 1. Mathematics Education

Perceptions of prospective chemistry teachers about the skills of writing argument-based teaching material on voltaic cell subject

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Abstract
Teaching materials and scientific argumentation should be provided to prospective chemistry teachers to fulfil their required professional competencies. The study aims to investigate the information about the perceptions of students concerning the ability in writing argument-based teaching materials for prospective teachers on voltaic cell subject. 21 students of chemistry education program at the fifth semester, who are taking the subject of school chemistry in one university in Bandung, West Java, are chosen as the participants of this study. Questionnaires and interview are employed as the instruments. They are used to investigate the perceptions of students towards the characteristics of voltaic cell materials. The ability to draw a scientific argumentation (claim, data, warrant, backing, qualifier, rebuttal) is revealed through the instruments of teaching materials writing task assessment. This study indicates that most of perception of students are that prospective chemistry teachers have to be able to write teaching materials and scientific argumentation and voltaic cell materials are easy to comprehend because it is a concrete material. The students have a difficulty to find a topic and to distinguish warrant component, backing, qualifier, rebuttal. Furthermore, the argumentation ability possessed by the students on their teaching materials is still considered in low category.

Keywords: Teaching material, Argument, Voltaic Cell

Topic: 4. Chemistry Education
Profile of senior high school students scientific literacy in Banda Aceh

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Abstract
This study aims to find out the profile scientific literacy ability of senior high school student in Banda Aceh. The scientific ability consists of competence to explain the phenomena scientifically; to evaluate and design scientific enquiry; as well as to interpret data and evidence scientifically. Data was collected by giving 9 questions which adapted from PISA (Programme for International Student Assessment) 2015 consisting of content and procedural knowledge that examined on 11th-grade students at one of the schools in Banda Aceh. Based on the result, senior high school students have the scientific literacy ability with very less category in the amount of 47.06%. Furthermore, it is necessary to do further study on the learning that gave rise to the scientific literacy of high school students so that information can be obtained to what extent the ability of teachers in generating scientific literacy on teaching.

Keywords: scientific literacy, PISA
Topic: 4. Chemistry Education

Prospective Biology Teachers Critical Thinking Skills in Microbiology Argument-Based Inquiry Laboratory Activities

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Abstract
Argumentation in science education have been realized to have connections with many benefits including critical thinking skills. This study explored the implementation of argument-based inquiry activities in microbiology laboratory course and how the implementation may improve students critical thinking skills. The subject of this research was the fifth semester students of a biology teacher educational institution in Cirebon. The data collected were the students critical thinking skills using a set of critical thinking skills test in microbiology lab course. The result showed that the students participation in the microbiology argument-based inquiry laboratory activities significantly improved the critical thinking skills of the students. The aspects of the critical thinking skills that influenced the most by the program was developing and maintaining a position in an issue by analyzing, evaluating and producing explanations.

Keywords: Critical Thinking, argument-based learning, scientific argumentation
Topic: 5. Biology Education
Analysis Of Misconceptions On Virus In The High School Biology Textbooks

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Abstract
One of the factors that impedes the process of acceptance and assimilation of new knowledge in students is misconception. The cause of misconceptions, one of which can be from textbooks used by teachers and students in learning. This study aims to analyze the type and percentage of misconceptions contained in biological textbooks. This research is a descriptive study with document analysis method, which is done by evaluating the concepts that already exist in the book carefully and comparing it with the reference books. Concepts that have been studied include the structure and characteristics of virus, classification of virus, replication of virus, and the role of virus in human life. Sample consist of three books selected purposively. This research used the instrument of misconception indicator in textbook according to Hershey. The results of the analysis on the three books, found that there are misconceptions on some of the virus concepts, i.e. 37% Undergeneralizations (UG), Obsolete Concepts and Terms (OCT) by 12%, Oversimplifications (OS) by 8%, Overgeneralizations (OG) by 36%, and Misidentifications (MI) by 7%.

Keywords: Misconceptions, Virus
Topic: 5. Biology Education

Argument-Based Inquiry Lab Activity on Microbiological Water Analysis for Pre-service Biology Teachers

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Abstract
Lab activity is a critical part of microbiology course for pre-service biology teachers. The aim of this study was to investigate the students learning experience and scientific argumentation skills in a microbiology argument-based inquiry lab activity. The most probable number (MPN) methods were designed to analyse drinking water samples by detecting the presence of coli fecal bacteria. The observation method was used to assess learning experiences for the students. Meanwhile, scientific argumentation skills were assessed by using argument level criteria from students worksheets and lab report. The lab activity was following 8 steps: 1) introducing the problems and investigation questions; 2) formulating initial group arguments and hypothesis; 3) designing and conducting the experiment; 4) analyzing data and formulating group arguments; 5) engaging in argumentation session 6) writing lab report 7) doing peer-review; and 8) writing revision and evaluating the report. The results showed that the argument-based inquiry lab activity improving students scientific argumentation, especially in making data as evidence for their claims. The students also responded that the activity made them have more understanding and interest in microbiology.

Keywords: scientific argumentation, microbiology lab activity, pre-service biology teacher
Topic: 5. Biology Education
[ABS-607]
Implementation of Field Trip Based Inquiry Method to Improve Critical Thinking and Problem Solving Skills of Students on Plantae Topic

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Abstract
This study aims to obtain information on how the implementation of field trip based inquiry method in improving the critical thinking and problem solving skills of students on plantae topic. The research method is a pre-experiment, with the research design the one-group pretest-posttest design. The implementation of the study involved 30 students in one of the high schools in Bandung. The research instrument used was observation sheet of the implementation process of field trip based inquiry method, critical thinking and problem solving skills test instrument, student response questionnaire. Data were analyzed using Microsoft Excel program and SPSS Statistic Software version 22.0. The results of the implementation show that field trip based inquiry method contributes in improving the critical thinking and problem solving skills. The result showed that there was a difference in the scores of the pretest and the posttest of critical thinking and problem solving skills of students. The average N-gain for critical thinking skills included medium category, and for problem solving skills included high category. The average percentage of the implementation process of field trip based inquiry method included very good category, and the students gave very good responses to the implementation of field trip based inquiry method.

Keywords: Field trip based inquiry method; Critical thinking skills; Problem solving skills

Topic: 5. Biology Education

[ABS-608]
Identifying the secondary school students misconceptions about number

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Abstract
This study aims to identify students misconceptions about the conception of number and its operation, especially whole number and fractions. Data was collected 31 students of 7th grade with knowledge test as much as 6 items. To further identify the students misconceptions that occurred in questions then researchers execute the interview from several students. Generally, the result of this study found that many students experience errors in the operation of whole number and fractions. In addition, students errors are also obtained in order to process the workings of whole number and fractions as well as change the fraction to decimals or percent. From the errors described above and based on the result of interview found the misconception that occurs in the students concept about negative number, fractions, and sorting in working the operation of whole number and fractions.

Keywords: misconception, number

Topic: 1. Mathematics Education
Analysis of Mathematics Anxiety of Junior High School Students

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Abstract
Mathematics anxiety (MA) is a feeling of depression and fear when someone is faced with a mathematical problem. MA can affect student achievement in mathematics. This study aims to determine MA of junior high school students. The method used in this research is descriptive. The sample of this study was 94 students of junior high school. MA instruments are modified from some valid and reliable test MA. The results showed that the MA of junior high school students was at a moderate level. Increased anxiety occurs in grade 8. The greatest student anxiety occurs when students are facing math tests and when completing math tasks. Students feel insecure when solving math problems, because students only memorize mathematical formulas and do not understand its meaning. The material in mathematics textbooks cannot be understood well by students. MA increases as students go to higher classes, and generally students do not want to have a career in the future associated with mathematics. Teachers have an important role in reducing the level of MA. Knowing about MA experienced by students is the first step of the teacher to make efforts to minimize MA.

Keywords: mathematics anxiety, junior high school, students

Investigating 10th grade students understanding of the structure of deductive proofs

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Abstract
Miyazaki, Fujita, and Jones define the structure of deductive proofs as the relational network via deductive reasoning that combines singular and universal propositions. Related to the theory, this research aims to investigate students understanding of the structure of deductive proofs. Researchers conducted a qualitative research to 30 students of 10th grade. The data was collected from geometrical proof test that focused on Sine and Cosine rule. The result of this research showing the lack of students understanding of the structure of deductive proofs. For the future research, researchers wonder wether to apply a flow-chart proof or a table proof to teach mathematical proving can improve students understanding of the structure of deductive proofs.

Keywords: structure of deductive proof, mathematical proof, deductive proof

Topic: 1. Mathematics Education
Students mathematical critical thinking ability on cube and cuboid problems

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Abstract
The critical thinking ability becomes a prerequisite and purpose in learning Mathematics today. This study was aimed to analyze the mathematical critical thinking ability of students by using four indicators: identifying concept characteristics, selecting strategies for solving problems, providing complete and correct explanations, and evaluating the solution of problem. This was a descriptive research. Data collection was done by giving the test of mathematical thinking ability about cube and cuboid to 38 students in one of junior high schools in Lembang District. The results showed that the average ability of students in identifying the characteristics of the concept was about 43.7%, in choosing a strategy to solve the problem was about 17.9%, in providing a complete and correct explanation was about 26.8%, and in evaluating the solution of problem was about 21.1% from the ideal score.

Keywords: Mathematical Critical Thinking Skills; Cube and Cuboid Problems
Topic: 1. Mathematics Education

Science Learning Package Using Guided Inquiry To Increase Students Science Process Skills

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Abstract
The aim of this research is to produce a science learning package using guided inquiry model that validity, practicality, and effectiveness to increase students science process skills. This research was research design using three stages which are defining, designing, and developing from Four D-models. Learning package tested on 9st of Kamal 4 Junior High School. The research data obtained through the validation method, observation, test, and questionnaire. The result of the research showed that (a) the category of learning package developed is very valid, (b) learning activity is very successfully, (c) cognitive product achievement of student has increased in high category and cognitive process achievement of student has increased in high category, (d) students responded very positively to respond learning that is already implemented. The conclusion of this research are the science learning package using guided inquiry model were alidity, practicality, and effectiveness used to increase students science process skills. The impacts of the research suggest that guided inquiry may stimulate the students science process skills.

Keywords: Guided inquiry, science process skill, science learning package
Topic: 2. Science Education
Achievement of ESD (Educational for Sustainable Development) through mathematics learning

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Abstract
The purpose of writing this article is to know the concept of ESD, to know the perspective in ESD, to know the role of math teacher in ESD. Indonesia is a developing country which is actively doing national development from various sectors. This development has nothing but positive impacts or negative impacts. The positive impact is the development in Indonesia is good enough can be seen from improvements in the economic sector, education, facilities prasana, and so forth. But the negative impacts come to the environment sector. Even environmental conditions in the last decade are getting worse. This is where the concept of sustainable development (sustainable development) is very important to be applied in order that development goes well without putting environmental interests aside. ESD (education for sustainable development) is a dynamic concept through education that has a noble value for the sake of the realization of a sustainable future. There are three main perspectives in ESD: socio-cultural, environmental, and economic perspectives. Education as an approach used in ESD therefore the role of teachers and the learning process that is in it is very important. ESD can be instilled to learners one of them through learning mathematics.

Keywords: ESD (Education for Sustainable Development), math teacher, math learning

Topic: 1. Mathematics Education

Level of Secondary-school Students Algebraic Thinking

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Abstract
The diversity of students algebraic thinking, has its own levels, which is important for the teachers and the students to notice. This research aimed to describe the level of secondary-school students algebraic thinking, through the assignment of an algebra task to seventh to twelfth graders followed by interview, this research analyzed to what extent their level of algebraic thinking along with underlying experiences. The analysis results indicated that there found levels 0 to 4 from these various grades. Interestingly, the learning of algebra that the student experienced at school did not guarantee their capability to apply algebraic thinking.

Keywords: algebra, algebraic thinking level, secondary-school

Topic: 1. Mathematics Education
[ABS-617]

Effectiveness of Thermodynamics Learning Based by Multiples of Representation to Understanding The Basic Concept of Physics Educational Students

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Abstract
This study aims to determine the effectiveness of the application of multi-thermodynamic learning based on the representation of the concept of the concept of basic thermodynamic concepts in physics education students. The subject of this research is 4th semester students, amounting to 32 people. The research design is pre experimental in the form of one shot case study. Instrument of data collecting in this research is test result of learning comprehension of basic concept of student thermodynamic which consist of five question as indicator of understanding of concept of Bloom theory. The data were analyzed through descriptive analysis technique by looking at the learning result of understanding the basic concept of student thermodynamics by using absorption criteria and the effectiveness of learning. The results of this study obtained the average value of student absorption of 77.85% with good category. Of all the indicators of basic thermodynamic concepts have been obtained that the indicator with the highest absorption is in the indicator classify with a percentage of 86.85% in the category of very good while the lowest absorption lies in the indicator compare that is equal to 66.55% with enough category. Thus it can be concluded that the application of multi-layer thermodynamic learning based on effective representation applied to the basic concepts of thermodynamic topic in physics education students.

Keywords: Effectiveness, Understanding Basic concepts of thermodynamics, Multiple representation.

Topic: 3. Physics Education

[ABS-618]

Profile Of Food Chemistry Lectures In Chemistry Education Program: A Descriptive Study On the Fulfillment Of Competency Standards Of Chemistry Teacher Candidates

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Abstract
The fact is that until now chemical education in school is still far from expectations such as competence standards and Learning Outcome (LO). One of the subjects in the department of chemistry education which has a responsible for the fulfillment of competence is food chemistry. Food chemistry is one of the two (2) credits elective courses provided to prospective chemistry teachers in most of teacher education institutions (TEI). Descriptive study have been conducted to picture the implementation of the food chemistry lectures from the perspective of the curriculum, the learning process, and the students views. The subject involved were, secondary data (curriculum) from six (6) TEIs, 50 students, and classroom activity. Data were interpreted by triangulation to make a conclusion. The results showed that lectures have not fully accommodated the LO according to competency standardsexpectations. Lectures have accommodated the fulfillment of conceptual achievement, but still lacks the building of high-level skills of such as problem-solving skills and evaluative thinking skills. The recommendation of this research is the need to reorient the curriculum of food chemistry course and its implementation in the lecture.

Keywords: competency standards, Learning Outcome (LO), Food chemistry

Topic: 4. Chemistry Education
[ABS-620]

Have acid base practicums at school in Muara Enim oriented to environmental literacy?

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Abstract

This study aimed to obtain information about practicum activities of acid-base which have been done in schools. This study was a qualitative method involving analysis of 5 lesson plan and its instruments. The results of this study were: First, student learning activity on acid-base material less integrated to environmental phenomenon. Second, teachers lesson plan did not relate between concepts and application concept, especially on the environment. Third, practicum only lifted concept and did not have orientation to environmental literacy. Forth, lack of practicum skills assessment. The findings indicated that there was a learning innovation need through development of a practicum about environmental issue to build environmental literacy of students.

Keywords: Environmental literacy, environmental issues, acid base, practicum

Topic: 4. Chemistry Education

[ABS-621]

Science Teacher Educator and Authentic Assessment: Attitude toward NoS and Its Assessment in Science Instruction

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Abstract

Effort to develop teacher competency in the field should be handled seriously by university that graduate them. Nevertheless there are not many studies carried out their experience during their study. The focus of this study is mainly to the involvement of strategic lecturers in five universities in Indonesia that graduate science teachers, as there is relationship between attitude and competency with ones experience in the process of constructing and implementing competency of authentic assessment in science learning and supervising prospective teachers during teaching practice at schools. A number of 63 lecturers in three courses (Evaluation, practical works, teaching practice) participated in this study. Data were collected through questionnaire and lesson plans. Research results show that their attitude toward assessment is good (3.92), also the factors supporting the effectiveness of authentic assessment (3.77), and very good for the objective of the authentic assessment (4.30). It was also found that level of respondent attitude towards Assessment based on each aspects varied from transitional and close to constructivist for the four aspects. A number of patterns was found that relate assessment and instruction components. From the interview it was found that the lecturers for the two courses (Evaluation, practical works) are sure that they have done the assessment properly even though they do not know the relationship, but no clear result about the attitude of lecturers for teaching practice due to the limited number of supervisor with science background who supervise students for KKN at the same time.

Keywords: assessment literacy, attitude toward assessment, NoS, science learning

Topic: 2. Science Education
[ABS-622]  
**The Creativity Indicators of Vocational Schools and Feasibility Analysis of Electrochemistry Module Based on Problem Based Learning Integrated on Battery Competence Unit**

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**Abstract**  
This study aims to analyze the feasibility of electrochemistry module based on Problem Based Learning (PBL) integrated on battery competence unit to improve students creativity of class X of Vocational High School. The electrochemistry module that developed was used indicator of creativity proposed by Piirto are 1) cognitive strategies macroabilities: a) clarifying issues, conclusions, or beliefs; b) analyzing or evaluating arguments, interpretations, beliefs, or theories; c) generating or assessing solution; and 2) cognitive strategies microskills: a) comparing and contrasting ideas, predictions, or interpretations; b) making plausible inferences, predictions, or interpretations; c) giving reason and evaluation evidence and alleged facts. The type of this study was a Research and Development (R & D) that used Borg and Galls development model. The module development stages were include: 1) research and information collecting, 2) planning, 3) develop preliminary form of product, 4) preliminary field testing, and 5) main product revision. The validation result by Aiken show that V > 0.75 indicates that the module is valid in content, presentation, language and graphic aspects. The results of teacher and students response questionnaires to the electrochemistry module in the preliminary field test stage show that the module can be categorized as very good.

**Keywords:** cognitive strategies macroabilities, cognitive strategies microskills, module, electrochemistry, problem based learning, indicator creativity, vocational high schools  
**Topic:** 4. Chemistry Education

[ABS-623]  
**The Effectiveness of Collaborative Learning Mode With Challenging Task on Students Mathematical Problem Solving Skills**

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**Abstract**  
This study aims to examine the effectiveness of collaborative learning model with challenging task in terms of students mathematical problem solving skills. This study was a quasi-experimental with pre-test and post-test control group design. The population of this study was all the eighth grade students in one of the state junior high school in Pontianak that consisted of nine classes, then randomly selected two classes as the samples. One class as the experimental group was taught using collaborative learning model with challenging task, while another class as the control group was taught using collaborative learning model. The data were obtained by tests including a pre-test and a post-test to measure students problem solving skills. Data were analysed using one-sample t-test and independent samples t-test at a significance level of 5% on the normalized gain score. The result of the study shows that collaborative learning model with challenging task and collaborative learning model are both effective in terms of students mathematical problem solving skills. Furthermore, this study concludes that collaborative learning model with challenging task is more effective than the collaborative learning model in terms of students mathematical problem solving skills.

