ICoSTEM-ED2019: Learning Innovation in Science and Technology to Challenge the Future.

ICoSTEM-ED2019 Handbook
FKIP University of Jember

Jember, Indonesia
September 30 – 1 October 2019

UNIVERSITY OF JEMBER
Tradition of Excellent
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Organizer and Co-Organizers:
Faculty of Teacher Training and Education, University of Jember

Supporters:
Faculty of Teacher Training and Education, University of Jember
University of Jember

Sponsors:
University of Jember
Fulbright AMINEF

Theme
ICoSTEM-ED2019: Learning Innovation in Science and Technology to Challenge the Future.

Conference Dates
September 30 – October 1, 2019

Venue
The University of Jember, East Java Province, Indonesia.

Organizing Committee
Erlia Narulita (Chair), Isti Nur Asyiah (Secretary), Iwan Wicaksono, Agustiningsih, Kamalia Fikri, Vendi Eko Susilo, Ika Lia Novenda, Aris Singgih Budiarso, Arik Agok Wardoyo, Kendid Mahmudi and Anjar Putro Utomo.

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Drs. Zulfikar, Ph.D. (Vice Rector I of the University of Jember)
Prof. Drs. Dafik, M.Sc., Ph.D. (Dean of Faculty of Teacher Training and Education University of Jember)
Prof. Dr. Suratno, M.Si. (Vice Dean 1 Faculty of Teacher Training and Education University of Jember)
Prof. Dr. Joko Waluyo, M.Si. (Vice Dean 2 Faculty of Teacher Training and Education University of Jember)
Dr. Sukidin, M.Pd. (Vice Dean 3 Faculty of Teacher Training and Education University of Jember)

Peer Reviewers
Prof. Chun-Yen Chang (National Taiwan Normal University, Taiwan)
Prof. Hyunju Lee (Ewha Womans University, South Korea)
Prof. Dr. Indrawati, M.Pd (University of Jember, Indonesia)
Prof. Dr. Sutarto, M.Pd (University of Jember, Indonesia)
Prof. Dr. I Ketut Mahardika, M.Si (University of Jember, Indonesia)
Muhammad Abd Hadi Bunyamin, Ph.D (Universiti Teknologi Malaysia)
Dr. Hobri, M.Pd (University of Jember, Indonesia)
Dr. Sri Wahyuni, M.Si (University of Jember, Indonesia)
Bevo Wahono, M.Pd. (National Taiwan Normal University, Taiwan)
Pramudya Dwi Aristya Putra, M.Pd. (Shizuoka University, Japan)
Nurul Fitriyah Sulaiman, M.Pd. (Shizuoka University)
Faisal Sudrajat, M.Pd. (Seoul National University, South Korea)
WELCOME MESSAGE

Dear colleagues & iSTEMhouse friends

It is our great pleasure to invite science educators and scientists to the first International Conference of Science, Technology, Engineering, and Mathematics Education (ICoSTEM-Ed) of iSTEMhouse 2019 Jember-Indonesia. The Conference, co-organized by the University of Jember, will be held at Jember City, East Java, on September 30 (Monday) to October 01 (Tuesday), 2019, with arrangement of registration, an ice breaking meeting, plenary and parallel session, and a focus group discussion of all head of undergraduate and graduate science education department in Indonesia.

This is the first ICoSTEM-Ed of iSTEMhouse in Indonesia as an initiation program by willingness being able to be held in another university in Indonesia or around the world in the near future. This means that we need to make a difference, and we need something interesting and impressing in this meeting. From this point of view, apart from our ordinary style and format of the ICoSTEM-Ed of iSTEMhouse, we do strongly encourage junior scholars (including graduate students) to commit the iSTEMhouse event to take initiatives to do ‘something new,’ in order to strengthen their networking and collaboration for the future. Please encourage your students to come to the Conference, so that cross-regional exchange among the junior scholar group will be much visible.

We are very looking forward to seeing you all at UNEJ!!

Sincerely

Erlia Narulita
(Chair of the Organizing Committee)
# PROGRAM SUMMARY

<table>
<thead>
<tr>
<th>No</th>
<th>Activities</th>
<th>Time</th>
<th>Person in Charge</th>
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<tbody>
<tr>
<td></td>
<td>The 1st Internasional Conference on Science Technology Engineering and Mathematics Education (The 1st ICoSTEM-Ed)</td>
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<td>Rector/Vice Rector 1</td>
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<tr>
<td>1</td>
<td>Registration</td>
<td>07.30 – 08.00</td>
<td>Committee</td>
</tr>
<tr>
<td>2</td>
<td>Opening</td>
<td>08.30 – 09.00</td>
<td>Dean</td>
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<tr>
<td></td>
<td>• Speech from Dean of FKIP</td>
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<td></td>
<td>• Speech from Rector of UNEJ</td>
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<td>• Photo session</td>
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<tr>
<td>3</td>
<td>General conference</td>
<td>09.00 – 11.30</td>
<td>Moderator: Siti Murdiyah, M.Pd</td>
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<td></td>
<td>&quot;STEM Education to challenge Industrial Revolution 4.0&quot;</td>
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<td></td>
<td>Speaker:</td>
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<tr>
<td></td>
<td>1. Prof. Yoshisuke Kumano</td>
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<tr>
<td></td>
<td>(researcher of STEM Education from Shizuoka University, Japan)</td>
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<td></td>
<td>2. Prof. Dr. Suratno, M.Si</td>
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<td></td>
<td>(University of Jember)</td>
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<tr>
<td>4</td>
<td>Lunch</td>
<td>11.30 – 12.30</td>
<td>Committee</td>
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<tr>
<td>5</td>
<td>Oral Presentation</td>
<td>12.30-15.30</td>
<td>Committee</td>
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<tr>
<td>6</td>
<td>Closing</td>
<td>15.30-16.00</td>
<td>Committee</td>
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</table>

Panel Session, Symposium and Focus Group Discussion on STEM Education
Selasa, 1 October 2019, venue: Auditorium CDAST 4th floor