**Keywords:** Collaborative learning; Challenging task; Mathematical problem solving skills  
**Topic:** 1. Mathematics Education
[ABS-624]
Development of multiple intelligence test instrument for teen students in perspective of physics learning

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Abstract
The purpose of this study is to develop multiple intelligence instruments for teen students (15-19 years old). The research method used mixed-method with a sequential explanatory design. The research activities were conducted in the odd semester of the academic year 2017/2018. The subjects of the study were the students of class X and XI in one of the private vocational school in Bandung consisting of one class for each random sampling. The results showed that the multiple intelligence test instrument developed in this study has been able to provide a profile picture of multiple intelligences owned by middle-aged students. This multiple intelligence profiles can be used as a basis that can be used by teachers in the design of physics learning in the classroom. The profiles of multiple intelligences result obtained: musical intelligence 9 students, kinesthetic intelligence 8 students, logical mathematic intelligence 8 students, spatial intelligence 3 students, linguistic intelligence 7 students, interpersonal intelligence 7 students, intrapersonal intelligence 8 students, and naturalist intelligence 7 students.

Keywords: Physics learning; Multiple Intelligence; Teen Students
Topic: 3. Physics Education

[ABS-625]
The Implementation of Problem-based Learning Viewed from Mathematical Connection Ability

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Abstract
The mathematical connection ability is very important for students. The mathematical connection ability includes (1) connection between mathematical topics, (2) connection with other disciplines, (3) relationships in everyday life. The aimed of this research was to describe the effect of problem-based learning on mathematical connection ability of the 8th class students (age 13-14). This research was quasi-experiment with one group pretest-posttest design. The research samples consisted of one class taken randomly from 4 classes in the population. The data collected by using mathematical connection ability achievement test that has been declared valid by the expert team. The data analysis used one sample t-test. The criterions of effective are: 1) posttest score is higher than pretest score and 2) the proportion of student that pass the mathematical connection criterion is more than 75%. Based on the result of one sample t-test, the significance value is 0.000, it can be said that the problem-based learning approach is effective in terms of students mathematical connection ability. The effectiveness of mathematics learning with problem-based learning approach reach 87.55%. It can be concluded that the problem-based learning is effective on mathematical connection ability.

Keywords: problem-based learning, mathematical connection
Topic: 1. Mathematics Education
Didactical design research of quadratic function based on learning obstacle and learning trajectory

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Abstract
Students understanding on the topic of quadratic equation and quadratic function is separated each other, whereas both are interconnected. This research aimed to formulate a didactic design, which will help junior high students understand the linkage between both topics. By employing a didactical design research (DDR), this research involved the process of repersonalization and recontextualization of quadratic function to explore the learning trajectories and learning obstacles within such a process. This design aimed to represent the context of the assigned problem, and was analyzed through the following steps: 1) the explorative prediction of students responses related to the assigned problem; 2) collaborative learning to lead the students in understanding the linkage of both concepts: quadratic equation and quadratic function. Assigned by a contextual problem related to quadratic function, the students could widen their understanding about quadratic equation, but simultaneously encountered difficulties in relating the topic with quadratic function. In this case, collaborative learning helped them in doing so.

Keywords: Didactical design research (DDR), Learning Obstacle, Learning Trajectory, Quadratic Function

Learning media movements fall freely to reduce misconceptions and improve students conceptual understanding

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Abstract
Has been made free fall learning media for class X students in Physics subjects. Students always think that the amount of mass affects the acceleration of vertical falling objects downward. Media was created to reduce student misconceptions. This research uses demonstration method. This media is proven to reduce misconceptions and can improve students conceptual understanding.

Keywords: Free fall motion, misconceptions, understanding of concepts, instructional Media.
Topic: 3. Physics Education
**[ABS-630]**

A test construction based on mathematical problem solving ability for quadrilateral

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**Abstract**

The ability to solve mathematical problems becomes an important skill the students should possess. Thus, it becomes an important duty for the teachers to help the students solve any encountered problem in their daily life. In the classroom learning, they need to teach the students how to solve the problem. It is not enough by assigning the routinized problems. This research aimed to construct a mathematical problem-solving test to assess students mathematical problem-solving ability. The research method included several steps, namely: analysis, developing test, evaluating test, trial, revising the test, and collecting data on test validity and reliability. The research data were collected by using a written test, which was administered to 31 seventh-grade students at one of state Junior High Schools. The test consists of four essay questions with four indicators. The results showed that: (1) the mathematical problem-solving test was considered valid and applicable; (2) the test showed a good distinguishing power; and (3) the difficulty levels of the instrument were moderate and difficult. In conclusion, the constructed mathematical problem-solving instrument is applicable to assess the students mathematical problem-solving ability.

**Keywords:** test construction, mathematical problem solving ability
**Topic:** 1. Mathematics Education

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**[ABS-631]**

Digital literacy of preservice science teacher

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**Abstract**

The development of digital technology takes place very quickly and gives significant influences in various areas of life including education. The Regulation of the Minister of National Education of the Republic of Indonesia Number 16 2007 on The Standards of Academic Qualification and Teacher Competence have integrated the digital literacy on the competences of professional teachers. College has a big hand in equipping teachers with various competencies so that teachers are ready in carrying out their duties as educators. This study aims to identify the digital literacy of preservice science teacher who have attended science lectures. By using the likert scaled questionnaires and interview, the researcher tries to explore five areas of digital literacy consisting of information, communication, content creation, safety, and problem solving. The results of this study indicate the digital literacy of science teacher candidates are in the medium category with the composition; information (2.97), communication (2.95), content creation (2.63), safety (2.63), and problem solving (2.1). It takes program that can stimulate the improvement digital literacy of preservice science teacher in order to able to innovate science learning activities using technology.

**Keywords:** digital literacy, preservice science teacher, technology
**Topic:** 2. Science Education
**[ABS-633]**

Development of M-learning Vertebrate determination program to improve student classification and reasoning skills

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**Abstract**

This study aim to development of M-Learning Vertebrata determination program as media for learning to improve students classification skill and inductive-deductive of reasoning skill. This study used 4-D (define, design, development, and deployment) development method. Results generally show that M-learning Vertebrata determination program for learning have a synergetic effect resulting in enhanced learning. The research findings imply that using mobile learning for study Vertebrate classification had a statistically significant effect on pre-test and post-test achievement scores for increase students classification and reasoning skills. User give the positive response, it means student can operate and simulate M-Learning Vertebrata determination program. Based on validation result from validator expert and trial results, M-Learning Vertebrata determination program has legibility to be used as learning media.

**Keywords:** M-Learning, Vertebrate Determination, Classification skill, Reasoning Skills

**Topic:** 5. Biology Education

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**[ABS-634]**

Students mathematical ability and spatial reasoning in solving geometric problem

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**Abstract**

Students have many difficulties in geometry such as disability to visualize two dimensional to three dimensional objects. That is indicated by lower spatial reasoning. This study aims at describing the spatial reasoning of students in solving geometric problem. This qualitative research involved three elementary students that are consist of highest, middle, and lowest students ability. The results pointed out the highest and middle recognized geometry object and they could explain some information which is known and asked correctly. The highest student also could imagine cube nets into cube and describing the surface of the cube when it viewed from the right, left, top, bottom, front, and back. The middle student could not drawing surface of the cube appropriately when viewed from the right, left, top, and bottom. The lowest student could not recognized geometry object, nor could mention the information. Finally, we suggest teachers to teach middle and low students to deepen the introduction of geometric objects.

**Keywords:** Spatial reasoning, Mathematical Ability, Geometric Problem

**Topic:** 1. Mathematics Education
Mathematical Problem Solving Under Process Oriented Guided Inquiry Learning Model

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Abstract
This study aims to perceive the improvement of mathematical problem solving of students who get learning with Process Oriented Guided Inquiry Learning (POGIL) model and students who get conventional learning. Implementation of POGIL model can improve mathematical problem solving. This study used quasi experimental approach, utilizing the control group pretest post test design of two groups students 8th grade in one of the junior high schools in Bandung. The result of this study showed mathematical problem solving in the experiment group is better than the control group. This is because the experimental group acquire POGIL model that trained students mathematical problem solving well. All in all, it can be concluded that the POGIL model can be an appropriate choice in improving students mathematical problem solving.

Keywords: Problem Solving, POGIL, 8th grade student
Topic: 1. Mathematics Education

Exploring the implementation of problem-based learning on acid base neutralization reaction in high school

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Abstract
Chemistry learning that only emphasizes the conceptual understanding and calculations is no longer appropriate to the needs of human resources today. Problem-based Learning as one of the innovative learning models designed to help students conceptual understanding of chemistry and develop their problem solving skills. This study aims to obtain informations about the implementation of Problem-based Learning on acid base neutralization reaction subject. This descriptive research involved 20 high school chemistry teachers as participants. Data were collected using interview guidelines which were further processed in accordance with the research question. Result shows that Problem-based Learning has not been widely implemented to acid base neutralization reaction subject due to constraints such as limited time and learning resources. The results of this study indicate the necessary of Problem-based Learning implementation on acid base neutralization reaction subject.

Keywords: Problem-based Learning, Acid Base, Neutralization Reaction
Topic: 4. Chemistry Education
The Effect of Problem Based Learning Model on Critical Thinking Skill Students in Primary School

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Abstract
Critical thinking is one of the 21st century skills that needs to be developed. This skill is one of the most important basic modalities for everyone and can affect their future life. This research aims to obtain a description of the effect of problem-based learning on critical thinking skill students of grade IV in one of the primary schools in Lima Puluh Kota district, West Sumatera province. The research adopted quantitative research and employed quasi experiment which is nonequivalent control group design. The subjects of this research were 42 students of class A as an experimental class and class B as a control class. The data were collected through instrument tests which is critical thinking skill test on natural science subjects especially natural resource materials. The result of this research showed that critical thinking skill students in experimental class improved significantly. So, it can be concluded that the problem based learning affect to critical thinking skill students. This research is expected to be a reference of teachers in developing innovative natural science learning, let alone explicitly this concept not only emphasizes the cognitive abilities of students, but also implicitly can develop their social skills in natural science perspective.

Keywords: Problem Based Learning; Critical Thinking; Natural Science; Primary School

Effectiveness of Guided Inquiry-based Modules to Improve Students Science Process Skills

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Abstract
Science process skills (SPS) are important in science learning. SPS is a skill process that encourages lifelong learning. In guided inquiry-based science learning, students engage in many of the activities and thought processes that scientists use to generate new knowledge. This inquiry approach can be implemented effectively with the use of chemistry modules for investigation in which students learn to understand the content of the subject. This study examines the effectiveness of guided inquiry-based modules for SPS. The study participants were 63 students in 11th graders. Data were collected through the test. Quantitative analysis is done to know the science process skills of student. The test result shows that the n-gain of SPS students in the treatment class has a better percentage of categories than the control class. The effect size also shows a value of 0.51 which is moderate category. The achievement of indicator SPS in the treatment class is also better than the control class.

Keywords: module, inquiry, science process skills, effect size

Topic: 4. Chemistry Education
Implementation of formative assessment portfolio check with feedback to improve mastery of concept and habits of mind students on acid-base material

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Abstract
This study aims to implement the formative assessment of checked portfolio with feedback to improve the mastery of concepts and habits of mind student on acid-base materials. Portfolio is a systematic collection of work products produced by a series of learning undertaken processes. Feedback is given in writing and verbally during the learning process takes a place. The method utilizes a quasi-experiment with pretest-posttest nonequivalent control group design. The instruments utilized to collect research data are formative assessment of portfolio check formats with feedback, question of acid-base concept, questionnaire habits of mind, interview guides and student response questionnaires. The mastering test of acid-base concepts is validated by 5 chemist experts and forming CVR index (Content Validity Ratio) between 0.60-1.00. Reliability test of acid-base concept mastery was tested involving 60 respondents XI MIA 1 and MIA 2 class in Senior High School processed utilizable SPSS 24.0 argued coeffisient alpha value of 0.76. Furthermore it will conduct a more experiment of formative portfolios with feedback that impacts on mastery of concepts and habits of mind.

Keywords: formative assessment portfolio, feedback, mastery of concepts, habits of mind, acid-base.

Topic: 4. Chemistry Education

Enhancing students motivation through brain-based learning

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Abstract
The aim of this study is to investigate the effect of brain-based learning on students motivation in learning the electric circuit. The participants come from one of International school in Bandung, Indonesia. The method used in this research was quasi experiment which used two classes with one control group and one experimental group. The control class consists of 23 students and the experimental class consists of 26 students. In the experimental class used brain-based learning and the control class used lectured-based learning. The results of this research shows that the average gain of the experimental class was 0.46, while the control class was 0.4. The results showed that the motivation in experimental class was statistically significant different with the control class. Based on this results showed that brain-based learning can be an alternative tool to improve students motivation.

Keywords: brain-based learning, students motivation, the electric circuit

Topic: 2. Science Education
The Effect of Problem Based Learning on Critical Thinking Ability in Mathematics Education

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Abstract
Abstrak: Critical thinking is needed by everyone in this life because the ability to think critically is one of the requirements of the process of education. Therefore, a critical thinking ability is very important to learn by students in various levels of education. One of learning models that increases the critical thinking ability and involves students role actively is Problem Based Learning. The purposes of this experimental quantitative research were to examine the ability of students critical thinking, the students activity and the teachers ability in managing the learning by using Problem Based Learning. The method of this research was Pre Experimental Design with one-group pre-test-post-test design with no control class. The data were collected through the test items and the observation sheet. The results showed that the students critical thinking ability increase at least 25 points by using Problem Based Learning model on enumeration rule, both the students activity during the learning process and the teachers ability in managing the learning were in active category. Based on the results of the research and data analysis, the authors conclude that Problem Based Learning can increase the students critical thinking ability.

Keywords: Problem Based Learning, Critical Thinking Ability, Enumeration Rule

Analysis of mathematical problem solving ability students of junior high school according to Polya model

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Abstract
This research aims to analyze the mathematical problem solving ability of students on the subject of the triangle. This research used descriptive qualitative method and involved 35 students in grade 8 at a junior high school. The instrument is a written test consisting of three items of problem solving. Analysis was conducted according to Polya model. This study showed that the problem solving ability of students still in a weak category. It is seen from the weak ability of students to understand the problem, devise a plan to solve problems, execute plans problem solving, and verification. Besides, the lack of mathematical problem solving ability of students can be seen from the test results of students who received an average score that is well below the average problem-solving abilities.

Keywords: Triangle, Mathematical problem solving, Polya model

Topic: 1. Mathematics Education
[ABS-645]
Lift the Flap Story Book Based on Child-Friendly: Improving the Ability of Students Mathematical Connection

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Abstract
This study aimed to: 1) produce a lift the flap story book based on child-friendly which is feasible to improve the ability of students mathematical connection; and 2) reveal effectiveness of the media in improving the ability of students mathematical connection. This study is research and development. The preliminary data is collected through observation, questionnaire, and interview techniques to 173 students of fourth grade. The results of a preliminary study are used to basic of media development. Furthermore, data collected by scales and tests. The data analysis used descriptive analysis, normality dan homogeneity data, dan t-test. The results showed that: 1) the media has passed the criteria of feasibility based on expert validation result, the responses scale of teachers and student (very good); 2) the media has developed is effective to improve the ability of students mathematical connection based on t-test result where sig.2 tailed value <0.05. The result of t-test for control class and experimental class I is indicated by sig.2 tailed 0.008 <0.05 while control class and experimental class II is indicated by sig.2 tailed 0.002 <0.05. Through media has been developed, students can improve the ability of mathematical connections and internalize the moral message about child-friendly.

Keywords: child-friendly, mathematical connection, picture story book

Topic: 1. Mathematics Education

[ABS-646]
The use of classroom assessment based on multi-representation ability in Basic Physics Course

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Abstract
This study aimed to describe the use of classroom assessment based on multi-representation ability. This research used descriptive research method. Research participants were 20 prospective physics teacher at one university in Indonesia, who attended basic physics course. Research instruments used questionnaires and essays test based on multi-representations. The results showed that the learning process only use summative assessment which focuses at the end of material and learning units. Learning process and assessment in basic physics course used one or two representation modes, so those did not facilitate simultaneous representation modes. The result described that only 42% representation ability of prospective physics teachers was good category (75-84 attainment) on mathematical representation. The recommendation of this study is to develope learning program, formative, and diagnostic assessment based multi-representation in Basics Physics Course.

Keywords: multi representation, classroom assessment

Topic: 3. Physics Education
Application of Investigation Group Learning Model on Triangle Lesson

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Abstract
Cooperative learning is a learning tool that prioritizes cooperation among students in groups to achieve learning objectives. The learning model has several types, including cooperative learning model of investigation group type and direct learning model. This type of research is experimental research and pre-eksperimental design type pre-test and post-test with quantitative approach. Population in this study were all students in grade VII of state junior high school 3 Banda Aceh, while the sample was taken two classes by random sampling that is class VII6 which applied by model of investigation group study type and class VII4 applied by non group investigation model. Data collection is done by using the test. Quantitative data processing is done by using two way t-test with a significant level of 0.05. Based on data analysis can be concluded that there is no difference of student learning outcomes on the application of learning model type of investigation group with student learning outcomes on the application of non group investigation model on triangle lesson in grade VII students of state junior high school 3 Banda Aceh.

Keywords: Model Of Study Investigation Group, Learning outcome on triangle lesson
Topic: 1. Mathematics Education

Study on Students Ability of Visual Spatial on General Biology Course

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Abstract
Multiple intelligence is an ability to solve problems and create a products that have cultural values, such as kinesthetic intelligence, interpersonal, verbal linguistics, logical mathematical, naturalist, intrapersonal, visual spatial, and musical. The focus of this research is to know one of the intelligence held by the students of spatial visual intelligence in general biology course. The sample of research is the students of the first semester in year 2017/2018 (N=20). There are two treatments given to the student that is making cell parts both in animal cells and plant cells according a prior knowledge, and concept. The analysis data was statistic descriptive by calculate the mean value and grouping it into three categories that is high, medium, and low. The result of mean obtained for prior knowledge is cell shape 1,2 and 1,6 for a concept. The categorization as follows: prior knowledge about cell shape is high (0%), medium (15%), and low (85%), while on understanding of cells according a concept is high (5%), medium (60%), and low (35%). There is a change on concept understanding in making cell shape once they learn the actual cell shape.

Keywords: Multiple intelligence, visual spatial, study, concept, cell structure
Topic: 5. Biology Education
Students attitude toward science in junior high school after follow science learning used ILD model assisted science magic

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Abstract

The purpose of this research improved students attitude toward science in one of the junior high school at Bandung City after follow science learning used ILD model assisted science magic. Research method is used pre experiment and one group post-test only design. The total sample of this research is 70 students, who were selected randomly in cluster. The instrument of the attitude towards sciences scale in this study is attitude towards sciences scale, which is consist of 30 items and refers to four dimensions. They are interest in science, importance of science in life, interest in advanced study in science, and interest in future career in science. The data was collected used Method of Successive Interval (MSI). The Result of this research showed that implemented ILD model assisted science magic can improve students attitude toward science in junior high school.

Keywords: ILD models; Attitude Toward Science; Science Magic;
Topic: 2. Science Education

PlantCard: innovation media to increase the reasoning of plants

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Abstract

Education is one effort to develop and improve quality human resources. Education in accordance with the development of the 21st century one of them relies on the development of thinking skills. The ability to think critically is one of the basic thinking skills a 21st century student must have. One of the key indicators of 21st century critical thinking skills is using various types of reasoning (inductive, deductive, etc.) that fit the situation. However, based on the results of field studies, students reasoning ability is generally low. Based on the results of the interview, students need innovative learning to study the classification of plants. For that, it needs innovative learning media to improve reasoning, one with PlantCard. This study is a preliminary study with purposive sampling technique. Research data were collected with essay questions reasoning ability, and student response with interview about PlantCard media. Initial research results show students feel helped after learning with PlantCard media. For reasoning ability, of the seven reasoning processes measured, the achievement of the most dominant reasoning process is comparing (33%), followed by abstracting (28%), constructing support (19%), deductive reasoning (9%), classifying (7%), and error analysis (4%).

Keywords: 21st century learning, reasoning, PlantCard
Topic: 5. Biology Education
[ABS-655]
Increasing 10th grade students mathematical representation through mind mapping strategy

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Abstract
Mathematical representation is one of the important abilities mastered by students, in an attempt to find a solution of a problem, both math problems, as well as daily problems. One way to increase this ability is through mind mapping strategy. Mind mapping strategy involves students actively in mapping information through effective note-taking techniques. The mind map process shows a picture of interconnectedness, and a clear relationship between concepts. In expressing an idea, students can recall information associated with the learned knowledge by projecting the idea into a map or graphic technique. In addition, mind mapping activities can enhance students creativity through freedom of imagination, so learning becomes more interesting. The main problem in this research is whether mind mapping strategy can increase students mathematical representation. This research is a quasi experiment with nonequivalent control group designs. This research involves 63 tenth grade students in Muara Bungo, Jambi. The result of this research is a significant improvement to students mathematical representation through mind mapping strategy.

Keywords: Mind Mapping Strategy, Mathematical Representation
Topic: 1. Mathematics Education

[ABS-656]
Thermochemistry multiple representation analysis for developing intertextual learning strategy based on predict observe explain (POE)

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Abstract
This article was written to describe the results of multiple representation analysis of concepts related to thermochemistry topic. The study was set under a qualitative method. It was found from the analysis of five General Chemistry textbooks that thermochemistry consists of three major concepts which include exothermic reaction, endothermic reaction, and enthalpy change. In macroscopic level, exothermic reaction was presented by several phenomena such as Ca(OH)2 production. Meanwhile, endothermic reaction was presented by Ba(OH)2.8H2O and NH4Cl reaction. In the submicroscopic level, all textbooks explained the concept of exothermic and endothermic reaction by using descriptive approach showing that reaction happened and followed by heat change. In addition, in symbolic level, the explanation was enriched by the use of chemical reactions equations, diagrams of energy level and the visualization of the system in releasing or receiving the heat. The macroscopic representation for concept of enthalpy change was presented as an experiment using calorimeter which then described by submicroscopic representation that the energy released is equal to the energy system accepted by environment. Last, in symbolic level, the explanation was enriched by the use of formula to calculate the enthalpy change. This finding was used for developing intertextual learning strategy based on POE.

Keywords: intertextual, multiple representation, POE, thermochemistry
Topic: 4. Chemistry Education
[ABS-657]
Developing Didactic Design In Triangle And Rectangular Toward Students Mathematical Creative Thinking Through Visual Basic For Power Point

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Abstract
Triangle and quadrilateral material has been studied since the students are in elementary school, but the junior high school students still struggle to solve problems related to triangle and quadrilateral. The research method used in this research is qualitative method with Didaktis Design Research approach (DDR). DDR is a research conducted through three stages didactic situation analysis before learning which its form is Didaktis Hypothesis Design, metadidactic analysis and retrospective analysis. Its define as an analysis which relate the result of didactic hypothesis analysis and the result of metadidactic analysis. Based on the results of the analysis shows that learning by using didactic design in teaching triangle and quadrilateral, students are able to work through the completion of visual basic power point. analysis and observation of the writers when learning takes place, the difficulties faced by students in solving the problem of mathematical creative ability is that students not usually used it for facing problems with indicators of creative ability of mathematics. So in general some students from both classes have depicted to the students creativity in solving the problem, but there is no answer and the level of thinking is low

Keywords: Didactic design; creative thinking; visual basic
Topic: 1. Mathematics Education

[ABS-659]
The Effectiveness of Cognitive Conflict on the Concept of Differential

_Wahyu Setiawan, Veny Triyana Andika Sari_

IKIP Siliwangi

Abstract
This study aims to explore the effectiveness of learning with cognitive conflict approach seen from the initial ability of students. This research method is quasi-experiment where there are two groups of a sample of class. Then in both classes are given pretest and posttest but the treatment is different that is given treatment with learning that uses cognitive conflict strategy and by using ordinary learning. The subject of this research is the students of class XI IPA in Cimahi city. The results of the study show that cognitive conflict learning approaches are more effective in improving mathematical reasoning abilities. This is because in cognitive conflict approach students are more able to think critically. Students are directed to be able to solve problems in everyday life. The cognitive conflict learning approach is expected to be the teachers choice to improve the ability of mathematical reasoning.

Keywords: cognitive conflict approach, mathematical reasoning
Topic: 1. Mathematics Education
Practicality Of Handout Based On Guided Discovery Method In Process Evaluation And Learning Outcomes Of Biology

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Abstract
Process evaluation and learning outcomes of biology is a compulsory subject that discusses the process of evaluation in learning and application design and processing of learning outcomes. Some of the problems found on this subject are the students difficult to understand the material and the unavailability of learning resources that can guide students to gain knowledge. Therefore, it is necessary to develop handout based on guided discovery method which can guide and direct students to acquire their knowledge independently. The purpose of this research is to develop handout based on guided discovery method which practical. This research is a Research and Development using a 4D model that is limited in the development stage is to see the practicality of the use of handout. Practicality data is taken through the handout practice by students and by lecturers. The instrument used was a questionnaire practicality of students and lecturers. Data were analyzed by using the percentage formula. The results showed that the average value of the student practicalities questionnaire is 77.64% (practical), and the average value of the lecturer practicalities questionnaire is 93.23% (very practical). Can be concluded that handout based on guided discovery method has been practical.

Keywords: practicality, handout, guided discovery method
Topic: 5. Biology Education

The effect of integrated learning model to the students competency on the natural science

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Abstract
The students competency of Junior High School in mastering the natural science concept is still low. Natural science learning is not yet integrated. The students are required to be active in learning and teacher is implemented the various learning methods. Therefore, the integrated learning is implemented in natural science subject. This research used quasi experiment method with pre-test post-test group control design. The subjects of the research were eight grades in Junior High School students. Data were collected using observation sheets, test, and motivation questionnaires. The result of the research shows that the integrated learning model impact to improvement the students competence, in the terms of (1) There is a significant difference of competence of students who use integrated learning with students who use conventional learning model. (2) There is significant difference of competence between students who have high and low learning motivation in integrated learning. (3) There is interaction of learning model and learning motivation that effect to the students competence. Thus, students competence is significantly influenced by the implementation of integrated learning model. Effect of integrated learning model to the students competence including large categories.

Keywords: Integrated learning, students competency.
Topic: 2. Science Education
[ABS-663]
An investigation of reasoning ability at the secondary level students

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Abstract
The study aims to investigate students reasoning ability of junior high school level. This study is quantitative descriptive research. The sample of the study were 178 students of eighth junior high school in Bandung, Indonesia. The samples were chosen by using stratified random sampling technique. A logical thinking test was used as the instrument of this study which consist of five reasoning aspects and every aspect consist of two items. The result indicates that only several students who have formal reasoning ability. There are many students who lack of probabilistic and correlational reasoning.

Keywords: Reasoning ability, test of logical thinking, secondary level students

Topic: 2. Science Education

[ABS-664]
Problem solving skill of junior high school students on the solid geometry topic

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Abstract
This study aims to investigate problem solving skills of junior high school students in solid geometry (cube, cuboid, prism, and pyramid) topic. A descriptive qualitative research study through individual written test (essay) was conducted to described problem solving skill of junior high school students. A test was given to 32 students of ninth grade in one of junior high school in Bengkulu, Indonesia. The result show that almost all student difficult to: 1) make strategy to solve the problem, 2) use the strategy planned before to solve the problem. This result of the study conclude that problem solving skills of junior high school students are low. The result of this study show us the need for developing an effective learning which can facilitate students in improving their problem solving skill.

Keywords: problem solving skill, solid geometry

Topic: 1. Mathematics Education
Construction of fractional concepts through visualization

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Abstract
The fundamental aspect of fractional learning is to instill a profound fractional concept so that it can apply it to real situations and experience the fractional benefits in everyday life. Understanding the concept of fractions is the result of construction of the fractional objects. The construction of this fractional concept is done through visualization that manipulates the making of drawings, diagrams or animations for the appearance of fractional information. This research is a qualitative study that describes the construction of fractional concepts as equal parts of the whole and the construction of a fractional concept of value. Subjects in this study as many as 9 selected students from 22 students are grouped into 3 groups, namely (1) failed construction groups and true visualization; (2) failed construction group and failed visualization; and (3) true construction group and true visualization. The results of this study are group (1) the visualization has followed the appropriate pattern but is less precise in the calculation, the group (2) does not understand the concept of fraction so that it fails to visualize, and group (3) can already visualize the concept of fractions with different visualization form from the pattern.

Keywords: construction, fractions of concept, and visualization
Topic: 1. Mathematics Education

Improving Students Mathematical Critical Thinking Skills through K-N-W-S Strategy

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Abstract
The research aims to analyze the improvement of mathematical critical thinking skills of student through K-N-W-S Strategy. Quasi experiment was used as research method with pretest-posttest control group design. It was conducted at one of the middle schools in Bandung. Population in this reasearch was 8th grade student of ten parallel classes. Two classes ware taken randomly as the research sample which consisting of 35 students in the experimental group and 33 students in the control group. The result showed that the improvement of mathematical critical thinking skills of students who acquired K-N-W-S strategy is higher significantly than students who acquired conventional strategy.

Keywords: Mathematical Critical Thinking Skills ; K-N-W-S Strategy
Topic: 1. Mathematics Education
**[ABS-668]**

Damping harmonic oscillator (DHO) for learning media in the topic damping harmonic motion

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**Abstract**

This study aims to 1) design and create a damped harmonic oscillator as a learning media for damped harmonic oscillation, 2) to know the effect of the displacement on the number of waves formed and the wave period until the oscillation is stopped. The method used in this research is Design and Development Research (DDR). The specific phase of development consists of analysis, design, development, and evaluation. This research was conducted at one of the universities in Lampung. The subjects were 57 physics education students who taught the wave course. The damped harmonic oscillator consists of two systems: the first system consists of a paper drive system and the second system consists of pendulum and spring. The research results are: 1) DHO was made as a learning media on the topic of oscillation. 2) the value of displacement given affected the amplitude and wavelength as well as its period, but only slightly affected the damping coefficient 3) based on the results of usability test given to 57 students it showed that DHO is "good" to be used for teaching the subject of damped harmonic oscillations.

**Keywords:** damping harmonic oscillator, design and development research (DDR)

**Topic:** 3. Physics Education

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**[ABS-669]**

Analysis of Primary School Students Mastery in Math Instruction Based on Kurtacil and Beemath Gamification

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**Abstract**

This research is motivated by the importance of multiplication operation ability for elementary school students. This research intend to analyze the students achievement of elementary school students in math instruction based on kurtacil and beemath gamification. The research method used is mixed method research and the sample of this research is the 3rd graders of elementary school students in Purwakarta, Indonesia. The results of this study indicate that there is an improvement ability of the 3rd graders of primary school after applying BeeMMath and Kurtacil games in the medium category, and all students feel happy learning math with the game.

**Keywords:** multiplication arithmetic mastery, gamification

**Topic:** 1. Mathematics Education
Analysis of Students Mistakes in Solving Problem of Two Variables Linear Equation System

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Abstract
Mathematics is a logical means of thinking. Reasoning is one part of thinking that we must understand about mathematics learning. But in fact there were students made mistakes. The aims of study to describe the caused students to make mistakes in working on the matter of Two variables Linear Equation System. The research is a qualitative descriptive study. Subjects in this study were four students of grade VIII. Data collection was done by tests, interviews and documentation. The results of data analysis showed that students made mistakes in solving the problem form of Two Variables Linear Equation System. The types of mistakes used in this study were the types of mistakes according to Newman, namely: (1) reading errors, (2) comprehension errors, (3) transformation errors, (4) process skills errors, and (5) errors in writing answers (encoding errors). The results showed that the errors made by the students lies in the concept, interpretation of language, procedures, and calculations. While the cause factor the students are less thorough, did not understand the purpose of the problem, less know the concept of the formula, and students who did not check again the answers that have been made.

Keywords: Analysis, error, problem solving, Two-variable Linear Equation System

Topic: 1. Mathematics Education

Implementation of field trip based cooperative learning method toward communication skills students

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Abstract
This study was conducted to determine the effect of method field trip based of cooperative learning toward students communication skills. This research uses the pre-experiment method. Subjects consisted of 35 students. Communication skills are measured using a written test (pretest and posttest) and observation sheet. Test and observation sheet communication skills was conceived and developed based on indicators of the 21st century communications. Analysis of the written test data (pretest and posttest) in this study were analyzed by statistical tests using software Statistics Package for Social Science (SPSS) and performed manually using Microsoft Excel 2010. The observation sheet data was analyzed using calculating the percentage. The data obtained from the study reveal the application of methods field trip based cooperative learning affect the communication skills. These findings may be considered by educators knowledge in choosing teaching methods to improve the communication skills.

Keywords: method field trip based of cooperative learning, communication skills,

Topic: 5. Biology Education
[ABS-676]
The Development of an Electricity Book Based on Augmented Reality Technologies

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Abstract
This research aims to produce an electricity book using augmented reality (AR) technology. This book can support observation, experimentation, and stimulation activities because AR technology can display animation, sound, and video. The method used in this research is 4D model research and development (RND) whose stages consist of: define, design, develop, and disseminate. The disseminate stage was done by uploading the application to the Google PlayStore. The AR book has passed the validation test stage with the percentage of achievement of 80.44 % according to the material expert, 91.75 % according to the learning media expert. The test results to 10 students showed the performance of 82.48% with 0.68 of gain value. Based on validation test and filed test, give the conclusion that the development of electricity book based on AR technologies has fulfilled the learning process and requirement as physics teaching materials.

Keywords: Textbooks; Augmented Reality; Static Electricity; Dynamic Electricity

Topic: 3. Physics Education

[ABS-677]
Flipped classroom model of mathematics learning outcomes

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Abstract
The aim of this research to investigate the flipped classroom model. As we know, Students experience difficulties in learning mathematics so that learning innovation is needed that helps students to maximize learning and practice math problems. The learning model that feels right is the flipped classroom learning model. The flipped classroom learning model is the reversed learning model. So, the flipped classroom learning model is suitable for mathematics learning.

Keywords: flipped classroom model

Topic: 1. Mathematics Education
[ABS-678]
Identifying Approach Teachers Used in Assessing the Understanding of the Students on Derivative from SPUR Perspectives

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Abstract
The level of understanding of students on mathematical knowledge could be assessed by multidimensional perspective of understanding; Skills, Properties, Uses, and Representations (SPUR) or which was also known as SPUR approach. This study was focused on identifying the way teachers used in delivering tasks or assignment to assess the level of understanding of their students on mathematical content knowledge. The participants of the study were high school teachers who taught derivative at high schools. Assignments that teachers gave to their students were analyzed to see what dimensional perspectives were used to figure out the ability of the students on related concepts in derivative. Based on their classroom observation and interviews, majority of teachers tended to uses skills and properties dimensional perspectives rather than uses and representations. Others supporting documents showed that even though teachers recognized that various kind of problems needed to help students understand concepts better, they tended to uses text book based problems rather than generating problems by themselves.

Keywords: derivative, assessment, SPUR Approach
Topic: 1. Mathematics Education

[ABS-679]
Improving Adversity Quotient (AQ) with Discovery Learning

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Abstract
Adversity Quotient (AQ) is ones ability to survive the difficulty and manage the adversity until it finds the way of its predicament. A person with a good AQ ability can achieve goals by facing difficulties. The role of AQ is important in mathematics learning. The researcher observed the students AQ, got the students average in the medium level. This study uses AQ with stimulation, problem statement, data collection, data processing, verification, and generalization. The purpose of this study is to increase adversity quotient in junior high school eighth grade students of SMP Muhammadiyah 2 Depok, Yogyakarta. This research was conducted on the mathematics lesson of The Linear Equation System (SPLDV) in the odd semester academic year 2017/2018. This research is a classroom action research using two cycles, each cycle consists of three steps which are conducted in two meetings by using discovery learning. Instruments performed in this study are questionnaires AQ, lesson plan, and student worksheet. After learning with discovery learning, students can increase AQ in each cycle. The students average has a high AQ. The results of this study indicate that the learning scenario that designed in each cycle can improve the adversity quotient students.

Keywords: adversity quotient, discovery learning
Topic: 1. Mathematics Education
Preservices creative thinking skills on Biotechneur programs

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Abstract

The aim of this research is to know how the biotechneur program influences towards creative thinking
skills of biology preservices teacher. The lessons were held for 14 lectures, divided into four phases.
Each phase contains learning strategies that support the formation of students creative thinking skills.
The subjects in this study is 34 biology preservices teacher who take biotechnology courses at the
University of Wiralodra. The instrument used in this research is 5 essay test items of creative thinking
skill in biotechnology. The answers are then given a score using assessment guidelines rubric to
obtain data in the form of a score at the time before and after learning. The data is then analyzed
quantitatively with the result n-gain value in the medium category and in a significant decision. Based
on the results of data analysis it can be concluded that the biotechneur program influences towards
creative thinking skills of biology preservices teacher, with all the creative thinking aspects has been
developed very well. This research has also revealed that biotechnology programs can be combined
with entrepreneurship, and not just an enhanced creative thinking skill but also produce biotechnology
products that made from local resources and have high economic value.

Keywords: Biotechneur, Creative Thinking skill
Topic: 5. Biology Education

Exploring high school teachers experiences of problem-based learning implementation on
buffer solution

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Abstract

Problem Based Learning (PBL) as one of the innovative learning models designed to enable students
to be actively involved in the process of obtaining information, knowledge and problem solving. This
descriptive study aims to collect information of methods often used by teachers, and the
implementation of PBL on buffer solution concept. The data source comes from 20 high school
chemistry teachers of class XI. Data were collected using interview guidance instruments and then
processed in accordance with research questions. The results showed that teachers often use lecturer
method, and most teachers have not yet used the PBL model on buffer solution and do not know the
proper syntax. These findings indicate how we need application of PBL on buffer solution concept.

Keywords: Problem-based Learning, Buffer Solution
Topic: 4. Chemistry Education
Abstract
This research aimed to describe the geometry verbal skill of FD-FI students in Junior High School according to Van Hiele Theory. This research was a survey. The samples were selected using proportionate stratified random sampling technique which was a combination of stratified sampling technique and proportional sampling technique followed by random sampling technique. This technique was used to determine the sample proportionately for each strata. The samples consisted of 4 representative high strata schools. The data were collected using tests and interview. Data analysis technique consists of data reduction, data display, and data conclusion. The result showed that: (1) FI students level 1, 2 and 3 get a better result than FD students to associate the correct name with a given properties and to define a figure accurately and concisely by showing interrelationships between figures recognize different figures from a picture, (2) FD students is better than FI students to define a figure accurately with various properties, (3) From 103 students, there is only one FI student at level 3 can answer definition of figure perfectly.