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<tr>
<th>No</th>
<th>Activities</th>
<th>Time</th>
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<tr>
<td></td>
<td>Registration</td>
<td>07.30 – 08.00</td>
<td>Committee</td>
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<tr>
<td>2</td>
<td>Opening</td>
<td>08.00 – 08.10</td>
<td>Dr. Iis Nur Asyiah</td>
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<td></td>
<td>General conference</td>
<td>08.10 – 11.30</td>
<td>Moderator: Erlia Narulita, Ph.D</td>
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<td></td>
<td>&quot;STEM Education to challenge Industrial Revolution 4.0&quot;</td>
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<td>Speaker:</td>
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<td></td>
<td>1. Prof. Gillian Roehrig</td>
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<td>(Researcher of STEM Education from University of Minnesota, US)</td>
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<td>2. Prof. Dr. Indrawati, M.Pd</td>
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<td>(University of Jember)</td>
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<td>4</td>
<td>Lunch</td>
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<td>5</td>
<td>Oral Presentation</td>
<td>12.30-15.30</td>
<td>Committee</td>
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<td>6</td>
<td>FGD</td>
<td>12.30 – 15.30</td>
<td>Moderator: Siti Murdiyah, S.Pd., M.Pd</td>
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<td></td>
<td>&quot;Science Curriculum in Higher Education&quot;</td>
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<td>7</td>
<td>Closing</td>
<td>15.30-16.00</td>
<td>Dr. Iis Nur Asyiah</td>
</tr>
</tbody>
</table>

- Prof. Gillian Roehrig
- Prof. Yoshisuke Kumano
FLOOR PLANS

Rectorate Building
Building no. 3: 3rd Floor

Conference Room

Floor Plans for Parallel, Symposium, and FGD Session Room
Center for Development of Advanced Science and Technology (CDAST) Building
Building no. 1: 3rd Floor

Building no. 2: 4th Floor
GUIDELINES

Strands
1. Studies on Learners:
2. Studies on Teachers:
3. Studies on Interactions between Teaching and Learning:
4. Curriculum/Assessment/Policy:
5. Curriculum/Teaching Materials:
6. ICT in Science Education:
7. Integrated Sciences (SSI, EE, ESD):
8. Teacher Education:
9. STEM Education:
10. Historical, Philosophical, Sociological, Cultural and Gender Issues:
11. Science Education in Informal Settings:
12. Science Communication/Engagement:
13. Mathematics Education: and
14. Other Issues.

Oral Presentation
15 minutes, including 4-5 minutes for questions and discussion.
An LCD projector (connected with a VGA or Mini Display Port) is provided. Neither computers nor tablets are available. Please bring your own machine with you. Since no technical staff is available, please do it by yourself. You can check it in the afternoon of 29th September 2019. It is recommended to prepare A4-sized handouts of the presentation.

(Session Chairpersons)
Since there are 10 concurrent sessions simultaneously running in each oral presentation slot, it is very difficult to invite chairpersons from other sessions. Therefore, we decided to assign one (or two in the session consisting of more than 5 presentations) of the presenters (or authors) within each session to the session chairpersons. However, it sometimes happens that the presenter(s) cancel the presentation with unavoidable or unexpected reasons after the conference program had been announced. If such case happens, we appreciate someone else in the session to take on the chairperson’s role. Our conference team had not enough manpower; however, our staff will serve as timekeepers.
INFORMATION & REMINDERS

Registration, Conference, Symposium and Workshop Rooms

<table>
<thead>
<tr>
<th>Room</th>
<th>Venue</th>
<th>Open Time &amp; Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration Room</td>
<td>Rectorat Building 3rd floor, Auditorium CDAST 4th floor</td>
<td>International Conference Registration on rectorat Building 3rd floor and Symposium Registration on Auditorium CDAST 4th floor</td>
</tr>
<tr>
<td>Conference room</td>
<td>R. Ahmad room at Rectorat building 3rd floor</td>
<td>September 30, at 8.30 – 11.30 and next Oral Presentation</td>
</tr>
<tr>
<td>Symposium room</td>
<td>Auditorium CDAST 4th floor</td>
<td>October 1, at 8.00 – 11.30 and next Oral Presentation</td>
</tr>
<tr>
<td>Workshop room</td>
<td>3 schools at Jember (SDN Jember Lor 1, SMP 3 Jember and SMA 2 Jember)</td>
<td>October 2, at SDN Jember Lor 1, start at 8.00 – 15.30</td>
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<td>October 3, at SMP 3 Jember, start at 8.00 – 15.30</td>
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<td>October 4, at SMA 2 Jember, start at 8.00 – 15.30</td>
</tr>
<tr>
<td>Oral Presentation</td>
<td>CDAST 3rd and 4th floor</td>
<td>September 30 and October 1, at 12.30-15.30</td>
</tr>
<tr>
<td>Breakrooms and lunch</td>
<td>All venue</td>
<td>There are a breakrooms for lunch and coffee in all session at 11.30-12.30</td>
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Registration Booth

Pre-registrants are identified only by the registration and abstract number ([RA0X]). We cannot check your status with your name, region, and affiliation. You can go directly to the appropriate booth led by your registration number. Pre-registrants with credit card problems need to go to the special booth, not to go to the pre-registrant’s regular booth. On-site registrants (by cash only) should go to the on-site booth. No credit card is acceptable.

Apparatus for Presentations

Please make sure that you need to bring your own laptop or tablet for the presentation. We are sorry that no computers are facilitated in our lecture rooms. An LCD projector (connected with a VGA or Mini Display Port) is provided in each room. But if your computer or tablet needs a different kind of connection with the projector, you need to bring it with you. In the afternoon of 29th September 2019, most of the session rooms are open for your pre-checking of the connection. Please feel free to check it in advance.

Lunch Box and Lunch Venues

Lunch box tables are open every day from 12:00 in the registration desk. Lunch ticket on designated day is needed. You can enjoy lunch at any conference rooms including breakrooms, if the sessions are closed.

Free Refreshment

Refreshment service is available at 11:00 and 16:00 at the drink bar areas, every day (except 16:00 on the last day).

Photos

We will invite a photo team (UNEJ photo circle members) to take snapshots of ‘what are going on’ and the drive link of pictures will be uploaded to the Flickr site, which is shown in the instruction sheet, attached to the name tag, every day. You can enjoy the scenes you miss on the site, and even download them. (We believe that all of the participants accept to be photographed and uploaded on the Flickr site (which is not open to the public, but to the participants who know the particular Flickr site shown in the instruction sheet alone). However, if you find a picture you are not willing to show on the site, please send an email to istemhouse.fkip@unej.ac.id, identifying the photo number and asking the photo team to take down, so that they will delete them as soon as possible.
ACADEMIC PROGRAM

Invited Guests

KEYNOTE 1

Prof. Yoshisuke Kumano (JPN)
Professor in Science Education
Department of Advanced in School Education
Shizuoka University, Japan

Prof. Dr. Suratno, M.Si (IDN)
Professor in Biology Education
Graduate Biology Education, State University of Malang
Vice Dean, Teaching and Teacher

KEYNOTE 2

Prof. Gillian H. ROEHRIG (USA)
Professor, STEM Education Department of Curriculum and Instruction faculty of Education
University of Minnesota, United State.

Prof. Dr. Indrawati, M.Pd.
Professor in Physics Education
Graduate School of Science Education in Education University of Indonesia Education, University of Jember
Abstract: Recently, one of the most influential innovation in science education should be pointed out so-called “STEM or STEAM learning” STEM is standing with the three-dimensional learning that is explicitly described in the NGSS; Next Generation Science Standards (NRC, 2013). It is quite interesting to finding that in the case of Minnesota Science Standards (tentative, 2019) that mentioned that they are adopting of NGSS in all of the grade of K-12 with STEM, however, I would like to point out the major change of engineering contents for all grades with 8 practices with NGSS. So, then it is much sure that State of Minnesota needs to educate many STEM Teachers for all grades!

We can find STEM or STEAM learning innovations for Science Education and Strategies of Adaptation to Asian Countries Especially for Indonesia and Japan

We need international research teams and funding for the new production of Asian SSSTEAM Standards for the coming future.

Theory and Practices within the Science Education Reform Movement in the US: The Role of Integrated STEM and STEM Schools

Prof. Gillian H. ROEHRIG (USA)

STEM Education and Strategies of Adaptation to Asian Countries with Asian Contexts Especially for Indonesia and Japan

Kumano Yoshisuke, Ph.D.
Graduate School of Science & Technology, Shizuoka University

Abstract: Recently, one of the most influential innovation in science education should be pointed out so-called “STEM or STEAM learning” STEM is standing with the three-dimensional learning that is explicitly described in the NGSS; Next Generation Science Standards (NRC, 2013). It is quite interesting to finding that in the case of Minnesota Science Standards (tentative, 2019) that mentioned that they are adopting of NGSS in all of the grade of K-12 with STEM, however, I would like to point out the major change of engineering contents for all grades with 8 practices with NGSS. So, then it is much sure that State of Minnesota needs to educate many STEM Teachers for all grades!

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We need international research teams and funding for the new production of Asian SSSTEAM Standards for the coming future.
 INSERTING STEM INTO TPACK IN THE CONTEXT OF INDONESIA EDUCATION

Indrawati1*, Sutarto1
1*Science Education Program, Department of Mathematics and Science Education, Faculty of Teacher Training and Education, Jember University, Indonesia
2Science Education Program, Department of Mathematics and Science Education, Faculty of Teacher Training and Education, Jember University, Indonesia

Abstract: As the technology and information progress in this globalization era, teaching skills need to be evolved simultaneously with this progress. Regarding this, Pedagogical Content Knowledge (PCK) is becoming irrelevant considering the rapid digitalization that is inseparable from the students in this era. To overcome this challenge, teacher should be skilled with the updated knowledge that combines both PCK and technology. This knowledge is known as Technological Pedagogical Content and Knowledge (TPACK). Aside from the teaching knowledge, some basic skills such as problem solving, creativity, critical analysis, teamwork, initiative mindset, communicating, and digital literation skills are highly required in addition to the competitive educator recruitment process nowadays. Previous findings mentioned that application of STEM education in several countries has successfully resulted in employees that could accomplish the public demands which requires such basic skills. Thus, a revamping on the curriculum aspect need to be applied in the institution of education for educator in Indonesia by referring to both TPACK and STEM knowledges. This article aims to provide an insight on how to involve STEM in TPACK on the application of curriculum construction especially in the bachelor program of educational science. The application of STEM in about 12-16 credits program by theory and practice are expected to improve the graduates to become more knowledgeable and skillfull with the STEM which is acutely necessary in the real teaching application. In conclusion, this insight intends to combine pedagogic knowledge and STEM which is suggested to be named as Pedagogic of STEM (P-STEM).

STEM + AR (Science, Technology, Engineering, and Mathematics plus Arts and Religious): Empowerment of Metacognition and Science Process Skills of Students in Coffee Plantation Areas

Suratno
University of Jember, Indonesia
suratno.fkip@unej.ac.id

Problem statement
Coffee is a famous commodity in the world, almost all countries know the commodity of coffee. Indonesia is a coffee producing country. Robusta and Arabica coffee are coffee product from Jember and surrounding areas. Coffee products in Jember reached 105 tons in 2013 and an climbing up to 18% per year. Preparation, planting, maintenance, harvesting, post-harvest activities are closely related to the provision of creative and useful human resources related to the coffee. Therefore, creative and innovative learning according to the value of local wisdom in coffee plantation area need to be developed in order to make students have a sense of pleasure and belonging to the coffee. Accordingly, sustainable coffee plantation will embed in the culture of local community mainly the students. One form of learning that can be developed in integration with innovative and creative learning as well as in accordance with the values of local wisdom in coffee plantation area in order to make a student becoming more religious person is STEM + AR (Author of Science and Mathematical Technology combined with Art and religious).

Research purposes
The purpose of the study is to analyze the metacognitive empowerment and skills of students related to coffee plantation by learning STEM + AR in schools of coffee plantation areas.

Research methods
Research conducted at the Coffee Plantation School in Jember Indonesia. Study with STEM + AR. Metacognition instruments and skills are developed and validated through construct validation and expert as well as limited trials. The implementation of STEM is supported by local cultural values and religious values. Data analysis uses the mix method. Quantitative data of metacognitive and science process skills are analyzed statistically. And video analysis as a comparison is quantitatively analyzed.