Keywords: Geometry verbal skill; Field dependent; Field independent; Van hiele thinking level
Topic: 1. Mathematics Education

Abstract
As we know that the mathematical communication is an important skill. Optimization mathematical communication research gave so many option as the effort to optimized it, such as reading, discussing, writing. All of the option was concerned about learning model and how to learn. Based on the study of literature, at least there were four aspect that could affect the mathematical communication, those were teacher, learning, the learning materials, and the student itself. Not only that four, but also conceptual understanding could affect mathematical communication because the thing that student communicate were the concept that they had. Some of problem about conceptual understanding were found in triangle. On this research, there were found that learning model was not the only problem of the way to optimized student mathematical communication. Thats why the way to optimized it has to be fitted to the problem that founded.

Keywords: Mathematical Communication, Conceptual Understanding, Triangle
Topic: 1. Mathematics Education
[ABS-687]
Students Critical-Metacognition Activity Based On Their Personality Type

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Abstract
Metacognition and critical thinking become a foundation key to solve any problem. Therefore, students with higher level of those aspects tend to demonstrate better skills in accomplishing problem solving tasks. This study aims to describe students critical-metacognition activity in solving geometry problem based on Keirsey personality types, namely rational, idealist, guardian, and artisan. The samples were 8th grade students of the Labschool Universitas Negeri Surabaya. Students were given mathematics test and the adapted Keirsey personality questionnaires. Four volunteer students, with higher rank of mathematics and represented each Keirsey personality types, were selected as the research subjects. Data were collected by giving geometry task and interviews. The collected data were analyzed by using critical-metacognition indicators. The result affirms that all students demonstrated critical-metacognition through planning, monitoring, dan reflection activities although some parts were missed. For planning activity, rational and idealist students could explain their reason behind the strategy used. On the other hand, different condition was shown by guardian and artisan students who could not make conclusions correctly. For reflection activity, only guardian student who did not check his performance. This study suggests that teachers should facilitate students to practice critical thinking and metacognition activities in order to solve problems mathematically.

Keywords: metacognition, critical thinking, keirsey personality type

Topic: 1. Mathematics Education

[ABS-689]
Development of Linear Algebra Learning Material Based on Mathematical Understanding and Representation

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Abstract
This research aims to design a Linear Algebra learning material that can facilitate the enhancing of students mathematical understanding and representation. The research method is research and development (R&D) which consists of three main stage, namely the preliminary, development, and dissemination. The research was limited to the development stage. The results concluded that the assessment of the experts (validator) on learning materials is in the category of valid with a small revision on the exercise questions part. The result of a practical test of learning material is 87,81% (very practices). Meanwhile, the result of limited trials indicates that learning material can be completed students mathematical understanding classically and individually. Besides, the mathematical representation of student has not reached the mastery both in classically and individual.

Keywords: Learning Material, Mathematical Understanding, Mathematical Representation

Topic: 1. Mathematics Education
The effect of game based learning toward conceptual understanding

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Abstract

The aim of this study was to examine the effect of game based learning toward conceptual understanding in learning mathematics. This study was an experimental research with design non-equivalent group pre-test post-test which consisted two classes namely experiment class and control class. This research was conducted in one of the junior high school in Yogyakarta Indonesia. The population of this study was all students eight grade with the respondents had low proficiency. On experiment class was taught using game based learning and on control class was taught classical learning. The effectiveness of game based learning was analyzed using Mann-Whitney test. The result of data analysis showed that (1) game based learning was not effective viewed from conceptual understanding (2) there was difference between the class was taught using game based learning and the class was taught using classical learning viewed from conceptual understanding after treatment was given.

Keywords: Game Based Learning; Conceptual Understanding

Student difficulties in solving geometry problem based on van hiele thinking level

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Abstract

The background of this study is the lack of problem-solving ability of students. The evidence in the school shows that there are difficulties experienced by students in solving geometry problems. This fact gave rise to this study which aims to analyze student difficulties in solving geometry problems based on Van Hiele thinking level. The descriptive qualitative research was used in this study. Van Hiele geometry test and problem-solving test were administered, followed by interviews. The subjects of the study were 38 students grade VIII in one of the Secondary school in Bandung and 6 of them were interviewed afterward. The results showed that the main difficulty of students who at level 1 (visualization) is interpreting problems into a mathematical model. While the main difficulty of students who at level 2 (analysis) and level 3 (deduction informal) is in the solution processes. We conclude that problem-solving ability is important to be taught to all students even though they are at different Van Hiele levels.

Keywords: geometry, problem solving, van hiele thinking level

Topic: 1. Mathematics Education
[ABS-692]
Teacher images on the derivatives concept

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Abstract
This study aims to figure out the image of high school math teachers on the derivatives concept and how they experience in learning the concepts. This study is a phenomenology research. It focuses on revealing the teachers perceptions and meaning of derivatives concept. Data are collected from questionnaires and interviews on four high school teachers who are or have taught the derivatives concept. The results show that there is a gap between teachers image about the concept of the derivative with the scientific conception. The experiences gained by teachers in learning the concept of derivatives were more focused on procedural understanding rather than conceptual understanding.

Keywords: derivatives concept, teacher, concept image

Topic: 1. Mathematics Education

[ABS-694]
Integrated Mathematics Books With ICT For Senior High School

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Abstract
Mathematics learning based on ICT is learning according to curriculum of 2013. In this case, required an integrated ICT teaching materials. Based on observations to some high schools in Padang, found that there are no schools used computer as mind tools in mathematics. In the other hand, the teachers have not known the software to supports the learning of mathematics. In addition, many teachers are able to use some software but have not been able to prepare their own computer-based learning materials. Therefore, the aim of this study was to produce an integrated ICT textbook that can be used by teachers and students to improve the effectiveness of learning mathematics. To facilitate teachers and students in using the computer program, the book comes with a CD tutorial. CD Tutorial consists of guide to use multiple software and examples of applied learning senior high school mathematics grade X first semesters. The text book developed with Plomp model and refers to Tessmer formative evaluation. This article describe the validation of the mathematics textbook that based on ICT with a CD Tutorial. Self-evaluation and validation sheet are used as instrument. The findings show that the textbook is valid from the content and construct aspects.

Keywords: ICT, CD Tutorial, textbook

Topic: 1. Mathematics Education
Ethnomathematics: A Review Aspects of Geometric Weaving Tribe Baduy in the Village Kanekes, Lebak, Banten

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Pascasarjana Universitas Pendidikan Indonesia

Abstract
Baduy is one of Indonesian culture that hold firm custom. Culture is inseparable from mathematics or called ethnomatematics. Baduy tradition one of them is weaving, whose work if studied ethnography has the concept of mathematical geometry. Among them are the management number, Build flat, etc.

Keywords: Culture, Ethnomathematics, Mathematical Geometry
Topic: 1. Mathematics Education

Featuring the Comic Nym the Leaf Fairy in Teaching about the Plant System at Elementary School Science

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Abstract
This study explored the use of comics as an aid in teaching elementary science on the topic of Plant Systems. A total of 18 Grade 5 student from one of the elementary schools in Brunei Darussalam participated in the study. A 15 page fully colored comic featuring a leaf fairy character called Nym was utilized to teach the students alongside various activities about plant during the intervention lessons. A pre test was administered prior to the lesson to establish their existing knowledge of the topic, and then a post test administered after all the intervention lessons were completed. The results from the achievement scores analyzed between the pre and post test indicated that the student performance improved significantly. Furthermore, the students were found to be interested, engaged and enthusiastic in the use of comics as revealed from the thematic analysis of the interviews. There are also vast potentials for comics to be used regularly to support learning in science related classrooms.

Keywords: Comics, Teaching aid, Elementary Science
Topic: 2. Science Education
Constructing the net: seeing from spatial abilities perspective

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Abstract

A nets can help students make the connection a concept between two dimensional and three dimensional objects. But there is still inaccuracy in composing nets caused by weak spatial ability. The purpose of this study was to describe students spatial ability in constructing cube and rectangular prism nets. Subjects are two students of fifth grade Elementary School. The results show that in completing the task of arranging cube and rectangular prism nets, the subject indicates a weakness in the ability of spatial orientation and spatial visualization. Spatial orientation is seen in the subjects ability to see objects from a particular point of view in recognizing two congruent nets that are considered incongruent, while the spatial visualization of the subjects ability to imagine the nets can be folded into cubes and rectangular prism.

Keywords: net, spatial ability

Topic: 1. Mathematics Education

Mobile game design for understanding fractional conception in elementary school

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Abstract

This research aims to design media for learning students conception on fraction headed for elementary level through mobile game. The indicators of conception related in this research were indicators definite on additions and subtraction. Research and development design research has already been pleased to collect data from third-grade elementary students in one of school in Cirebon Regency (25 participants: 8-10 years old). The instrument which is developed formed test with the expert judgement process. The result shows that every factual of conception have been developed and described. Design can be applied to make easier for students to comprehend conceptions. To summarize, the mobile game is able to define the 3th-grade elementary students conception on fractions.

Keywords: Virtual Game, Conception, Problems Solving, Fraction

Topic: 1. Mathematics Education
[ABS-703]
Using transcript-based lesson analysis to determine teacher discourse move in science lesson

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Abstract
One of teacher main task is conducting high quality learning process in their classroom. Teacher questioning and feedback in science lesson contribute to make dialogic classroom discourse so that learning process seems more meaningful. As the justice reflection for teacher practice in their class, analysis of lesson transcription was provided to inform the teacher about classroom discussion tendency and the gap for teacher improvement. This data was collected from one junior high school in Bandung, West Java, Indonesia. Three episode of science lesson were videotaped and transcribe. By using Transcript Based Lesson Analysis, teacher questioning, feedback, and student response in classroom were analyzed to reveal the discussion tendency whether it authoritative or dialogic. Through this study, teacher can reflect their practices and know how to improve their learning process.

Keywords: Transcript Based Lesson Analysis, Teacher Discourse
Topic: 2. Science Education

[ABS-705]
Students Ecological Intelligence Ability on the Environmental Knowledge Course

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Abstract
This study aims to determine the ability of the ecological intelligence of pre-service biology teacher in the course of environmental knowledge. This research includes qualitative research type with qualitative descriptive approach. The variables analyzed are the students ecological intelligence ability, especially on the subject of environmental knowledge with the materials such as Environmental Characteristics, Ecological Concepts, Material and Energy, Human and Environment, Natural Resources and Environment, Health and Environment. The results showed that the ability of ecological intelligence of pre-service biology teacher in the subject of environmental knowledge was good enough. For the content aspect, the highest score is on ecological concepts, as well as human and environmental, by 85%. In the skill aspect, the highest score is on material and energy concepts that is 85%. While in the attitude aspect, the highest score is on the material of ecological concepts is 86%.

Keywords: ecological intelligence, environmental knowledge.
Topic: 2. Science Education
[ABS-706]
The Effectiveness of Mobile-Based Interactive Learning Multimedia in Science Process Skills

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Abstract
Science process skills can facilitate students to increase the curiosity and activity of students in learning by doing, experiencing, and associating the subject of science in real life. Scholars found different phenomenon to improve science process skill. Hence this research aimed to explore the effectiveness of mobile-based interactive learning multimedia to improve students science process skill. This research was a quasi-experimental research with the entire subject 80 elementary students in Salam Magelang. Data were collected through observation, interview, and test. The results showed that mobile-based interactive learning multimedia is more effective to improve science process skill between the students who learn using mobile-based interactive learning multimedia and classical model with students book.

Keywords: Interactive learning multimedia, Mobile, Science process skill

Topic: 2. Science Education

[ABS-707]
Profile of scientific reasoning skill and ecological intelligence of pre-service biology teacher

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Abstract
This study aims to determine the profile of students scientific reasoning and ecological intelligence skills. The research method used is mixed methods with good performance by using both quantitative and qualitative analysis. The design used in this research is embedded design. This study includes a validator consisting of material experts and learning device experts, 1 high education practitioner, and experiments with a sample of 20 students. The instruments used include questionnaires, observations, interviews, and tests. The experiment used a class of 20 students. Data analysis and processing techniques used during the research are descriptive analysis, percentage technique, and independent sample variable test. The procedure in this research is to do the necessary things in the execution of research such as preparing questionnaire format, observation, teacher and student interview, and experiment with pretest and posttest for scientific reasoning skill and ecological intelligent on learning environmental knowledge. Data collection through interviews, observation and documentation, and test result data. The result of the research shows the profile of students scientific reasoning ability in the biology education program of the university of muhammadiyah bengkulu, including deductive and inductive reasoning with the percentage of good category achievement of 73% and the proficiency profile of ecological intelligence of excellent.

Keywords: scientific reasoning skill, ecological intelligence, environmental knowledge

Topic: 2. Science Education
How do the pre-service chemistry teachers view about the nature of science and technology?

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Abstract

This study is intended to explore the view of preservice chemistry teachers (PCT) about the nature of science and technology (NOST). This study is the second part of the Model of Educational Reconstruction (MER). 35 of PCT in in one of Chemistry Education Department in Midterm Indonesia participated to fill in the questionnaire about the view of NOST that has been modified from Tairab and Aikenhead. The PCTs view described and categorized as Realistic, Has Merit, and Naive. The results of the questionnaire suggest that many PCT were in Has Merit and few of them were in naive. It means that many PCTs views were not completely appropriate with the general view of science or technology but there were certain parts that fit the concepts and theories of science or technology. The results of this study will serve as a consideration in designing the instructional material at the third part of MER.

Keywords: Model of Educational Reconstruction; Nature of Science and Technology; Pre-service Chemistry Teachers

Investigating Learning Support in Science Classroom during Lesson Study for a Learning Community (LSLC)

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Abstract

Teacher and peers provide student with multiple learning support that promote social and academic engagement. How to provide appropriate support to student learning is one of focus in Lesson Study for a Learning Community (LSLC). LSLC emphasizes on reciprocity among student and also between teacher and children. This paper aims to identify profile of learning support during LSLC and analyse the impact of post-lesson discussion to learning support. Research method used in the study is descriptive qualitative. The study was carried out in science lesson which consist of three different science topics. Samples were collected through three videotaped LSLC cycle and those are analysed qualitatively. Required data in this study were field note, transcript of research lesson and transcript post-lesson. The findings in this paper illustrate that during LSLC 1) post-lesson discussion affect to initiative of teacher in organize learning support 2) support provided by teacher influence how student provide support to their peers.

Keywords: Learning Support, Lesson Study for Learning Community, Science Lesson

Topic: 2. Science Education
**[ABS-711]**

The inconsistency of level critical thinking in solving differential equation problem

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**Abstract**

Differential equation is a concept that has a variety of solutions that require critical thinking ability. This study explores the level of critical thinking ability of students in solving differential equation problem. This study is a descriptive qualitative research. The participants of this study were two university students of department of mathematics education, Universitas Islam Malang, who are taking differential equations course. The instruments were critical thinking questions based on IDEAS (Identify, Deepen, Enumerate, Assess, and Scrutinize) criteria and interview guideline. The results of the study showed that the level of critical thinking of students in solving the problem of differential equation is inconsistent. In this case, the inconsistency of the critical thinking level is caused by the obstacles that the students experience when solving the differential equation problem. The student who have problems in solving differential equations will trigger to think critically. It is expected that further research need to be carried out to examine the level of students critical thinking in other courses.

**Keywords:** level of critical thinking, differential equation, inconsistency

**Topic:** 1. Mathematics Education

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**[ABS-712]**

How to develop student creativity through teaching materials of hydrocarbon SETS-based?

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**Abstract**

This study aims to produce teaching materials of hydrocarbon SETS-based to develop student creativity through 4S TMD method. This article is the important part of the development of teaching materials that includes the selection and structuration steps. In the selection step, developing of indicators, explaining the concept of hydrocarbon using standardized textbooks sources, and developing student creativity and SETS aspects that can be integrated into hydrocarbon materials. Furthermore, in the structuration step, organizing concepts and materials into concept maps, macro structures, and multiple representations. The result of the two steps in the important part of this study produced a draft of SETS-based teaching material. Evaluation of the draft of teaching material has done by expert lecturers in the field of chemical education. The results show that the teaching material developed have been in conformity with the curriculum, scientifically correct, student creativity and SETS aspect is compatible with the subject matters, and concept maps, macro structures, multiple representations developed have been valid.

**Keywords:** Development teaching material, Hydrocarbon, SETS, 4S TMD, Creativity

**Topic:** 4. Chemistry Education
Developing laboratory skill assessment based on multiple competence for prospective biology teacher

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Abstract

Practicum activity in the laboratory is one part that cannot be separated from biology learning. Prospective teachers are expected to demonstrate mastery of the four dimensions of multiple competencies, namely task skills, contingency management skills, task management skills, and role / job environment skills. This study aims to develop an assessment to assess the prospective biology teachers skills and to determine the effectiveness of a comprehensive assessment integrated with the curriculum. This research uses Research and Development method. Research subjects were 40 prospective teachers who were carrying out teaching practice. Data collection technique used was tests, observations and questionnaires. Techniques of data analysis we used were descriptive quantitative analysis and T test. The results of research indicated that practicum activity that had been done could improve the laboratory skill based on multiple competences. The effectiveness of the assessment used to assess students laboratory skills is quite high. The developed assessment can detail and comprehensively assess laboratory skills based on clear work indicator criteria. The conclusions of the research results show that the assessment of multi competence-based laboratory skills developed is valid, reliable, and effective to be used to assess the laboratory skills of prospective biology teachers.

Keywords: laboratory skill assessment, multiple competences, prospective biology teacher
Topic: 5. Biology Education

Mathematics learning achievement of vocational high school students viewed from adversity quotient

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Abstract

Efforts to improve the quality of education have been done by improving the implementation of learning. The effort has not been enough to show satisfactory results. This can be seen from the mathematics learning achievement shown by the students. One of the factors can influence students mathematics learning achievement is the students Adversity Quotient. There are three types of AQ, they are quitters, campers, and climbers. The purpose this study is to find out which one provides better mathematics learning achievement between students with AQ quitters, campers, or climbers types. The type of this research is descriptive quantitative. Data collection techniques of mathematics learning achievement obtained from the value of mathematics test, while the AQ data obtained by the student questionnaire. The subjects of the research are 189 students from three Vocational High Schools in Gunungkidul Regency, Indonesia, with high, medium and low school category. The data analysis technique used is one way anova with unbalanced cells and post hoc test using Scheffe method. The results show that students with AQ climbers type have better mathematics learning achievement than students AQ campers and quitters types. Students with AQ campers type have better mathematics learning achievement than students AQ quitters type.