Conclusions / Implications
STEM + AR is able to empower students’ basic and advanced metacognition as well as science process skills in contextual studies to learn coffee plantation significantly. This is reinforced by the data analysis results of images and videos. Strengthening on art and religious aspect sustaine metacognition and basic and advanced level of student’s science process skills in accordance with the values of local wisdom and religious values.
Parallel Session

Oral Presentations
(September 30th, 11:30-12:30)

[RA01] Optimisation of quicklime from eggshell using surface response Methodology
Salisu Nuhu (Hussaini Adamu Federal Polytechnic Kazaure Jigawa State)
Abstract: This study developed empirical response surface models for optimizing the quicklime characteristics. The calcination process parameters evaluated were calcination temperature, calcination time, and eggshell particle size. Two process models were successfully developed and validated for RSM models. The modeling validation runs were within the 95% prediction interval of the developed models and their residual errors compared to the predicted values were less than 5%. Results from this study shows that the significant parameters that influenced the quicklime yield and reactivity are calcination temperature, calcination time and eggshell particle size. The RSM approach shows that a compromised setting of calcination temperature of 945.91°C and calcination time of 180.82 min will produce quicklime of optimal yield of 99.6608 % and optimum level of calcination temperature of 210 min and calcination temperature of 895.03°C produced optimum quicklime reactivity of 0.467835°C/s. The RSM models developed in this study can be used in the quicklime production industries to find the settings of the calcination process that will maximize quicklime quantity and quality. This will reduce the downtime.

[RA02] Earth and Space STEM Education based on the Comparative Planetary Science using the Dagik Earth
Tomohiro Takebayasyi (Graduate School of Science and Technology, Shizuoka University; Museum of Natural and Environmental History, Shizuoka)
Yoshisuke Kumano (Graduate School of Science and Technology, Shizuoka University)
Abstract: Since the beginning of the 21st century, with the improvement of exploration technology for planets and asteroids in spacecraft (e.g., Hayabusa 2 [Japan], Cassini [USA], Rosalind Franklin [Europe]), big data have been sent from spacecraft to the Earth, and we can utilize those data for sciences and science education. NASA provides free of charge big data for academic and educational purposes. These data are valuable when they are systematically connected. These systematic approaches are equally important in the field of science education. Recent science education allows children to observe and discuss natural phenomena from various perspectives, and hence, we hope that children can understand the natural of these phenomena. Moreover, in STEM education, systematic thinking exists as one of the important “Crosscutting-concepts”. Systematic thinking requires various perspectives, from three-dimensional, timescale, to energy changes, regarding scientific events. Therefore, in this study, we developed STEM classes on the basis of the comparative planetology used by the software, “Dagik Earth,” which are widely used in Japan. In practices at schools and museum, students compared the surface environments of Mars, Venus, and Earth. The purpose of the lessons was that the children could discover the evolution and diversity of the Earth by independent observation and consideration (Active Learning). This practice utilizes virtual (Dagik Earth) and real materials (local rocks) and follows the thinking process of STEM. In addition, the contents of the lessons focused on innovative science and technology. It is expected to be a useful method for future Earth and Space STEM education.

[RA03] SOLUTION OF M – INPUTS AND N-OUTPUTS CONTROL SYSTEMS SYNTHESIS PROBLEM USING THE LYAPUNOV GRADIENT-SPEED VECTOR FUNCTION
Zhuldyz Basheyeva, Mamyrbek Baisenbi (Department of Systems Analysis and Control, L.N.Gumilyov Eurasian National University)
Abstract: This paper describes one method of research and synthesis of control systems with m-inputs and n-outputs by the output of the object by the gradient-speed method of Lyapunov vector functions. The task of the synthesis of the regulator and the observer is considered as a system that can provide the specified (desired) transition characteristics of a closed system.
Factors Behind the Implementation of STEM Education in Bangladesh

Sabbir Ahmed Chowdhury, A.S.M. Shamsul Arefin, Fariha Ahmed (University of Dhaka, Bangladesh)

Abstract: In this world of ever growing challenges; Science, Technology, Engineering, and Mathematics (STEM) has gained momentum in global education systems. Unfortunately, Bangladesh as a country is yet to be on board with this advanced education system. No research has been published related to STEM education in Bangladesh. Hence, the aim of this study was to explore the key factors and major challenges behind the implementation of STEM education system in Bangladesh. This study design followed mixed method approach. Data were collected from undergraduate students of the University of Dhaka through semi-structured questionnaire and focus group discussion. According to the primary findings, more than 80% of the respondents agreed that infrastructure and resources as well as professional development are the key factors to implement STEM in Bangladesh. In addition, inadequate scientific laboratory facilities, lack of financial resources, lack of training for trainers and large class size have been identified as the major challenges behind the implementation of STEM. Keeping these factors and challenges in mind, an effective STEM based education system can be developed and successfully implemented in phase by phase from primary to tertiary levels. This study has, therefore, implications for policy makers, educationists and stakeholders in both private and public sectors to increase the country’s global competitiveness as well as boost the national economy via providing the STEM based skills and capacity to the learners.

Analysis of Pedagogical Content Knowledge on Students of Science Education as Pre-Service Teachers in Madura Secondary School

Aida Fitriyah, Mochammad Yasir, Nur Qomaria (Universitas Trunojoyo Madura)

Abstract: This study aimed at describing the pedagogical content knowledge of students of science education as pre-service teachers in Madura secondary school. This qualitative descriptive research involved 110 students as subjects. Data were collected through interview, questionnaire, and test then analysed qualitative descriptively using the triangulation technique. Findings indicated that the lowest aspects of pedagogical content knowledge on the study subjects were teaching skill and comprehension about students’ needs. In addition, misconceptions were also found during the learning activity. It was also found that they have not implemented various learning methods that were able to enhance students’ motivation. To sum up, the pedagogical content knowledge on students of science education as pre-service teachers in Madura secondary school still need to be enhanced respectively.

Solving Distance Problems on Geometry through Imitation Spatial Visual Reproduction

Abi Suwito (University of Jember)

Abstract: One of the geometry materials discussed in high school students is the third dimension. The topics discussed in this material are composed of distance points and points, points and lines, points and planes, lines and planes and planes and planes. Of the five topics studied, problem solving at points and planes is a problem that needs attention. In solving geometry problems, especially in terms of distance points and planes, the spatial visual experience required by students is needed. This experience can help students in presenting image abstractions. To help students in the image abstraction process, spatial visual reproduction is needed. This study aims to uncover spatial visual reproduction of imitation in solving three plane problems, namely the distance of points and planes. The research subjects taken were class XI IPA SMAN 1 Blitar. The results showed that spatial visual imitation of reproduction has a strategy in resolving distance through more detailed image abstraction.

Effectiveness of hands-on activities in learning mole concept and volumetric analysis to develop chemistry learners’ curiosity

Esther Samwel Kibga, Emmanuel Gakuba (University of Rwanda-College of education (UR-CE,ACEITLMS))

John Sentongo (Makekere University)

Abstract: Curiosity is a non-cognitive variable of education that has great potential to enhance students learning. Yet, research in educational context rarely takes curiosity into account. The study was undertaken in three community secondary schools in Dar es salaam, Tanzania; with 169 chemistry students from three science classes. The study examined the effectiveness of hands-on activities on chemistry learners’ curiosity in learning mole concept and volumetric analysis. The study employed mixed methods in a pragmatic stance. The results showed significant increase of learners’ curiosity due to implementation of hands-on activities as an instructional strategy. The mean indicators of curiosity demonstrated (M=3.17, SD=0.47) in pre-test and (M=3.86, SD=0.30) in post-test, t=(22.5, df=127 and p=0.0005 upon paired sample t-test. Basing on the findings of this research we gave recommendations to researchers, educators and other educational pioneers.
[RA08] Energy STEM Project from Student's Self-assessment Perspective in Japanese Context
Nurul F. Sulaeman, Ippei Mineta, Yoshisuke Kumano (Shizuoka University)

Abstract: This research discusses our first experience to try our Energy STEM learning material for 3rd Junior High School. Moreover, we explored the students' perspective from their response to self-assessment instrument. In our setting, 16 students were assigned into team project (each group 4 students). The project is related to wind energy and held for 4 meetings. In the last meeting, the students filled their self-assessment toward the learning activity. The self-assessment instrument consists of 4 parts which are the learning steps, participation, self-esteem and critical thinking towards the project. Based on the result, we found that students have a unique different concept of learning and doing the project. All students stated that their participation to this project are high, they could mention clearly their self-esteem toward the activities and reflect the critical thinking about wind energy issue. Our research indicated that self-assessment could bridge the perspective of teachers and students. More specific in our STEM project, for the development of learning material, the students' perspective toward this project become valuable data for enhancing the lesson. Moreover, the students showed their enthusiasm to wind energy issue and willingness to try more after doing this project.

[RA09] Developing textbook based on scientific approach, critical thinking, and science process skills
Ainur Rolief, In Hindun, Lely Shulthonnah, Fuad Jaya Miharja (Universitas Muhamadiyah Malang)

Abstract: Several researchers have done the development of textbooks as a source of learning. However, most only partially develop students' academic abilities. This study aims to develop textbooks based on a scientific approach to improve students' critical thinking and process skills. This mix-method research consists of research development and quasi-experiment. Model development refers to the modification of the Borg & Gall development model, which consists of preliminary studies, model development, and model testing, whereas the quasi-experiment uses the pretest and posttest groups design. The population in this study were all students of Kepanjen Islamic High School, while the sample involved was 24 students of class X MIA. The data collection method uses expert questionnaire validation, pretest, and posttest. Data analysis used the dependent t-test with a significance level of α = 0.05. The results of the model test show that there are significant differences in the average between pretest and posttest scores. Besides, the validation test results indicate that teaching materials are declared appropriate and effective in learning.

[RA10] The Effectiveness of Polysaccharide Krestin from Coriolus versicolor Extract on IL-23 Concentration in Mice Serum Exposed by Staphylococcus aureus
Nadyatul Ilma Indah Savira (University of Jember)
Sri Puji Astuti Wahyuningsih (University of Airlangga)

Abstract: Staphylococcus aureus causes nosocomial infection because of its antimicrobials resistance. Alternative treatment for this infection is to use immunomodulators. Polysaccharides krestin (PSK) from mushroom extract are commonly used as an immunomodulator, especially Coriolus versicolor. Polysaccharide krestin from C. Versicolor extract contains β-glucan as an active compound. This research was designed to know the effectiveness of PSK on interleukin-23 concentration in mice serum exposed by S. aureus. Polysaccharide krestin was fractioned and precipitated with 90% ammonium sulphate. Thirty six adult mice strain Balb/C were given 100 mg/kg BW PSK for seven days by gavage. S. aureus exposure was given by intraperitoneally for once two weeks. Interleukin-23 was measured using ELISA kit mouse then analyzed by One Way ANOVA (p < 0,05). The results showed that giving PSK before S. aureus infection increased IL-23 concentration. Based on the results, PSK was effective to stimulate the immune response by increasing IL-23 concentration in mice serum exposed by S. aureus and could be useful as an immunomodulator.

[RA11] The Contribution of Metacognitive Skills between Male and Female Students on Cognitive Learning Results in Malang at The Implementation of RQA Learning Model
Bea Hana Siswati (University of Jember)
Aloysius Duran Corebima (Universitas Kanjuruhan Malang)

Abstract: The correlation between metacognitive skills and cognitive learning results has been widely researched. This research aims at investigating this correlation from a different point of view, which is gender. This research was carried out on 32 Class X Senior high school students in Malang. The results of this research revealed that there was a significant correlation between metacognitive skills and cognitive learning results, both in female students and in male students. The contribution of metacognitive skills toward cognitive learning results in female students and in male students was 92.4% and 92.7% respectively. This explains that the contribution of metacognitive skills toward
cognitive learning results in both female and male students taught by using the RQA learning model were equally significant. Therefore, it is recommended that the RQA learning model be be implemented in the learning process because it has a positive effect on the empowerment of students’ metacognitive skills and cognitive learning results.

[R12] Evaluating Cognitive Presence to Observe Community of Inquiry Forming Process
Indira Wahyu Alfia Terra (Universitas Jember)
Surjani Wonorahardjo, Suharti Suharti (Universitas Negeri Malang)
Abstract: Community of Inquiry is a community formed in blended learning. One aspect of the inquiry community is cognitive presence. Cognitive presence shows that there is a cognitive process that occurs in students who take part in blended learning. This research is a qualitative descriptive study conducted on 30 chemistry students in the third year. This research was conducted using cognitive presence observation sheets from each phases of the community of inquiry. Cognitive presence phases are triggering events, exploration, integration, and application. The results shows that blended learning had been carried out in forming process of community of inquiry. The triggering event phase is carried out at the initial face-to-face meeting. Students begin to get an initial overview of the material. In addition students get material and discussion topics to be studied. At the exploratory stage students discuss in small groups simultaneously. The integration phase is carried out during class discussions between students and teachers in e-learning forums. The application phase is carried out at the end of learning as indicated by the development of research designs by students.