Keywords: mathematics learning achievement, adversity quotient, anova
Topic: 1. Mathematics Education
[ABS-718]
Application of Think Talk Write Model (TTW) to Improve Communication Ability of Grade XII Students on Biology Learning

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Abstract
This research entitled "Application of Think Talk Write Model (TTW) to Improve Communication Ability of Grade XII Students on Biology Learning". This research is a classroom action research that aims to know the level of student communication in oral and written by applying Think Talk Write (TTW) learning model on Growth and Developmental materials in Cycle I and Enzyme (Metabolism) materials in Cycle II. The data of students oral communication ability is obtained from the observation sheet to observe the achievement of the students communication ability indicator orally on the learning activity. Data were analyzed based on 8 communication indicators from Ennis (1985). While the data for students communication skills in writing obtained by using the test in the form of a description of 10 numbers. Ability to communicate students orally in the first cycle of 53.80%, while in the second cycle increased to 73.02%. While the results of the ability to communicate in writing showed the results of 71.55% in cycle I and increased to 83.97% in cycle II. Based on the results obtained, it can be concluded that the application of Think Talk Learning (TTW) model can improve communication ability of grade XII students in Biology learning.

Keywords: Think Talk Write Model, communication ability
Topic: 5. Biology Education

[ABS-720]
Comparative of kinetic coefficient friction of material surfaces using manual method and video tracker application

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Abstract
A system consisting of a block with surface type of wood and jubin was slide down on the incline track. Experiments had been done to determine kinetic frictional coefficient by manual method using stopwatch and technology by using video tracker application. The length of the track were varied by 5 cm, 15 cm, and 25 cm. To determine kinetic frictional coefficient manually, stopwatch had been used to calculate the travel time on each track length. Then video tracker application had been used to observe the block while sliding from the top of the incline and then recorded it in video. The results of kinetic coefficients of the block surface that almost had similar value and hard to obtain by manual method, it can be simplified obtained by using video tracker application. Because the results were more rigorous and had smaller relative error. However, using video tracker application required a good camera resolution and good skills to operate it. So with the manual method would also be more effective and efficient but with long path length and the plane was sloping.

Keywords: kinetics frictional coefficient, video tracker
Topic: 3. Physics Education
[ABS-722]
Analyze the correlation of hafiz quran and yaumiah worship toward the level of math anxiety

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Abstract

Abstract. Anxiety towards mathematics is often experienced by students in the learning process, especially mathematics. High level of mathematical anxiety can affect the process and student learning outcomes. High levels of anxiety can make student learning outcomes low. This research is aimed to analyze the relation of rote quran and yaumiah deeds to the level of math anxiety. Subjects in this study are junior high school students, who in addition to learning he also do memorization activities Al-Quran, other than that the students are also very maintaining yaumiahnya deeds, such as obligatory prayers and sunna, fasting sunah, read quran. This research was descriptive qualitative research. The researchers collected data through questionnaires of anxiety mathematics, sheet of memorization Al-Quran, and sheet of muttabaah yaumiah, then the researchers analyzed the data collected. The results are that: (1) Quantity of high zikr can reduce anxiety in learning mathematics, to the level of medium learning anxiety, and (2) obligatory prayers are always done and on time can affect the level of anxiety students in doing math problems, to the level of medium anxiety.

Keywords: math anxiety; hafiz quran; yaumiah worship

Topic: 1. Mathematics Education

[ABS-723]
Development of Scientific Literacy Instruments Based on PISA Framework For Global Warming Topic

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Abstract

The purpose of this study is to develop scientific literacy instruments on global warming topic for senior high school students. The instruments were adapted from The Programme for International Student Assessments (PISA) framework. The method of this study is research and development used instructional models 4D (define, design, developed and disseminate) is constrained only to a point 3D (define, design and developed). (1) Define stage include literature studies and field study, (2) design stage include designing draft scientific literacy instruments based on PISA framework, and (3) developed stage include expert review and trial test for students. The instruments are consisted test for context, competence and knowledge aspects and non-test for attitude aspects. The test instrument consists of 23 essays and non-test instrument is a questionnaire. The subject of this research consisted of 37 students of XI MIA at a senior high school in Bandung. The Scientific literacy instruments were analyzed using expert review by 4 validators and classic test analysis include the validity of items, reliability, discriminating power and level of difficulty. The results showed that scientific literacy instruments have a good quality as instruments to measure scientific literacy of senior high school students for global warming topic.

Keywords: scientific literacy, assessment, test instruments, global warming, research and development

Topic: 3. Physics Education
Information Literacy Profile of Junior High School Student

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Abstract

Information Literacy (IL) is one of important skills in 21st century. According to Partnership-21, IL includes the ability to access, evaluate, use and process information. However, there is a presumption that this skill has not been optimally trained in the science learning process. One of the reasons is the difficulty of teachers in teaching and assessing these skills. This qualitative descriptive research is a preliminary study to get the initial IL profile of students so it will be able to provide the action plan and to assess IL in science learning in the classroom. This study was conducted in one of SMPN in West Bandung Regency which is selected by cluster random sampling. The research instruments are structured description test and observation format of learning process. Profile Analysis is measured by presentation interpretation. The results show that most students can access information, but only a small number of students have the skill to evaluate, use, and process information. Therefore it is necessary to develop ways on improving students IL skills related to evaluate, use and process information.

Keywords: profile, information literacy, junior high school students
Topic: 2. Science Education

Design of Scientific Reasoning Test Instruments on Simple Harmonic Motion Topics

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Abstract

Scientific reasoning is one of the 21st century skills that is expected to be taught in science class. The students scientific reasoning skills are important in addressing new issues and planning investigations to solve real-life science, engineering and social problems. This study aims to design a scientific reasoning test instrument on simple harmonic motion topics in senior high school. The method utilized in this research is a research and development of instructional model 4D (define, design, develop, and disseminate), but this research limited only to 2D (define and design). The define stage include: (1) literature study (2) field study (3) concept analysis (4) formulate instructional objective. The design stage is to design the test instrument to be developed. The test instrument scientific reasoning based on Han (2013). There are 8 dimensions of scientific reasoning that is control of variables, proportions and ratios, probability, correlational reasoning, deductive reasoning, inductive reasoning, causal reasoning, and hypothetical-deductive reasoning. The test instrument scientific reasoning consists of 24 items, two tier, multiple choice test.

Keywords: Research and Development, Scientific Reasoning, Simple Harmonic Motion, Test Instrument
Topic: 3. Physics Education
[ABS-731]

Students achievement in Lawsons Classroom Scientific Reasoning (LCTSR) The effect of gender and age on scientific reasoning ability

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Abstract

Nowadays scientific reasoning is currently considered the central of goal for development of 21st century people. Scientific reasoning is important factor in science learning. This study aims to examine the effect of gender and age influenced students scientific reasoning ability. This research was a descriptive quantitative. The samples of the result were 200 students (female=100, male=100) on first year physics education class of Tadulako University in Palu, Indonesia with the age range was 18-20 years old. The data on students scientific reasoning ability were taken from a multiple choice test on scientific reasoning ability using Lawson Classroom Test of Scientific Reasoning (LCTSR). LCTSR was administered to investigate students scientific reasoning ability in six constructs namely (1) Conservation of Mass and Volume, (2) Proportional Thinking, (3) Control of Variables, (4) Probabilistic Thinking, (5) Correlational Thinking, and (6) Hypothetical-deductive Reasoning. The results showed that no statistical difference between male and female on scientific reasoning means scores were observed. The gender and age do not significantly impact on students scientific reasoning ability for each construct. In addition, the lowest mean score for the students reasoning ability for both genders was control of variable.

Keywords: LCTSR, Gender, Age, Scientific Reasoning

Topic: 2. Science Education

[ABS-732]

Identification of the content, process orientation and basic electronics lab at 2 Universities in Banda Aceh

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Abstract

This study aims to identify practical enforceability Basic Electronics II with a focus on content, process and practical purpose. This descriptive study involved 2 University in Banda Aceh and documentation of data collection methods, observation and interviews. Documentation made to the RPS and Practical Guidance is being conducted to observe the observation of practical implementation with a focus on obstacles during practicum, skills that emerged during the practicum, practical valuation techniques and application of technology in practical activities. Further observations were also conducted to observe the basic skills for a student lab practicum implement Basic Electronics II. Interviews were conducted to corroborate the data documentation and identify the achievement of the objectives practical implementation Basic Electronics II. From the research results can be concluded that the practical implementation still using verification models and without the use of augmented reality / virtual laboratory, lab design Basic Electronics II not equip students 21st century skills and practical assessment methods rely only on laboratory work reports and assess the skills of student lab.

Keywords: basic electronics lab, skill of the 21st century, Augmented Reality

Topic: 3. Physics Education
[ABS-733]
Deskriptive Study : Knowledge Construction of Secondary Science Teacher during Lesson Study in SMP BPI 1 Bandung

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Abstract
Secondary science teacher may come from various science competencies background. Teacher with Physics, Biology and Chemistry competencies background should teach science comprehensively. MGMP based lesson study in one of schools effort to help science teacher to discuss teaching material. The objective of this research is to investigate knowledge construction of secondary teacher on science content during lesson study. This descriptive study was designed with 3 cycles of lesson study which consist of 3 times of plan, do and see for every single cycle. The participant comes from same school with various science competencies background teacher. Field note, video and its transcript are used to identify the characteristic of teachers knowledge construction. Verbal communication or critical dialogue among science teacher during plan and see phases are described to show classification of knowledge construction. Furthermore, dialogue between students and teacher during do phase are discussed to categorize type of dialogue. The result of this research show that science teacher with different competencies background tend to reconstruct their science knowledge while the other stand on cognitive imbalance.

Keywords: knowledge construction, science teacher, lesson study
Topic: 2. Science Education

[ABS-734]
The 9th grade student mathematical understanding in problem solving based on Pirie-Kieren theory

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Abstract
Abstract. The purpose of this study is to analyze the mathematical understanding in 9th grade student problem solving based on Pirie-Kieren theory. The Pirie-Kieren theory provides a framework to evaluate the students mathematical understanding in solving mathematical problem. The layers of mathematical understanding in Pirie-Kieren theory consist at primitive knowing, image making, image having, property noticing, formalising, observing, structuring, and inventizing. This study designed according to case study toward two students who are studying at one of primary school in Bandung district. The participants in this study were selected among voluntary students by considering their mathematics interesting and recommendation from the mathematics teacher. The data was collected by testing and interviewing. One problem solving item was posed for the mathematics test. The interview of this study was collected by through a semi-structured interview. The obtain data was descriptive analysis with qualitative approach based on Pirie-Kieren theory. The result show that two of participant was started working at image having layer and they have placed at formalising layer. The participants have lacked at primitive knowing and image making according to Pirie-Kieren theory.

Keywords: Pirie-Kieren Theori, Understanding Mathematics, Problem Solving
Topic: 1. Mathematics Education
[ABS-735]
Mathematics Communication of Students in Agriculture Area

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Abstract
Mathematics communication is an important cognitive ability, especially students who live in an area which geographically located in agriculture area. This research aims to see and analyze mathematics communication of students in senior high school increased with agriculture based mathematics learning. This research is quasi-experiment involve a school in area with good agriculture potential. Result of this experiment showed that mathematics communication of students who have high and medium ability in mathematics learning increased through agriculture based mathematics learning. But it was not have effect to students with low ability in mathematics learning.

Keywords: Mathematics Communication, Mathematics ability, Agriculture based mathematics learning

Topic: 1. Mathematics Education

[ABS-738]
Traditional Measurement Units: A Study on the Construction of Rumah Gadang of Minangkabau

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Abstract
Rumah gadang, a traditional house of Minangkabau people, is a form of manifestation of the knowledge of that ethnic which has unique architecture. The design and the construction of rumah gadang are traditional craftsman creation. This article presents a study on measurement which employs the process of constructing and measuring a rumah gadang. Using qualitative method, information was gathered from tukang tuo as a traditional craftsman. Dapo, eto, jangko, tampok, and jari, are the measurement units that are used by traditional craftsman. Using non-standard measurement units, therefore, can be recommended for the teachers in their instruction in mathematics classroom in West Sumatera.

Keywords: Measurement; Rumah gadang; Ethnomathematics

Topic: 1. Mathematics Education
Challenging Student to Play The Ladder Snake Game "Finish Your Mean" to Improve Students Communication and Collaboration

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Abstract
Challenging student to do the exercises with speed and focus through the game is a fun lesson. This study aimed to improve the communication and collaboration of students in learning mathematics using Problem-based learning with the help of ladder snake game "finish your mean" to replace daily exercise. The subject in this study is eight grade in public school in the village, precisely in Bantul, Indonesia. The number of students is 29 students in the school year 2018/2019 and have an age range of 13 to 14 years. This study was conducted with a quantitative methodology. Data collection techniques used in this study were questionnaire and observation sheet. Data analysis was obtained from questionnaire with t-test and observation sheet with percentage of learning enforceability. This study conclude that communication and collaboration of students enhance through Problem-based learning with the help of games to replace daily exercise.

Keywords: Communication, Collaboration, Game, Problem Based Learning

Topic: 1. Mathematics Education

Analysis of the need to development an authentic assessment instrument on buffer material

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Abstract
The use of authentic assessment is supposed to be able to provide learners with the ability to solve real problems and to give learners the opportunity to think, act and work systematically through processes or results that are consistent with program requirements. This study aims to describe the process of learning chemistry, explaining the assessment instrument used in the process of learning chemistry and to know the problems encountered by teachers in carrying out an authentic assessment. The type of research used is a descriptive evaluation. The subject of this evaluation is the chemistry teacher. The instrument used in this research is the interview. The data were analyzed descriptively. The result of the research shows that the teacher at school has a genuine assessment, but because of the many instruments that teachers have to do and the time is limited so that the assessment is not maximal and the number of learners is too high.

Keywords: Assessment authentic, buffer
Topic: 4. Chemistry Education
Analysis of students difficulties in mathematical literacy

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Abstract

This research investigates the students mathematical literacy skill and difficulties in answering the mathematical literacy questions. This study is considered as a survey research. 53 students are participating in this research. The data are collected through the instrument of mathematical literacy skill test. A quantitative analysis is employed to examine the students mathematical literacy skill levels. Meanwhile, the qualitative analysis is conducted to figure out the students errors in completing the mathematical literacy test. Mathematical literacy is greatly important for students to acquire. Mathematical literacy is an ability to completely master the mathematics concepts and apply them in our daily life. Mathematical literacy skill deals with the ability to formulate, apply, and interpret mathematics in various contexts. The students mathematical literacy is considered still poor. The students difficulties are identified through the students errors in answering the mathematical literacy questions. The students errors in answering the mathematical literacy questions respectively from the highest frequency are: errors in comprehension, transformation, processes, encoding, and reading. Students errors may be utilized as one consideration for the teachers anticipation steps to overcome the students mathematical literacy difficulties.

Keywords: anticipation steps, errors, mathematical literacy, students difficulties

Topic: 1. Mathematics Education

Analysis of Metacognition Skills of Students in Junior High School Based on Cognitive Style

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Abstract

This paper aims to analyze the aspect of mathematical metacognition skills of students in Junior High School based on cognitive style. Metacognition is an important factor of mathematical problem solving. Metacognition is the ability to monitor and control our own thoughts, how we approach the problem, how we choose the strategies to find a solution, or ask ourselves about the problem, in the other word, it can be defined as think about thinking. Another thing that needs attention in mathematical problem solving is cognitive style. Cognitive style refers to a persons characteristics in responding, processing, storing, thinking, and using information to respond to a task or different types of environmental situations. Cognitive style that used in this paper are Field Dependent (FD) and Field Independent (FI) cognitive style. People with FD cognitive style tend to perceive a pattern as a whole, it is difficult for him to focus on one aspect of the situation or analyze a pattern into various parts and people with FI cognitive style tend to perceive separate parts of a pattern according to its components.

Keywords: Metacognition, Cognitive Style

Topic: 1. Mathematics Education
[ABS-745]

Increasing Fractions Performance of 4th Grade Students Through Realistic Mathematics Education

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Abstract
The purpose of this study is to improve the performance of grade 4 students in fractions through Realistic Mathematics Education (RME). This research was conducted at SDN Cilendek Timur 2 Bogor, Indonesia. The research method used is Classroom Action research with Kemmis and Taggart model, which consists of: planning, action, observation, and reflection. This study consists of three cycles. The percentage of students who achieved fraction score more than or equal to 70 in the first Cycle was 12.5%, in the second Cycle was 56.5%, and in the third Cycle was 92%. The activities of teachers and students in accordance with the learning steps with RME reach 92.5% at the end of Cycle III. So it can be concluded that RME can improve student learning outcomes in fractions.

Keywords: Fraction performance, Realistic Mathematics Education
Topic: 1. Mathematics Education

[ABS-746]

Case study : Analysis of Vocational High School students Scientific Creative, Critical Thinking and Argumentation Skills on the Dynamic Fluid Concept

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Abstract
This research aims to analyze the scientific skill in creative thinking, critical thinking and argumentation thinking of vocational High School students in Tangerang district on the dynamic fluid concept. this research, the writer used case study and description analysis by using instrumental such as creature scientific thinking, critical thinking, and scientific argumentation ability. The participant of this research were 33 students from ninth-grade of TSM ini one of SMK Kabupaten Tangerang. The instrument used in this research were one case consisted of 4 creature scientific thinking indicators and one case consisted of 4 scientific argumentative ability. The result of this research showed that the students average score of creative scientific thinking on statis fluida was 34,14 from maximum score 100, so they were in low category. The average of students critical thinking was 24,5 from the maximum score and they were in the low category. However, the average of the students argumentative ability was 43,67 from maximum score 100 and the were in the low category.

Keywords: analysis, creative thinking, critical thinking, and argumentation skills.
Topic: 3. Physics Education
Understanding multimodal representations of junior high school students when writing scientific explanations

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Abstract

This research is an attempt to analyze the understanding of the concept of static electricity in junior high school students expressed in the form of scientific explanatory text from linguistic point of view, for the development of multimodal representation competence. Scientific explanations in the form of text made by 9th grade junior high school students through worksheets in static electricity studies provided by experienced science teachers are data from this study. The text created by the learner is analyzed by examining lexicogrammar through a systemic framework analysis of Systemic Functional Linguistic (SFL). Our analysis identifies specific aspects of the language that students need to be appropriate in expressing an understanding of static electricity that is aligned with the scientific perspective and competence of multimodal representation of learners from the teacher-created worksheet. The findings of this study indicate that conceptual understanding is not sufficient to develop multimodal representations competence. The implications of this research are expected to assist teachers in overcoming linguistic challenges in explaining static electricity, and developing multimodal representations competence.