[R13] IMPLEMENTATION OF FUZZY DYNAMIC SET-POINT WEIGHTING METHOD ON HYDROPONICS NUTRITION CONTROL SYSTEM
Muhammad Imaduddin, Agus Fernando, Ahmad Quethobi, Asep Suhendi, Nurul Insyani (Telkom University)
Abstract: On the hydroponics system, the concentration of nutrition should be controlled to approach the optimal growth of plants. One popular method to regulate the concentration of nutrition is by using the fuzzy logic controller system. Generally, the controller is set for a static set point. However, most plants have changing optimal concentration of nutrition based on their growth stage. Therefore, it is necessary to design a control method to accommodate the dynamics set point of nutrition parameter. In this paper, a fuzzy dynamic setpoint weighting control (FDSWC) method is proposed to tackle dynamics optimal nutrition concentration of hydroponics system. Electrical conductivity (EC) was used to represents nutrition concentration and it was measured as a reference to actuate the valve of nutrition and the valve of water. Based on the result, the implementation FDSWC could track dynamics set point of hydroponics plant with average error 16,98 uS/cm and 36.35 uS/cm for static set point and dynamic set point, respectively. The nutrition parameters (EC, water tank level, and nutrition tank level ) are then transmitted to the internet server by using WiFi connection with rate of 5 data/min to help remote farmers monitoring their hydroponics system.

[R14] CONTAINED TESTING: THE COMPARISON OF SCIENTIFIC LITERACY ABILITY OF MIDDLE AND HIGH SCHOOL STUDENTS AGED 15 YEARS OLD
Aulya Nanda Prafitasari (Biology Education, University of Muhammadiyah Jember)
Restasa Britan Pradhan (SMA Negeri 2 Situbondo)
Abstract: One of skills used as the basic of high order thinking skills is scientific literacy ability. This ability is evaluated by OECD in PISA program follow by students aged 15 years old from various countries. Therefore, this article is aimed to compare scientific literacy ability of middle and high school students aged 15 years old on a limited scale. Scientific literacy ability has 4 indicators which are nominal literacy, functional literacy, conceptual/procedural literacy, and multi-dimensional literacy. The data were gained from the comparison between 25 students grade IX SMP Negeri 7 Jember and 25 students grade X SMA Negeri 2 Situbondo. The data were analyzed using t-test with SPSS program. The result showed that 3 among 4 indicators of scientific literacy test of middle and high school students aged 15 years old had sig (2-tailed) >0.05, which means there is no significant difference. Those 3 indicators are nominal literacy (0.204), functional literacy (0.107), and conceptual/procedural literacy (0.154). Meanwhile, for multi-dimensional literacy showed sig (2-tailed) 0.04 or <0.05, hence it can be concluded that there is significant difference of multi-dimensional literacy ability between middle and high school students aged 15 years old.

[R15] Teaching Skills of Prospective Mathematics Education Teachers in Microteaching Subjects: Commognitive Perspective
Moh Zayyadi (University of Madura)
Toto Nusantara, Erry Hidayanto, I Made Sulandra (State University of Malang)
Abstract: The purpose of this study is to describe the teaching skills of prospective mathematics education teachers in micro teaching subjects in a commognitive perspective. This type of research is qualitative research. The research subjects consisted of 15 students of the 2015 class of Mathematics Education Study Program who were taking micro teaching courses. The instrument used in this study was a rubric sheet. Assessment of prospective teacher’s teaching skills and rubric syllabus Value. Data analysis techniques used are data reduction, data presentation, and conclusion collection. The results showed that: Prospective mathematics education teachers in preliminary activities more often use the word usage component, visual mediator, routine and do not use the narrative component. In the core activities of learning mathematics teacher candidates use 4 components commognitive which are the use words, visual mediators, routine, and narrative. In the selection of mathematics education teacher candidates only use the word usage component.

[RA16] Factors Influencing E-Learning in Relation to Learning Outcome and Student Satisfaction: A Literature Review
Rika Andayani (FKIP Universitas Jember)
Abstract: Electronic-learning (E-learning) has been extensively utilized and gaining more impact in higher education. Some studies have compared face-to-face teaching to online learning in order to decide which of the design provides the highest learning outcome and create the most students’ satisfaction. This paper references some of the research work on the use of e-learning in the higher education. Some studies revealed that the use e-learning in the teaching and learning activities are influenced by more than the teaching format only. There are many more factors which have significant role in influencing the e-learning implementation in the classroom activities. This literature review paper will discuss further into some of them.

[RA17] Developing a mathematical literacy test: Measuring prospective mathematics teacher’s content knowledge in preparing to teach mathematical literacy
Nurcholif Diah Sri Lestari (Universitas Jember)
Dwi Juniati (Universitas Negeri Surabaya)
St. Suwarsono (Universitas Sanatha Dharma)
Abstract: This study aims to describe the development of mathematical literacy test instruments to measure the ability of prospective mathematics teachers to form mathematical situations, the ability to use facts, concepts, procedures and mathematical reasoning or the ability to interpret and evaluate mathematical solutions. This research is a type of research design for developmental research that consists of four phases, i. e. initial investigation; Design; realization / construction; and tests, evaluations and revisions. A total of 157 prospective mathematics teachers from three universities in East Java, Indonesia, and four mathematics and mathematics education experts were involved in the examination, evaluation and revision stages. The data obtained were then analyzed qualitatively. The results of this study are valid, practical and effective mathematical literacy tests consisting of four problem themes and a total of ten questions. Each theme contains two or three questions classified in the context of mathematical literacy that fit the problem on the theme, one dominant mathematical content, and one of the most dominant process domains used to solve mathematical literacy questions. Based on the results of this study, we recommend this test to be used in measuring mathematical literacy of prospective mathematics teachers to predict their readiness in terms of content knowledge in integrating mathematical literacy.

[RA18] The Use of Simple Mathematics to Support and Enhance the Income of Home industry of Rengginang in Situbondo
Marta Mila Sughesti (SMA Negeri 2 Situbondo)
Abdur Rahman As’ari (Universitas Negeri Malang)
Abstract: The main resource of Situbondo is fish. People make many local product using as the main inggridient. The most popular local product of Situbondo made from fish is rengginang. The customers of rengginang come from many cities and provinces but the producers cannot sell the product in a high price. The biggest problem is on the packaging. The producers only wrap rengginang using plastic while the texture of rengginang is fragile; hence, the product will be broken when it arrives in customers and they send it back to the producer and make them lose in their business. The research purposes are to help producers of home industry rengginang in Situbondo to enhance their income and profit by making an efficient packaging for their product and finding inequality to calculate their profit in easy way and definite number. This research began in July until December 2018. In this research, qualitative approach was applied. The subject of this research are eight producers of home industry rengginang in Gelung village of Situbondo. The result of this project an efficiency packaging to wrap rengginang for home industry rengginang in Situbondo and inequality to help producers of home industry rengginang to calculate profit in easy way in definite number.
[RA19] Integration of Mathematics and Entrepreneurship to Create Prospective Youth Entrepreneurs by Using “Math Ship”

Marta Mila Sughesti (SMA Negeri 2 Situbondo)
Abdur Rahman As’ari (Universitas Negeri Malang)

Abstract: This study’s aims are to increase students' interest in learning and applying mathematics in their daily life and also creating young entrepreneurs in SMAN 2 Situbondo by using the worksheet "Math Ship". This study has been done in grade X and XI in SMAN 2 Situbondo in 2017. The data from counseling team of SMAN 2 Situbondo showed that 71% of students did not like mathematics and did not understand the application of mathematics in their lives. This study uses Research and developing method through the work sheet "Math Ship" which is applied in learning process. The learning process has been done through Project based learning and problem solving models. The results of this study showed that the integration between mathematics and entrepreneurship through work sheet "Math Ship" are: (a) the value of the students in based competence are increasing (b) students' interest in learning mathematics increases from 29 % to 57% (c) student can created products with high aesthetics, selling points and prospective young entrepreneurs (d) students’ products are able to be the winner through international competitions (f) the success of SMA Negeri 2 Situbondo’s students is able to provide enthusiasm for other schools in East Java to create other winners (d) the product of the students creates a social impact by improving the economy of home industry and entrepreneurs in Situbondo.

[RA20] IoT BASED RIVER WATER LEVEL MEASUREMENTS FOR TIME TRAVEL ESTIMATION

Agus Fernando, Muhammad Imanuddin, Rahmat Awaludin Salam, Asep Suhendi (Telkom University)

Abstract: Flooding is one of the annual events occurring in the area through which the Citarum river, Indonesia, flows during the rainy seasons. The lack of water catchment and awareness of waste disposal management are the main causes of floodings. Majalaya is a one of a flood-prone area, in which the flood in this area are typically due to the sudden arrival of water from upstream. This type of flooding, will be very damaging and life-threatening even though the incident can be very short. Therefore, early warning of potential flooding is needed. This research will examine the possibility to create a flood early warning system by estimating potential flood events using an Internet-based water level measurement system. There are two areas that will be monitored for water level, namely in the upstream area and in the area of potential flooding. The Cikaro River, one of the tributary of the Citarum River will be used as a model for the upstream. Data on the water level in the Cikaro river and in potential flood areas have been monitored and recorded. The data were then processed to estimate the travel time of water between the two locations. The results show that the difference in the water level of the Cikaro river to river water levels in flood-prone areas is up to 92.89%. The estimation of the increase in water level is in the range of 20 to 60 minutes with an average duration of 40 minutes.

[RA21] ANALYSIS OF THE APPLICATION OF STEM EDUCATION IN BIOLOGY IN SENIOR HIGH SCHOOL

Aini Meitanti Rosalina, Joko Waluyo, Erlia Narulita (University of Jember)

Abstract: Biology is one of the compulsory subjects in the upper middle class of science majors and is a general subject that is used to enter into special fields such as medicine, nursing, pharmacy, agriculture, biotechnology, and others. STEM is a learning that is starting to be interested and developed to prepare students to face the challenges of the 21st century. This research is a descriptive study using data mix method analysis. The sample in this study was a high school biology teacher in Banyuwangi of 30 teachers. Data was collected using a questionnaire. The results of this study indicate that 10 high school teachers have applied STEM education in biology, with material often used is biotechnology. 14 teachers used discovery-based learning and 6 teachers used a scientific approach in accordance with the 2013 curriculum.

[RA22] Integrating STEM in ILC3 models: teaching and learning experiences in biotechnology

Mellyatul Aini, Indrawati, Erlia Narulita (University of Jember)

Abstract: Biotechnology is a multidisciplinary applied science which develop very rapidly, to fulfill the demands of the current globalization of the world and give impact on human life. Biotechnology concept can be studied using a problem-based learning model, namely ILC3 which requires students to design appropriate solutions in solving society problems. This study aims to analyze lecturers' teaching and student learning experiences on biotechnology using STEM-based learning. The research respondents were lecturers who teach biotechnology, and students who had attended biotechnology class. Descriptive method was used in this study and observation was used to collect data. The result showed lecturers of 83% and students of 87,3% agreed for development of ILC3 learning models. In addition, there was 92,7% of students stated that the STEM-based ILC3 models suitable for learning biotechnology. Thus it needs further research to develop syntax ILC3 learning models and its application.
**[RA23]** Instructional Materials for Optical Matter Based on STMCpE (Science, Technology, Mathematics, Contextual problems, and Engineering) for Increase Student Critical Tinking Skills in SMA

Ika Permata Sari, Sutarto, Imam Mudakir, Indrawati, Aris Singgih Budianto (University of Jember)

Abstract: Optical matter is divided into three different points of view, there are physical optics, geometric optics, and optical tools. Three different points of view make optical matter difficult to integrate. Besides, the learning of optical matter in school mostly focuses on formulas, not concept, so students find it difficult to apply optical matter in their daily lives. Also, critical thinking skills are needed to apply a concept to solve problems in daily life. One of the solutions to these problems is to apply optical teaching materials that discuss concepts and mathematics in a balanced, integrated, equipped by contextual problems to increase student’s critical thinking skills and make it easier to apply optical concepts in daily life. One of the suitable teaching materials is optical teaching materials based on STMCpE (Science, Technology, Mathematics, Contextual problem, and engineering). This study aims to apply optical teaching materials based on STMCpE. This research used Quasi-Pretest-Posttest Experiment without control class. Data analysis using the mix method and the data were analyzed qualitative and quantitative. The sample used was 33 students of class XI science. Data obtained from the questions pretest and posttest with open questions that accordance with indicators of critical thinking skills. The application of optical instrument teaching materials and function based on STMCpE shows that student critical thinking skills are increase, from weak and unacceptable category to acceptable and strong category.