Keywords: Multimodal representations competencies, Static electricity concept, Systemic Functional Linguistic

The effect of problem solving approach to mathematics problem solving ability in fifth grade

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Abstract

This study is an experimental research that aims to determine the effect of Problem Solving approach to solving mathematical problems in fifth grade. The population in this study is all students of class V SD Islam Athirah Bukit Baruga academic year Makassar 2014/2015 consisting of four classes. The sample of research is two classes, namely experimental class, and control class consisting of 26 students. Both classes were obtained by purposive sampling technique. To obtain the required data, the study was conducted in both sample classes. A technique of data collecting done by observation and test. Data analysis techniques used are descriptive and inferential statistical analysis techniques. The results obtained from the descriptive statistical analysis are: (1) The ability to solve the problem of mathematics of students who were taught by using Problem Solving approach is in qualification capable with the average value of 74.73 and the standard deviation of 21.574; (2) Ability to solve math problems of students who are taught without using Problem Solving approach in qualification less able with average score 55.70 and standard deviation 16.216. From the results of inferential statistical analysis obtained that ability to solve the problem of mathematics students who are taught by using Problem Solving approach is better than the ability to solve problems students who teach mathematics without using Problem Solving approach. From the results of this study can be concluded that the application of Problem Solving approach in learning mathematics affects the ability to solve mathematical problems.

Keywords: Problem solving approach, problem solving ability

Topic: 2. Science Education
The analysis of science literacy knowledge aspects of high school students on the concepts of heat and temperature

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Abstract

Scientific literacy is one of the skills needed in today's digital era so that the ability of the 21st century can be achieved. Science literacy students aspects of knowledge on the topic of heat and temperature physics in high school being the purpose of this research. Science literacy that is used is the result of the adaptation of the PISA year 2015. Research in the form of analysis of science literacy of students in one high school in Bandung has 6 class XII which populations, and taking 1 class as a randomly selected sample. Data collection techniques derived from assessment question of temperature and the heat that has been validated and interviews using interview guidelines. The results showed that the ability of high school students in science literacy is still low with the percentage of each indicator in the aspect of knowledge, 63.45%, Procedural content 73.79%, and epistemic 43.45% if averaged became 60.23%. Science literacy requires increased focus through science literacy trained learning or to develop instruments that can trained the science literacy of the students.

Keywords: scientific literacy, heat and temperature

Topic: 3. Physics Education

Students self-efficacy of mathematics through brain based learning

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Abstract

Self-efficacy is a capability needed by students in mathematics. The research aims to determine whether there are differences of brain based learning and direct instruction model on students mathematics self-efficacy. This research was quasi experimental research with pretest-posttest control group design. The population was fourth graders of State Elementary Schools in Yogyakarta academic year 2017/2018. The sample was randomly assigned to either the treatment or the control group. The data was collected by using self-efficacy scale. The data analysis used independent sample T test. The results show that brain based learning model used in experimental class was more effective in increasing self-efficacy than direct instruction model used in control class. Brain based learning was a learning model that could facilitate students to develop self-efficacy. Brain based learning emphasized a comfortable, fun, emotionally engaging learning environment, and the learning process corresponded to students brain abilities to learn.

Keywords: self-efficacy, mathematics, brain based learning
Topic: 1. Mathematics Education
[ABS-752]

The development of an authentic assessment instrument to measure students skills in learning biology in grade 8 junior high school

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Abstract

Authentic assessment in the 2013 curriculum are echoed for all lessons. The 2013 curriculum emphasizes that student are expected to have knowledge competence, skill competence, and attitude competence. This research was conducted to develop authentic assessment instruments in the implementation of the final assessment of school, especially on the skills aspect so as to obtain valid, practical, and effective assessment instruments. This assessment instrument research uses a 4-D development model. The objective of the research is the skill aspect assessment instrument that was tested on 34 graders 8 Junior High School in the first semester with the experimental One Shot Case Study model. Data analysis using descriptive qualitative. The result of data analysis showed: validation of skill assessment instruments is a very valid (3.56), readability of assessment instruments in categories is interesting and easy to understand, implementation of the assessment instruments entered in a very good category with a very high percentage (97.92%), reliability showed a reliable result (r>0.70). It can be concluded that the development of authentic assessment instruments to measure students skills in learning biology grade 8 junior high schools is valid, practical, and effective.

Keywords: assessment instruments, authentic assessment, skills, 2013 curriculum,

Topic: 5. Biology Education

[ABS-754]

An analysis of eight grade students mathematical reasoning in mean, median, and mode

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Abstract

This paper reports on the level of mathematical reasoning of eighth grade students. The study involved 31 eight grade junior high school students in urban areas in Wonosobo. The data collection used the test in the form of a description problem developed with scoring guidance in accordance with the assessment rubric that has been made. Technique of data analysis in this research by give score on each answer and convert become standard value five criterion. The results showed that the majority of students mathematical reasoning are at an intermediate level. Thus, students need to be accustomed to solving problems that make their mathematical reasoning abilities improved.

Keywords: Mathematical Reasoning, Mean, Median, Mode

Topic: 1. Mathematics Education
Characteristics Pseudo Thinking of Grade 7th Students in Solving Mathematical Reasoning about Number Operation Based on Mindset

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Abstract
Pseudo construction thinking occurs when students assume what is believed to be true / false but is actually not totally true / false. There are two types of pseudo: true pseudo and false pseudo. One aspect of human psychology that affects learning outcomes is the mindset. They are two types of mindset: fixed mindset and growth mindset. The study aimed to describe the characteristics and causes of pseudo grade 7th students in solving mathematical reasoning about number operation based on mindset. This research was descriptive qualitative research. The subjects of this study were 30 Junior High School students in Kebumen. Data collection techniques used mathematical reasoning test, questionnaire mindset, and interview. The mathematical reasoning test was constructed with indicators making a conjecture. Questionnaire of mindset adapted from Mindset Work. Interviews were used to support the validity of data related to subjects indicated to have pseudo. Based on the result of the research: 1) there are 20 students with growth mindset and 10 students with fixed mindset, 2) fixed mindset students only experienced false pseudo, 3) student growth mindset experienced both types of pseudo and 4) the cause of these pseudo were conceptual error and procedural error.

Keywords: Mathematical Reasoning, Pseudo, Error, Mindset, Number Operation

Profile of pre-service physics teachers decision-making skills related to electric circuit

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Abstract
Higher education is a process of developing human resources that master various skills needed to meet the challenges of the 21st century. One of the important skills to have in order to compete in facing the challenges of the 21st century is the decision-making skills. This study aims at describing the profile of pre-service physics teachers decision-making skills related to electric circuit. This research is a descriptive research conducted in the physics education program at one of the private universities in Jakarta. Data collection is done through the test of decision-making skills related to electric circuit. The collected data is analyzed quantitatively. The results showed that 0% of students were in the category of high decision-making skills, 20% on moderate decision-making skills, and 80% on low decision-making skills. Thus, the decision-making skills of pre-service physics teachers still belong to low category.

Keywords: Decision Making Skill, Electric Circuit

Topic: 3. Physics Education
[ABS-759]
Prepping 21st-Century Teacher Candidates through Embryology Learning with Technological Pedagogical and Content Knowledge (TPACK) Framework

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Abstract
This study is aimed at discovering the effectiveness of Technological Pedagogical and Content Knowledge (TPACK) framework in establishing master of Embryology concepts and 21st century teachers characteristics on students of Biology teacher candidates. The representation of Embryology learning materials were changed into the form of interactive multi-media uploaded on Learning Management System (LMS) Moodle which could be accessed through the internet. The learning taking place using blended learning method was attended by 49 students. The measurement of dependent variables were conducted through LSM and in-class direct observation. The result of the study shows that learning using TPACK framework can enhance the mastery of Embryology concepts significantly (pre test X score = 7.35, post test X = 15.35, t(48) = 0.74, p < 0.05) and effective in building the character of 21st-century teacher candidates who have 21st-century skills.

Keywords: 21st-Century Teachers, Teaching Embryology, TPACK
Topic: 5. Biology Education

[ABS-760]
Pre-Class Tutorial: An Instructional Strategy to Improve Student Understanding in P-V-T-S Diagrams in Thermodynamic Course

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Abstract
The Pre-Class Tutorial have been used to successfully improve deep conceptual understanding and skills to draw and interpret the PVT diagrams in Thermodynamic Courses. This study was motivated by the previous research findings that students encounter the lack of conceptual understanding to draw and interpret the PVT diagrams to describes thermal process and Cycles. The analysis of the academic responses at written test shows that some of the students conceptual difficulties as follows. First, the biggest difficulty in each PV, PT, and VT diagram is to draw an adiabatic proces. Second, The percentage of students who answer the PV diagram correctly is higher than those who answer the PT and VT diagram. Third, Students prefer understanding thermal processes with their unique characteristic, such as isobaric with constant pressure, isotherm with constant temperature, and isochoric with volume constant. Finally, lack on understanding the concept of PVT diagram also impacts students understanding on various thermal cycles. Based on these findings, we developed pre-class tutorial that facilitate students either to construct their own concepts to draw and interpret the PVT diagram. The descriptive method was used to involve 34 third-years students of Physics Education Department. The increased conceptual understanding was identified from the average of students achievement score on the instrument test. The findings showed that the use of preclass tutorial effectively improves students conceptual understanding in draw and interpret the PVT diagrams to describes thermal process and Cycles

Keywords: pre-class tutorial, P-V-T-S diagrams, thermodynamics
Topic: 3. Physics Education
The Effect of Structured Individual Responsibility on Students Achievement in Cooperative Learning Science Class

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Abstract
Generally student group projects can be problematic due to the lack of structured individual responsibility leading to the uprising of the social loafing phenomenon among the students. The aim of the present research was to compare types of cooperative learning models which is least structured individual responsibility (STAD type) and more structured individual responsibility (jigsaw type) with two groups of junior high school students (14-15 years old). The research design was quasi-experimental with crossover-repeated measurements design within two sessions. The sample consist of 61 students of a junior high school studying he topic of magnet in Bandung (Indonesia). The results of a pre-test and a post-test for each session were compared for the two groups. The working hypotheses were the group who is given more structured individual responsibility (jigsaw) perform better in learning the topic of magnet. With respect to Hypothesis, the results appeared to show a better improvement in learning in the jigsaw group compared to the STAD group, as it is shown both in the statistical test and comparison between the n-gain value.

Keywords: Individual Responsibility, Students Achievement, Cooperative Learning, STAD, Jigsaw, n-gain value
Topic: 3. Physics Education

Students Concept Mastering Analysis on Astronomy: Case Study in Physics Education
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Abstract
The course of astronomy as a new course in the curriculum that must be taken by physics teacher candidate at PGRI University of Semarang. Astronomy in front of students is known as part of science-based science that gives curiosity about the science of religion and technology. Mastery of Astronomy concept of teacher candidate is analysis with the aim to take a picture of mastery of concept and process of astronomy lecture which is a new course as the base of development of astronomy learning device based on KKNI. This research method is descriptive quantitative and qualitative. Technique of collecting data is done by triangulation through analysis of test result, astronomy lecture observation, and questionnaire response of physics teacher candidate. Data analysis technique is done descriptively. The results obtained that the results of the test document analysis obtained the test instrument subjects more dominant astronomy on aspects of concept understanding, no test items that measure the realm of analysis and creation. Analysis of test results obtained that the ability of the most dominant students in the realm of knowledge and the lowest ability in the realm of application. The results of observation suggest that astronomical learning is applied by lecture, discussion and assignment methods. Lecturers give lectures related to content, student discussions to discuss more in-depth Astronomy content and assignment to students to make logbook about celestial phenomena. The results of the student questionnaires give a positive response to astronomical learning that provides contextual knowledge in life.

Keywords: Students Concept Mastering, Astronomy
Topic: 3. Physics Education
[ABS-763]
Correlation between cognitive abilities to the scientific creative thinking ability and scientific critical thinking ability on sound wave concept

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Abstract
The aim of this study was to describe the correlation between cognitive ability to the scientific creative thinking ability and scientific critical thinking ability on sound wave material. This study used an analytic descriptive method. The population of this study were 11th grade students of SMAN 3 Cimahi academic year 2017-2018 which contained 20 participant. The instrument used is a multiple choice questionnaire for cognitive tests and an essay questionnaire for the scientific and critical scientific thinking skill test. From the conducted study related to the correlation between cognitive ability to the scientific creative thinking ability and scientific critical thinking ability showed a high correlation with correlation coefficient for cognitive ability with scientific creative thinking ability was 0.63 and correlation coefficient for cognitive ability with scientific critical thinking ability was 0.65. From the results it can be concluded that it has a good correlation.

Keywords: Cognitive Ability, Scientific Creative Thinking Ability, Scientific Critical Thinking Ability
Topic: 3. Physics Education

[ABS-764]
Use of RME Approach in Learning KPK and FPB to Increase Critical Thinking Skill

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Abstract
This paper is a Classroom Action Research conducted in 5th grade of Primary School. This research was conducted in three cycles to see the effectiveness of Realistic Mathematics Education approach in learning about the Biggest Fellowship Factor and Multiple Fellowship in Improving Student Critical Thinking Abilities. Critical Thinking is one of four 21st century skill through Mathematics. In the process of lesson, students will be train the oher skill; comunication and colaboration. The background of this research is Students who have a concept of mathematical form but not able to solve daily lives problems. The implementation of the study in first cycle of learning to use the problems in their daily lives with completion student by using a real object. In second cycle of learning with daily lives problems, the students do a simulation of FPB. In third cycle of learning with daily lives problems and students solve problems using the math concept, the students has been managed to construct a concept. Author argues that this concept will be able to be used to solve the problem and match the way with the RME approach. The result of research proven learning Realistic math can improve students Critical Thinking abilities.

Keywords: Realistic Mathematics Education, critical thinking
Topic: 1. Mathematics Education
The profile of logical thinking biology prospective teachers

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Abstract
Certain program in practical work or lecture often 100% achieved but the achievement result seems still very low. The variety of student backgrounds in a private LPTK also worsened the situation. Therefore it was important to detect first their logical thinking ability as their background or their position in intellectual development before they joint certain courses. This preliminary descriptive study was conducted to investigate the logical thinking ability and scientific reasoning level of prospective teachers at two universities in the area of kopertis VI academic year 2016/2017 (n=84). The data on logical thinking was collected through the standardized test (TOLT) that had been validated for students from middle school up to doctorate degree. The research finding shows that about 38% of the respondents were still in the concrete operational level, 29% in transitional level, and only 33% informal operational level. In general, all indicators of students logical thinking ability can be revealed by the test with different percentage values. This condition explains why most of the prospective biology teachers at private university in the area of kopertis VI have difficulties in learning abstract biology concepts, and that this conditions should be handled through direct activities (hands-on) in programs.

Keywords: intellectual level, practical work in Biology course, reasoning ability

Correlation of Cognitive Ability Relevance to the Ability of Scientific Creative Thinking and Scientific Critical Thinking Skills of Students of Work and Energy Concept

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Abstract
The aim of this study was to analyze the correlation of cognitive ability relationship to the ability of scientific creative thinking and students critical scientific thinking ability. According to the aim mentioned, research method used was correlation research because in this research there was no effort to influence the research variables (there is no manipulation of variables). Data obtained in the form of cognitive test results consisting of twenty multiple choice questions, scientific creative instrument test results consisting of two cases described into four point description of the description in each case and test results of scientific critical instruments consisting of two cases described each three points. Participants are high school students in Cimahi city consisting of 32 students. Cognitive tests are sorted by sub-chapter on work and energy and divided into four cognitive levels ranging from C1 to C4. Scientific thinking thinking tests are based on the Scientific Structure Creativity Model (SSCM) with three assessed abilities of fluency, flexibility and originality. While the critical thinking test instruments are based on the Assessment of Critical Thinking Ability (ACTA) with the three capabilities being reviewed Critical Thinking Ability 1, Critical Thinking Ability 2 and Critical Thinking Ability 3. From the data correlation coefficient value for the relationship of cognitive ability with creative thinking ability is 0.743578, the correlation coefficient value for the relationship of cognitive ability with critical thinking ability is 0, 745445, while the value of correlation coefficient relationship of creative thinking ability and critical thinking ability is 0.45003. From the above results, there is a very strong relationship between the ability of creative thinking and critical thinking ability with cognitive ability while the relationship between the ability of creative thinking and critical thinking ability is said as a moderate relationship.

Keywords: Cognitive Ability, Scientific Creative Thinking Ability, Scientific Critical Thinking Ability

Topic: 3. Physics Education
Application of Self and Peer Assessment with Feedback To Improve Control Concepts and Habits of Mind Students On Acid Titration Materials Bases

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Abstract

This study aims to apply self and peer assessment with feedback to improve the mastery of concepts and habits of mind students on the topic of acid-base titration. Self-assessment is an assessment carried out by ourselves on the progress achieved through the workings, while peer assessment visits of the ability of an individual to contribute to the task group. The method uses a quasi-experimental study with nonequivalent pretest-posttest control group design. The instrument used to collect research data is the format of self and peer assessment, a matter of mastering the concept of acid-base titration, habits of mind questionnaire, interview and questionnaire responses of students. Tests mastery of the concept of acid-base titration validated by 5 experts in the field of chemistry and formed a CVR index (Content Validity Ratio) between 0.60 to 1.00. Reliability tests mastery of acid-base concept involving 60 respondents XI MIA 1 and MIA 2 High School processed using SPSS 24.0 produce Cronbach alpha value of 0.75 including high criteria. Further research will be carried out self and peer assessment with feedback to determine the impact on mastery of concepts and habits of mind students.

Keywords: self and peer assessment, Feedback, mastery of concepts, habit s of mind, acid-base titration.

Topic: 4. Chemistry Education

How to develop student creativity through teaching materials of reaction rate STEM-based?

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Abstract

The purpose of this research is to produce teaching materials (reaction rate) based on STEM to develop student creativity. The research method using is Development Research, the method of development of teaching materials used is Four Steps Teaching Material Development (4S-TMD). This article is the first part of the development of teaching materials that includes the steps of selection and structuring. The selection steps consists of the development of indicators, the selection of concept labels, the selection of concept definitions derived from international textbooks, and the development of aspects of STEM. The steps of structuring is organizing concepts and materials into concept maps, macro structures, and multiple representations. The results of the first two steps of this study are the design of STEM-based teaching materials. The evaluation of the draft of teaching materials is done by an expert lecturer in the field of chemical education to assess the feasibility of teaching materials. The result of the research indicates that the teaching material developed has been in accordance with the curriculum requirement, has guaranteed the scientific truth, the value and the STEM aspect in accordance with the subject, and the concept map, macro structure, multiple representations developed are valid.

Keywords: teaching materials, four steps teaching material development, reaction rate, student creativity

Topic: 4. Chemistry Education
Preliminary Study: Development of science-based science, technology, engineering, and mathematics materials for improving critical thinking skills of elementary school student

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Abstract
Indonesian education in the era of the fourth industrial revolution should be able to produce generations have the critical thinking skill and ready to compete with technological advances in the future. Currently research on the development of teaching materials based on Science, Technology, Engineering, and Mathematics (STEM) is needed to change paradigm of education from partial to holistic. This research is a preliminary study to develop STEM-based science materials to improve students critical thinking skills. This study uses qualitative methods by using questionnaires, interviews, observations, and review of teaching materials that are already available. Preliminary study was conducted in 5 schools involving 10 elementary school teachers and 150 students. The results of this study indicate that science and math learning is a key development of technology today. Students and teachers need teaching materials that combine science, technology, engineering and math as a new breakthrough in learning. With engineering-based learning, students are expected to think more critically.

Keywords: fourth industrial revolution, STEM based science, critical thinking skill

Topic: 6. STEM Education

[ABS-772]
Application of the scientific approach to improve the mastery of concepts and science process skills of high school students on work and energy

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Abstract
Mastery of concepts is one of important things to measure achievement of the learning objectives in mastering the concept of physics, process skills are required. The research used pre-experimental design with one group of pretest-posttest design which aimed to get an overview of improvement of mastery of concepts and science process skills on work and energy after the application of scientific approach in learning. The research instrument consisted of 19 items of concept mastery test shaped the essay, referring to revised Bloom taxonomy with a reliability of 0.64 and student worksheet to measure the student science process skills referring to the worksheet developed by Rezba. The instrument is applied to 32 nature students of grade 11 in one of the senior high schools in Bandung which is selected by purposive sampling. The measured concept mastery aspects are related to cognitive aspects based on Bloom Taxonomy which consists of the aspects of understanding (C2), applying (C3), and analyzing (C4). The measured science process skills aspects consisted of identifying variables, predicting, constructing hypotheses, and experimenting. The results showed that there were an increase in concept mastery with a normalized gain value of 0.48 and science process skills from a fair to excellent level.

Keywords: Science Process Skills, Concept Mastery

Topic: 3. Physics Education
[ABS-773]
Mathematic Learning Design Using Inquiry Based Learning For Geometry Nets Topic In Elementary School Grade V

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Abstract
This study aimed to determine the design of mathematics learning using inquiry based learning for the topic of geometry nets in Elementary School grade V. The research method used was a qualitative approach with DDR (Didactical Design Research) method. The research strategy used was triangulation strategy. In this case, the researcher used essay test, observation, interview and documentation for the data source from students of grade V Cigugur Elementary School. The results of this study showed that in obtaining optimal learning outcomes, the preparation of mathematics learning design considered not only the components contained in the design of learning, but also the learning obstacle and student trajectory.

Keywords: Inquiry Based Learning, Didactical Design Research, Learning Obstacle, Learning Trajectory
Topic: 1. Mathematics Education

[ABS-774]
Traditional Knowledge Of Medicinal Plants For Health Of Women In Cibodas Village Lembang Subdistrict West Bandung Regency And Their Potency To Development Of Biodiversity Education

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Abstract
This qualitative study aims to explore the traditional knowledge information about the plants used for health of women, the folk classification and the conservation of medicinal plants which do villagers in the Cibodas Lembang West Bandung Regency, West Java Province. The research subjects involved consisted of 66 villagers residing in Cibodas Village. The results show that there are 113 species of medicinal plants used for health of women in this village in various ways of preparation and mode of use. There are about 98 kinds of diseases that generally assisted be made well with medicinal plants. Folk classification of medicinal plants is a horizontal classification with artificial and natural systems. Conservation efforts by society in the form of planting certain medicinal plants along the placenta and planting in the yard and garden. The response of community is very good. They perhaps that diversity of medicinal plant and its conservation can be included to school curriculum as part of biodiversity education.

Keywords: traditional knowledge, medicinal plants, folk classification, conservation, biodiversity
Topic: 5. Biology Education
[ABS-775]
Learning progression of Madrasah Aliyah students in remedial teaching about interaction of an electrically charged object with a neutral object concept using CSCCText

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Abstract
The objective of this study was to construct and test Computer Supported Conceptual Change Text (CSCCText) for facilitating students learning progression in in remedial teaching about static electricity concept. The pre-experiment method was using as a research method with a one group pretest-posttest design. The study is based on 30 students in one of Madrasah Aliyah in Bandung city. Students conceptions and confidence levels are identified in the part-I and part-IV of CSCCText. CSCCText was designed based on students misconceptions by following six-phase Conceptual Change Model (CCM) synthesized by Stepans with reliability is 0.8. Students learning progression about the interaction of an electrically charged object with a neutral object concept was evaluated by comparing the initial conceptions of students identified in part-I of CSCCText with the final conception of students identified in part-IV of CSCCText Data were analyzed using quantitative approach. The types of learning progression reviewed include: consistent with scientific conception type, well progression type, no progression type and degraded type. From quantitative analyses suggest that the use of CSCCText in the remedial teaching of static electrical concept were facilitated students learning progression. Of the total subjects, 8.00% were in consistent with scientific conceptions type, 75.00% were in well-progression types, 17.00% were in no-progression and 0% were degraded type. If it calculated from the number of students who initially misconception and lack of knowledge, then get the number 82.00% of students are in the well-progression type. This shows that the use of CSCCText has a high effectiveness in facilitating students learning progression with the well-progression type.

Keywords: Learning progression, CSCCText, Remedial teaching

Topic: 3. Physics Education

[ABS-776]
Identification Creative Thinking Skills in Primary School

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Abstract
The ability of creative thinking is that must be possessed by students to life and challenge in 21st century. The ability that must be owned by students is creative thinking. The purpose of this research is to know the creative thinking ability of fourth grade students in elementary school on energy concept. The concept of energy is chosen because the concept is studied on basis from third to sixth grade in primary school. The number of respondents in this study were 51 students. This article uses an essay test instrument that is use indicator of creative thinking that is fluency, flexibility, originality, and elaboration. The data obtained are the lowest creative thinking ability in the indicator of originality and elaboration. The result of creative thinking ability in fluency and flexibility stage is classified. The result of this research is the creative thinking ability of elementary school students on the concept of energy very low and the need for a learning activity that is able to familiarize elementary school students to be able to think creatively to be ready to compete globally in the face of the 4th industrial revolution as a form of life challenge in the 21st century.

Keywords: creative thingking skills, primary school

Topic: 2. Science Education
[ABS-777]
Application of cooperative learning model make a match to improve student learning achievements on lesson of materials functions of human digestive organs in fifth grade of primary school

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Abstract
This study aims to improve student learning outcomes of fifth grade on primary school on the material function of human digestive organs by applying cooperative learning model Make a Match in science learning in primary school. Research method used is Classroom Action Research which starts from planning, implementation, observation and reflection then made improvement planning used in next cycle. This research consists of two cycles, each cycle is done in two meetings. The results showed that by applying cooperative model Make a Match in science learning can improve student achievements. Assessment of Cycle I RPP was 73% and increased by 10% to 83% in cycle II. While the implementation of learning cycle I by 77% and increased by 6 percent to 83% in cycle II. The results of student achievements in the first cycle of 74% and increased by 12% to 86% in cycle II. Based on the data analysis, it can be concluded that the application of cooperative model of Make a Match in science lesson can improve student achievements in fifth grade.

Keywords: Cooperative Model Make a Match, Learning Achievement, Science.

Topic: 2. Science Education

[ABS-778]
Analysis of student habits of mind after the implementation of inquiry based learning with levels of inquiry

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Abstract
In order to prepare teachers and next generation for twenty first century can act based on their higher order thinking skills, teacher, students need have relevant experience. In Biology instruction, it seems needed habits of higher order thinking in solving problem in processes such as inquiry based learning. Through inquiry, the students will be able to develop science and intellectual skills necessary to solve problem and find out the answer to fulfill their curiosity. A descriptive study was carried out to investigate students habits of mind after having experience in IBL in certain topics, among others were topic in Biodiversity. Habits of Mind with 16 categories, meanwhile IBL with six levels of inquiry (discovery learning, interactive demonstration, inquiry lesson, inquiry lab, real world application and hypothetical inquiry). Qualitative method in this research was conducted with the use of questionnaire on Habits of mind and individual interview toward students. Research results show that students Habits of mind is in average category, the IBL can facilitate students higher order thinking experience, and most of the students agree to lengthen the implementation of the IBL for other Biology topics so as to be able to become good thinker in near future.

Keywords: Habits of Mind, Higher order thinking, Level of Inquiry

Topic: 5. Biology Education
The implementation of authentic assessment through project-based learning to improve students problem solving ability and concept mastery of environmental pollution topic

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Abstract

This study aims to obtain the information about improving of students problem solving ability and concept mastery after the implementation of authentic assessment through project-based learning of environmental pollution topic. The subject of the study were 10th grade students consist of 40 students in a senior high school in Bandung. The research method was weak experiment with the one-group pretest-posttest design. The instruments used for this research are the test of problem solving ability and concept mastery, completed with observation sheet, questionnaire as students responses, product assessment and students worksheet. Students problem solving ability was measured by pretest and posttest questions referred to the problem solving aspect of Marzano while concept mastery was measured by pretets and posttest referred to Revised Blooms Taxonomy. Data were analyzed using quantitative way with N-Gain value. Students problem solving ability showed the point of N-Gain 0.72 while the concept mastery N-Gain 0.70. The results of the study shows that the implementation of authentic assessment through project-based learning can improve students problem solving ability and concept mastery with high category.

Keywords: Authentic Assessment, Project-Based Learning, Problem Solving Ability, Concept Mastery

Topic: 5. Biology Education

Mathematical Self-Esteem of Junior High School Student based on Gender

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Abstract

Abstrak: The formulation of the national education paradigm of the 21st century that education should be oriented to the science of mathematics and natural sciences. Mathematics is one field of science that helped determine and support the progress of science and technology. In studying mathematics, there are still many students both male and female who view mathematics as a boring subject. Based on that, the gender aspect in the learning of mathematics became the attention of educators. Gender differences not only result in different abilities in mathematics, but also how to acquire mathematical knowledge. This research is a quantitative descriptive research which aims to describe students self-esteem mathematics based on gender and its relationship with mathematics achievement. A total of 110 female students and 79 male students became respondents in this study. The results showed that female students had higher levels of mathematical self-esteem compared to male students and mathematical self-esteem had a positive relationship to student achievement.

Keywords: Students Self Esteem on Mathematics, Mathematical Achievement, Gender

Topic: 1. Mathematics Education
The basic physical program based on education model online assisted by alfa media to increase creative thinking skills

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Abstract
This research was conducted to find out the level of creative thinking skill of physics education student at Universitas muhammadiyah makassar, through basic physics education program based on education model online (edmodo) with alfa media aid. In addition, this study is also to determine the response of students to the lecture program. Edmodo is an application of learning model with online learning system. Edmodo provides a more effective environment for lecturers and students in carrying out learning. In descriptive analysis of pretest data, creative thinking skills obtained an average score of 8.89 with a standard deviation of 1.72. Maximum score obtained 11 and minimum score of 6 of the ideal score of 20. In descriptive analysis of posttest data of creative thinking skill that is average score 13.30 with standard deviation 1.77. Maximum score obtained 17 and a minimum score of 10 of the ideal score of 20. The result of student response questionnaire is the average percentage of student response to the implementation of learning is 78.30 percent. Then it can be concluded that the student response is in the high category.

Keywords: Education model online, Basic physics program, Alfa media
Topic: 3. Physics Education

TPACK and Habit of Biology Teachers in Teaching and Learning

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Abstract
The integration of technological knowledge, pedagogical knowledge and content knowledge in the form of TPACK is important in content representation of biology concepts to become students easily understand. Does the cultural background, local wisdom and school environment affect to the formation of biology teacher TPACK? To answer that question the research on teachers TPACK has been conducted. The research aimed to find out whether the background of local cultural of biology teacher and school environment are effecting to the TPACK of biology teacher. The research instruments have administered to 4 biology teachers in West Java and 8 teachers located in West Sumatra. They are a rubric content representation analysis (CoRe) and rubric TPACK implementation analysis for biology lesson. The results showed that 12 teachers did not significantly indicate TPACKs specificity as an influence of cultural background and school environment. TPACK teachers are more dominantly influenced by the demands of syllabus and textbook content.

Keywords: TPACK, technological knowledge, pedagogical knowledge, content knowledge, local culture
Topic: 5. Biology Education
[ABS-783]

The Environmental Ethic of Local Wisdom of Aga Tenganan Pegeringsingan (Bali) in Conserving their Environment

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Abstract

The aim of this research is to study about environmental conservation of Aga Tenganan ethnic group in Desa Pakraman Tenganan Pegeringsingan Karangasem Bali. Qualitative descriptive method is carried out in this research. Field observation is done and fifteen respondents including children and adults is selected in this study. Data is collected from questionnaire and interview from respondents. The findings of field study shows that Aga Tenganan are still maintaining their local tradition. It shows with the presence their social practices in meeting places such as bale banjar, bale wantilan and bale subak; awig-awig which have to be obeyed by all local people; local tradition ceremony Mekare kare related to environment; and forest preservation. High attention of local people in environmental conservation is supported by their environmental science education background. Based on data collected from 15 respondents shows that environmental science education is taught from elderly people (80%) and parents (76%). However, the rubbish and wastes produced by people activities needs more attention.

Keywords: Environmental science education, local tradition people, environment conservation

Topic: 5. Biology Education

[ABS-786]

Basic skills and Generic Competency of Postgraduate Students When They Designing Biology Laboratory Worksheets

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Abstract

Basic skill is the ability to work in the laboratory as an integrated science process. Generic competence is the competence with the workplace performance. Both competencies are needed by various and diverse students. This study aims at how to develop both these competencies through lectures on the Development of Biological Practicum when they did project-based learning. Students were given the task to analyze the laboratory worksheet that used in the school, then tested themselves in the laboratory and reconstructed it. Based on the experience, students were given the task to design the new lab activity worksheet. This study uses two classes of students as participants in the academic year 2016/2017 with two lecturers as mentors. The results showed that the basic student competence is an insufficient category with the average 56.4, standard deviation 16.1, while generic competence is in good category the average 77.8, and standard deviation 12.6. The diversity of students can be seen from the width of standard deviation variability, this is due to the diversity of students coming from several of the Indonesian archipelagoes besides coming from different universities both public and private.

Keywords: basic competence, generic competence, biology laboratory worksheet

Topic: 5. Biology Education
[ABS-787]
Students looking back on mathematical word problem solution

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Abstract
An important aspect of solutioning on mathematical word problem is looking back. The study aims to analyze students ways of looking back on mathematical word problem solving solution. The method used in this study was qualitative with grounded theory was used to understand the data and build the models. The subject were fifth grader students of an elementary school in Bandung, Indonesia. Through the activities of looking back, students can understand the mistakes and enable them to make improvements. Looking back is a powerful activity that allows students to be flexible when building a solution. By looking back, students can validate ideas throughout the problem solving process.

Keywords: Looking Back
Topic: 1. Mathematics Education

[ABS-788]
Pre-service Physics Teachers Mental Models of Heat and Conduction: A Case study

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Abstract
Identifying the students mental models in heat conduction forms the foundation for re-construction the introductory physics learning. In order to probe students mental model on heat conduction, we conducted a qualitative study. In this paper, the authors describe the process of a multiphase study aimed at inferring the pre-service physics teachers mental models of heat conduction. Semi-structured interviews were conducted to 31 students from two different teaching preparation institutions in West Java Province, Indonesia. They were all enrolled in Introductory Physics to elicit their understanding, explanation, and prediction of heat conduction phenomena. Students mental models were found to be dominated by unscientifically accepted mental models. These findings led teacher educator to suggest changes in the way that thermal topics are addressed in introductory physics course.

Keywords: mental model, heat, convection
Topic: 3. Physics Education
Design and develop Physics E-book for senior high school that contains of balance of science literacy aspects in dynamics fluid topic

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Abstract
Physics E-book for senior high school has been designed and developed. The e-book that has been developed has a unique characteristic. Balancing science literacy aspects based on the qualification from Wilkinson had been referred. The research and development method by Dick and Carrey has been used. The steps of the research were Analysis, Design, Development, Implementation and Evaluation. Physics E-book with balance of scientific literacy aspects has been validated by six experts both from the content, media, and the balance of the scientific literacy aspects. The effectiveness of this e-book has been measured by implemented the e-book to 30 students in one of public senior high school in Bandung City. The results described that the effectiveness of the e-book was high. We concluded that the designed Physics E-book that contains of balance of scientific literacy aspects in dynamic fluid topic is qualified and can be used as one of the learning sources in Physics learning.

Keywords: Physics E-book, Balance of science literacy aspects, dynamic fluid

Profile of Scientific Literacy Competence Student on Temperature and Heat Matter

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Abstract
This study aims to obtain a scientific Literacy profile on a competency domain that refers to the PISA 2015 framework. Such competences include explaining scientific phenomena, interpreting data and scientific evidence, planning and evaluating investigations. The instrument used consists of 32 multiple choice questions. Based on the results of the analysis, the validity of the test used was 0.83 while the reliability is 0.76, both of which are high category. The research was conducted on the students of class XII in one of the SMA Negeri in Bandung. The results show that the competence of student science literacy still low and need to be improved. Competence explains scientific phenomenon gets percentage 56, interpret and scientific proof gets percentage 58, while planning and evaluating experiment gets percentage 40.

Keywords: scientific literacy, framework PISA 2015, Temperature and Heat Matter

Topic: 3. Physics Education
[ABS-791]
The Social Media WhatsApp to Support Physics Learning Problem Solving on Tutorial Online Activities in Distance Education

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Abstract

One of the subjects that must be taken by distance education students of Physics of Open University is PEFI4201 Physics Learning Strategy. The average score obtained by students in PEFI4201 courses is low. To master the concept of this course students are given learning assistance services in the form of online tutorials in addition to studying the module as the main teaching material. However, the students activity in the tuton is less encouraging. Thus the social media WhatsApp (WA) is required to enable students to follow the online tutorials.

The purpose of this research is to describe WA communication process in support of online tutorials implementation. The method used in this research is descriptive qualitative to analyze WA communication process in support of online tutorials implementation. The results of this study obtained that WA strongly supports student activeness in online tutorials. Communication occurring from 28 August to 29 October 2017 consists of academic administration 6.67%; reminder 22.42%; explanation of material 62.42%; and technical explanation elearning 8.48%. Two-way communication can work well through WA, because WA is more familiar to be accessed anywhere, anytime. If the student is late to access every step of the weekly learning activity on the online tutorials, be reminded through WA. Progress of individual progress in completing discussions and online tutorials assignments informed through WA with the intent to motivate students to immediately follow the discussion and complete the online tutorials task. Thus it can be concluded that social media WA can support online tutorials activities.

Keywords: WA, problem solving, online tutorials activities, distance education

Topic: 3. Physics Education

[ABS-792]
Softskill Profile and Prospective Students Habits Of Mind Biology Teacher

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Abstract

Softskill and habits of mind is an ability that must be possessed by biology teacher candidates especially in solving problems. This study aims to describe the profile of softskill and habits of mind of biology teacher candidate of FKIP Pasundan University. This research used survey method with qualitative descriptive technique. The results of the research obtained information that there are 12 subjects are dislike by the students of Biology Education Program of Unpas University, those are: Genetics, Physiology and Entomology, Criptogamae Botany, Phanerogamae, Statistics, Nutrition Science, Animal Physiology, Sundanese Culture, Chemistry, and Physics for Biology. The ability of students thinking skill of Biology Education Study Program of FKIP Unpas in problem solving especially in solve a problem as a whole has bad category. There is a relationship between the subjects that are not preferred by students with students softskill in general.

Keywords: softskill, prospective students, Habits Of Mind

Topic: 5. Biology Education
[ABS-793]
The effectiveness of physics e-book that contains balance of scientific literacy aspects in increasing scientific literacy skills: A case study to 32 students in one of public senior high school in Bandung

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Abstract
Physics e-book with balance of science literacy aspects on static fluids based on 3D Flip book had been designed and developed. The e-book has been implemented to 32 students to investigate the effectiveness of the e-book. One shot case study design has been chosen as a research design. Scientific literacy skills of the students have been measured after the students were treated in learning aided with physics e-book. The research data obtained results test of science literacy skills students and related with result of student respons on the e-book. The results showed that the implementation of e-books was effective for use in physics learning, especially in improving of science literacy skills, with an average score of 86.0% and students provide a positive response on the e-book.

Keywords: physics e-book, balance science literacy aspects, static fluids, 3D Flipbook
Topic: 3. Physics Education

[ABS-794]
The Ability of Elementary Teacher Candidate STKIP Subang in Developing Material Learning by Scientific Approach

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Abstract
The scientific model is one of the learning models that embrace constructivism theory. This can be explained because the scientific model always strives for learners to discover knowledge and then construct in their own minds through scientific activities. This study aims to determine and describe the ability of STKIP Subang students in developing learning tools scientific approach that is done with the pattern analysis document or called content analysis, or information analysis. Based on the exposure and discussion it can be concluded that the ability of prospective teachers in developing scientific learning tools is dominated in the medium category, both in the development of lesson plans (RPP), teaching materials and scientific student worksheets. From the results of this study, it is necessary to develop the ability of prospective student teachers in STKIP Subang in developing scientific learning devices.

Keywords: learning tool, elementary teacher, developing material, scientific approach
Topic: 2. Science Education
Abstract
This research aims to know the impact of formal operationing in system thinking skills on climate change content through climate change course which is using system approach epistemology. The research design is quasi experiment by comparing groups of students with formal pre-operationing and operationing on two lectures i.e. human and environment (n=34) and Earth and Space Science (n = 30). Testing the level of students reasoning are using reasoning test TOLT and CCSTI (Climate Change System Thinking Instrument) for testing student system thinking skills. The results showed that the level of students reasoning on the lecture of the human and environment affect the system thinking skills especially indicators III and IV indicators with a value of Cronbach Alpha 0.048 and 0.008. Meanwhile the level of reasoning has no effect on student teachers of physical education with the Cronbach alpha value of 0.005 >. Based on the value of Cronbach Alpha obtained, it can be concluded that it was not a formal knowledge which affects the system thinking skills in climate change content but the prerequisites knowledge and post formal operationing.

Keywords: system thinking, climate change, formal operationing

Topic: 2. Science Education

Abstract
This study is a survey having a goal to analyze students mathematical creative problem solving ability, self efficacy, and its association. This survey involves 25 eight grade students, a mathematical creative problem solving ability (MCPSA) test, and a mathematical self efficacy (MSE) scale. The MCPSA essay test contains 3 items and the MSE scale is compiled in Likert’s model. The survey found that students MCPSA was at low grade level and students realized difficulties in some items of MCPSA tasks. Even though on MSE, survey found the students grade was at fairly good level. The other findings, there was no association between MCPSA and MSE.

Keywords: creative problem solving, self efficacy

Topic: 1. Mathematics Education
[ABS-798]
Implementation of Free Inquiry Learning Model to Establish 21st Century Skills

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Abstract
Free inquiry learning model through field trip activity on Invertebrate Zoology and Macro algae courses for prospective biology teachers need to be done, as efforts to establish 21st century skills to compete in globalization era. The skills in the 21st century include three domains of competence: cognitive, interpersonal, and intrapersonal. The research purpose to describe cognitive, interpersonal and intrapersonal competencies for a prospective biology teacher. This research uses a quantitative approach to survey method. The subject in this research is the student in Syekh Nurjati Institute of Cirebon 3rd semester who took the courses of Invertebrate Zoology and Macro algae subject. Data collection through observation and filling questionnaire. The data were analyzed using a descriptive analysis. The results showed that cognitive competencies include cognitive process and strategies, knowledge and creativity with a range of score 80-98, while Likert scales data of measurement results on intrapersonal and interpersonal competencies showed positive results. The conclusion that free inquiry learning model through field trip activity can establish 21st century competencies needed for a prospective biology teacher.

Keywords: 21st century skills, free inquiry learning
Topic: 5. Biology Education

[ABS-799]
Analysis on Senior High School Student Reasoning Skill

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Abstract
This research aims to get analyzation of reasoning skill in Senior High School level. Defined as ability in drawing conclusion expressed in logical argument, the analyzation on reasoning skill is measured by student argument in answering essay question involving respiratory system topic. The arguments are categorized into five levels based on Toulmin Argumentation Pattern (TAP) consists of claim, data, warrant, qualifier, backing, and rebuttals. The subjects are students of Senior High School chosen by purposive sampling. The method used in this research is descriptive. The results shows that level of students argumentation lies 29.17% on level one and 70.83% on level two. The arguments of the students are also categorized into weak and strong argument, with 69.23% arguments dominated by weak arguments. This results indicates that most of Senior high school students are still having difficulty in giving explanation on their claims using data and relate to fact or theory they have acknowledged.

Keywords: Reasoning Skill
Topic: 2. Science Education
Implementation of advance organizer model to improve mathematical evaluation ability senior high school students

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**Abstract**

This study aims to find out and examine the implementation of advance organizer model to improve mathematical evaluation ability senior high school students. This research is an experimental research with the research instrument used is the test of mathematical evaluation ability, teaching materials in the form of students worksheet. Based on the results of the research, it is known that the achievement and improvement of students mathematical evaluation ability who obtain learning with the advance organizer model are better than students who get learning with the conventional model. However, these categories of achievement and improvement (either in the advanced organizer or conventional class) are in the middle category and there is a difference in students mathematical evaluation ability based on the classification of early mathematical ability (high, middle and low level) between advance organizer class and conventional class. Advance organizer can be used as an alternative to mathematics learning and improves students mathematical evaluation ability.

**Keywords:** advance organizer model, mathematical evaluation ability

**Topic:** 1. Mathematics Education

Teachers understanding about cognitive level on science items test

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**Abstract**

This study aims to describe science teachers understanding about cognitive level on science test items. Subjects of the study were 30 secondary school science teachers from 4 districts in Banten Province, Indonesia. Data were collected from online survey about teachers ability to determine cognitive levels on five science test items from TIMSS 2013. Teachers professional development on assessment and higher order thinking skills (HOTS) item development were asked in the survey as well. Blueprint and test booklet from X district were analysed to get information about teachers skills in developing HOTS items. The results showed that the teachers tended to assume items with lower cognitive level as a higher cognitive level items. Teachers from X district claimed that 4 items from summative test were in the level C4. Meanwhile, referred to the item analysis in item construction , it was showed that those 4 items were still classified in the level C2. From the survey results, the average duration for teachers professional development programs on assessment and HOTS item development is only 5-6 hours at district level (MGMP). The activities in those programs were still lack of direct practice on HOTS items. Intensive teachers professional development programs are really needed to improve teachers skills in developing HOTS items.

**Keywords:** cognitive, level, items, teachers, HOTS

**Topic:** 2. Science Education
[ABS-802]
Relationship between Content Knowledge and General Pedagogical Knowledge on Pedagogical Content Knowledge

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Abstract
The aim of the present research was to investigate the relationship of content knowledge and general pedagogical knowledge on pedagogical content knowledge (PCK). The chemical content of Acid Base was used as an example. The research sample consisted of 18 chemistry preservice teachers. The lesson preparation task, content knowledge test, general pedagogical knowledge test, the task to develop CoRe and PaP-eRs, and semi-structured interview were used to collect data. This study shows that content knowledge and general pedagogical knowledge both have a proportion of influence on pedagogical content knowledge in the amount of 88.4%. It is known that both knowledge have a significant relationship on pedagogical content knowledge. The result of this study emphasize that content knowledge and general pedagogical content knowledge had positive influence on teaching practice.

Keywords: content knowledge, general pedagogical knowledge, pedagogical content knowledge
Topic: 4. Chemistry Education

[ABS-803]
Conceptual understanding and mathematical disposition of college student through concrete-representational-abstract approach

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Abstract
The purpose of this study is to examine whether the improvement of mathematical conceptual understanding of students whose learning using Concrete-Representational-Abstract (CRA) approach is better than direct learning, and to know the relationship of mathematical conceptual understanding with mathematical disposition of students. The method used in this research is quantitative. The population in this study is the students of the Department of Mathematics at the second level in Cimahi, The sample is two classes of students who contract Mathematics Statistics courses. The instrument used in this research is a mathematical conceptual understanding test, as well as a questionnaire of mathematical disposition. Data analysis using Mann-Whitney and correlational with the help of SPSS software. The conclusion gained is the improvement of conceptual understanding ability of students who learn to use CRA approach better than students with direct learning, and also there is relationship between conceptual understanding with mathematical disposition of student.

Keywords: Conceptual Understanding, Mathematical Disposition, Concrete-Representational-Abstract Approach
Topic: 1. Mathematics Education
Profile of Student Metacognition with Rasch Analysis and Student Ability in Problem Solving

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Abstract
This study aims to obtain a description of the students ability profile in solving problems and metacognition of students by using Rasch analysis, this research is considered important as the initial research to find ways to improve students ability in solving problems through students metacognition knowledge. This descriptive study uses a population of students of class XII who have studied the eyes of effort and energy with the number of 180 students with sampling through random cluster side which amounted to 28 people side. The problem-solving skill refers to the rubrics developed by Doctor, and the metacognition knowledge observed refers to a rubric developed by Taasoobshirazi. The results showed that most students have not used systematic steps in solving the problem. Some metacognitive knowledge is congruent with planning, information management, and conceptual knowledge needs to be improved to support problem-solving skills.

Keywords: problem solving, metacognition, Rasch Analysis

Topic: 3. Physics Education

Profile Metacognitive Awareness of Biology Student on Microbiology Practicum

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Abstract
Metacognitive abilities are self-cognitive awareness, how cognitive works, and how to manage them. The lack of metacognitive capability causes the student to become less able to use appropriate learning strategies that will affect the cognitive abilities. This study aims to determine the profile of metacognitive awareness of biology students in microbiology practice. The subjects of the study were 28 students who were able to teach microbiology in a LPTK in West Java. Data collection is done by using Instruments to measure metacognitive awareness (Metacognitive Awareness Inventory). Data were analyzed by using Likert scale rule. The results showed that students metacognitive ability in microbiology practice is still low. Presentation of the number of students in each of the metacognitive ability criteria is less criterion (32%), sufficient criteria (43%), good criterion (25%).

Keywords: Metacognitive Awareness ;Microbiology Practicum

Topic: 5. Biology Education
The Effectiveness of Interactive E-Book Quantum Phenomena Compiled With Scientific Approach in Improving Higher Order Thinking Skills

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Abstract
This study was aims to examine the effectiveness of interactive e-book quantum phenomena compiled with scientific approach in improving higher order thinking skills that have been developed by the authors. The method used was research and development. The development design was ADDIE development model that included five phases of activity that is analyse, design, development, implementation, and evaluation. Implementation phase to test the effectiveness of e-book, using pre-test post-test. Data were collected by using questionnaires and written tests. The effectiveness was measured by comparing pre-test and post-test using using Two Related Samples Test, Wilcoxon and by calculating the normalized gain. The results of evaluation phase showed, interactive electronic book quantum phenomena compiled with scientific approach, effective in improving higher order thinking skills. The learning outcomes of quantum phenomena of students learning through interactive e-books compiled with scientific approach has increased in 67% indicator HOTS at level of trust 95%. The average N-Gain learning result of quantum phenomena is 0.31, entered in moderate category.

Keywords: e-book, higher order thinking skill
Topic: 3. Physics Education

Identification of student misconception about static fluid

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Abstract
This study aims to identify the misconceptions of students about static fluid and to discover how gender effects on misconception. The method used in this research is survey to 24 students in one of high school in Palu city. The instrument used is three tier tests of 23 numbers. The result of the analysis shows that there are still many students who have misconception with 70,8% on the law of pascal subject, 67,6% on the law of Archimedes and 55,7% on the topic of hydrostatic pressure. While for female misconception equal to 42,2% and male equal to 22,5% one of the misconceptions that occurs in static fluid material is that students assume that hydrostatic pressure will be large if it has a large area.

Keywords: Misconception
Topic: 3. Physics Education
Profile of pre-service physics teachers’ creative thinking skills on wave and optics course

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Abstract

This study aims to describe the profile of pre-service physics teachers’ (PPTs) thinking styles and creative thinking skills on wave and optics courses. The study is a survey involved 46 fifth semester PPTs at one of the universities in Ternate city. Data related to PPTs’ thinking styles were collected through the Yanpiaw Creative-Critical Styles Test. Data related to PPTs’ creative thinking skills were collected through tests of creative thinking skills. Data were analyzed by using quantitative descriptive technique. Based on the results of the data analysis, it was concluded that the profile of creative thinking skills of PPTs’ with CreT style can be categorized as high (66,8%), BT style as low (40,0%), CriT style as low (35,8%) and ScriT style as low (29,3%). The map of thinking styles and creative thinking skills will be used as a reference in developing a model of gamification on the physics learning context.

Keywords: creative thinking skills, wave and optics, gamification

Topic: 3. Physics Education

Analysis of Students Difficulty on Trigonometry Equations

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Abstract

Abstract. This article would like to explain the source of learning obstacle on Trigonometric concept, especially learning obstacle to solve the trigonometric function. The subject of this research were thirty six students of Senior high School. Method of research was qualitative. This research found that the learning obstacle was caused of miss preliminary knowledge of algebra concept such as degree measurement, the concept of sine, cosine, and tangent which are the specific concept in Trigonometric. To overcome the learning obstacle is needed special learning trajectory of Trigonometric concept.

Keywords: Analysis, Trigonometry Equations

Topic: 1. Mathematics Education
**[ABS-810]**

Trapezoidal Puzzles: The twists and turns of the 5th grade students process in calculating the area of the trapezoid

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**Abstract**

The area of a trapezoid is half the product of the altitude and the sum of the bases. On the other hand we should not forget that the trapezoidal regions can be divided into sections, such as being rectangle and triangle. This is what one teacher will use to conduct her lesson. She will lead her students to the meaning of the process. The various expected responses that have emerged have been predicted. However, the surprise that comes from the students we cannot avoid. This paper will describe some snippets that occur in the class as a reflective material to become a learning expert.

**Keywords:** Puzzles, twists

**Topic:** 1. Mathematics Education

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**[ABS-811]**

PjBL-STEM A Model of Science Learning to enhance STEM literacy of Senior High School Student

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**Abstract**

STEM education is an approach that can be applied in learning science in the millennial era. The Project based learning integrated with STEM approach (PjBL-STEM) has implemented to enhance the STEM literacy of senior high school (SHS) student. The quantitative (quasi-experiment) methods with the matching only pre-posttest control group design was used to investigate the enhancement of STEM literacy. The research subject were 71 SHS students (35 students in experimental class, and 36 students in control class) who were learning science in the environment pollution topics. The learning was arranged in a group of four students, initiating by the class discussion on the concepts behind the pollution, proposing the STEM problem by teacher, arranging the design to solve the problem-trying out the design- presenting the product by the groups, assessing the product as well as the presentation both by teacher and other groups (peer assessment). The research shows that all of student in group are closely involved in the project and learning. This leads to a good impact to the enhancement of STEM literacy, much better than control class which was implemented the PjBL model without STEM approach.

**Keywords:** Project based learning, STEM education, STEM Literacy

**Topic:** 6. STEM Education
[ABS-812]  
Enhancing Critical Thinking through the Science Learning On Using Interactive Problem Based Module  

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Abstract  
Facing the 21st century, higher order thinking skills are become a valuable thing to be learned. The R and D research on using ADDIE design was done to develop the interactive problem based module on population and environmental pollution topics. After validation process on the conceptual aspects as well as the learning and techno-pedagogic aspects, the module was then implemented in science learning at secondary school, to enhance critical thinking skills. The research shows that the module is very effective to use as a supporting material in order to enhance critical thinking skills. Based on the students response, the media was very helpful to student to learn science as well as to enhance the skill in how to practice IT.

Keywords: critical thinking skills, science learning, Interactive problem based module  
Topic: 2. Science Education

[ABS-399]  
Teachers Perception in the Implementation of ICT-Based Training to Manage Teaching Practicum  
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Abstract  
The Research aims to reveal physics teachers perceptions towards the implementation of an ICT-based training ti improve professionalism in managing practicum. The descriptive research involves 40 physics teacher coming from 40 different high school in Bandung, Indonesia. Their perceptions are described using observation sheets as the instrument and analyzed using percentage technique comprising dimensions of knowing, understanding, and evaluating. Based on the data analysis, the research finds out that in terms of knowing 85% of teachers are enthusiastic to join the training while in terms of understanding, only 50% of them participate well in the training since most of them lack in ICT literacy. Whereas, in terms of evaluating 70% of them agree that the training in proven to be able to improve their ICT literacy and help them manage better teaching practicum. Therefore, the results of the study can be consideration to design further ICT-based training focusing on students 21st century skills.

Keywords: physics teachers perceptions, physics teachers training, ICT utilization, managing teaching practicum, 21st century skills  
Topic: 3. Physics Education
[ABS-508]
Mathematical Reasoning in Geometry Learning Using ICT

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Abstract
Mathematical reasoning ability is one of the most important and fundamental skills in mathematics. It can improve through a learning that requires involvement of the student in building their own knowledge. One of them is by using Information and Communication Technology (ICT). Learning by using ICT is learning with knowledge of the latest technologies that utilize the computer as a medium of learning aids. Especially in Geometry, because Geometry is an abstract representation of visual and spatial experience. The activities in the informal geometry in high school can be used to introduce new ideas and to strengthen long learning materials. Material geometry in high school can start with something concrete, manipulate the experience to provide insight that is useful, and can be presented through the ICT. By using ICT, it can be used to demonstrate the mathematical reasoning abilities of students in geometry. This is a descriptive qualitative research with the aim to describes how much influence of the students mathematical reasoning abilities in geometry learning using ICT.

Keywords: Mathematical Reasoning, Geometry, ICT

Topic: 1. Mathematics Education

[ABS-549]
Improving the capability of decision making high school students trough physical practicum activities using HOTV-Lab model

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Abstract
This study aims to get a picture of the improvement of decision-making ability of high school students as the effect of using HOTV-Lab model in Physics practicum activities. The research method used is pre-experiment with design one group pretest-posttest design. The subject of research is 40 students in one of high school in West Bandung. The subjects were chosen by random sampling technique. Instruments used for data collection decision-making ability at the time before and after Physical practicum activities is a test of decision-making ability in the form of essay test. Increased decision-making ability of high school students was analysed using the concept of normalized average gain scores, \(<g>\) formulated by Hake. The results showed that 78% of students had a high increase, 19% of students had moderate increase and 3% had a low increase in decision-making ability. This suggests that the use of the HOTV-Lab model in Physical practicum activities has a moderate effectiveness in facilitating improved decision-making capabilities.

Keywords: virtual labs, HOTV Lab, decision making

Topic: 3. Physics Education