**[RA24]** STMCpE (Science, Technology, Mathematics, Contextual problem, and Engineering) Based Colloid Textbook to Train Creative Thinking Skill for Chemistry Learning in Senior High School

Marinda Resti Sari, Sutarto, Agus Abdul Gani, Nuriman, Aris Singgih Budianto (University of Jember)

Abstract: Colloid is a chemistry subject matter which is very closely related with our daily life. But most applications of this matter in the class only by requiring the students to read and memorize. Most of the students didn’t feel the benefits in learning colloidal subject because it was not applicable in their daily life and didn’t require students to think creatively. The aim of this research is to apply Colloid textbooks based on STMCpE (Science, Technology, Mathematics, Contextual problems, and Engineering) to train creative thinking skills for Chemistry learning in senior high school. This research used Quasi Pretest-Posttest experiment without control class. The research instrument used was a test of creative thinking skill. The effectiveness of textbook shown that each component of creative thinking, such as fluency, flexibility, elaboration and originality thinking gets percentage of 89.20%, 86.31%, 80, 98%, 80.09% and N-gain score of students get value ≥ 0.7 wich is 72.22% of students in the high category and 27.78% of students in the medium category.

**[RA25]** PHYSICS-BASED MODULE STMCpE(Science, Technology, Mathematics, Contextual Problem, and Engineering) in to TRAIN STUDENT LEARNING SCIENCE LITERACY PHYSICS at VOCATIONAL HIGH SCHOOL

Marinda Resti Sari, Sutarto, Sudarti, Indrawati, Aris Singgih Budianto (University of Jember)

Abstract: Materials in physics learning at school is considered difficult to understand for the students to understand the concept of the fluid in the low category. This situation is possible because the students also had misconceptions. To overcome the problem of understanding the material, required the addition of relevant contextual issues so that students do not encounter misconceptions, then STMCpE (Science, Technology, Mathematics, Contextual Problem, and Engineering) is seen to help students understand the concept of fluid through contextual issues. This study aims to develop a module based fluids STMCpE (Science, Technology, Mathematics, Contextual Problem, and Engineering) in physics in vocational learning. This research is an experimental research. The research data will be obtained by using observation and testing of vocational schools in Jember. The study involved 35 students of SMK class X, the data obtained from the pretest and post test using an open question. This study uses Quasi pretest posttest experiment classless control. Data obtained from pretest posttest questions corresponding indicator scientific literacy. Results showed an average of scientific literacy of students using STMCpE based modules are in both categories in the cognitive domain and a very good product on the cognitive process.

**[RA26]** Textbook Based on STMCpE ( Sains, Technology, Mathematics, Contextual Problem, and Engineering) Food Digestion System Materials Biology Learning in High School

Ira Maya Oktaviani, Sutarto, Slamet Hariyadi, Jeki Prihatin, Aris Singgih Budianto (University of Jember)

Abstract: This study aims to develop a digestive system textbook for class XI high school as a medium in the implementation of learning in schools based on STMCpE-based (Science, Technology, Mathematics, Contextual Problems, and Engineering). The textbook used is a contextual textbook with problem solving characteristics that exist in the "Food Digestion" material that is studied by high school students in class XI in
Biological science material has the characteristics of being selected using the STMCpE approach because it is based on the results of the study contains the scope of knowledge or science related to certain technologies that can be engineered by considering mathematical calculations, as well as the existence of contextual problems in the community regarding nutritional security. Therefore, students are expected to be able to solve problems regarding the availability of food as an appropriate source of nutrition. So that the later textbooks are made valid, interesting, practical, and effective for use by high school students. Quasi-experimental research method with Pretest-Posttest without the control class. Analysis of the data is used by the mix method, which is the result of qualitative and quantitative data. The sample used was 30 students of class XI high school with problems. The result is that students’ critical thinking skills are very good.

[RA27] Development of Vibration and Waves Textbook Based on STMCpE (Science, Technology, Mathematics, Contextual Problem, and Engineering) for Science Learning in Junior High School
Eka Anjarwati (University of Jember)

Abstract: This study aims to develop textbooks on Vibration and Waves based on STMCpE (Science, Technology, Mathematics, Contextual Problems, and Engineering) in science learning in junior high schools. Low understanding of the concept of wave material causes low student learning outcomes. The low understanding is due to the lack of interesting textbooks to be read or traced by students as well as limited textbooks. So it is necessary to develop STMCpE-based textbooks to meet the needs of students in learning. Troubleshooting in STEM is not perfect if it is not provided with contextual problems. Interesting contextual problems are able to practice problem solving maximally. This research uses the ADDIE development method (Analysis, Design, Development, Implementation, Evaluation). The effectiveness of teaching materials was conducted by comparing the results of class cognitive tests using STMCpE-based vibration and wave books with classes using conventional books. The results of the effectiveness test showed p-value > 0.05, so it can be concluded that there was a difference in effectiveness between the classes using the vibration and wave textbook material STMCpE-based and the classes using conventional books.

[RA28] Development of Air Pollution Teaching Materials and Environmental Management Based on STMCpE (Science, Technology, Mathematics, Contextual Problem, and Engineering) on the Ability to Solve Problems in Biology Learning High School
Dian Nuriyana Indah, Sutarto Sutarto, Agus Abdul Gani, Jeki Prihatini, Aris Singgih Budiarso (University of Jember)

Abstract: The teaching process about pollution in the school is only depended on theory and literature. It is not based on the comprehension concept. So, the students face the difficulty to understand the material that relevant with their life. Based on this problem, the researcher has initiative to develop the teaching material about pollution which is discuss about the concept and technology integratively, proportionally, and completed with contextual problem. So, the students can understand the pollution concept in their life. One of the suitable teaching material is the teaching material of pollution based on STMCpE. The purpose of the research is to develop the teaching material of air pollution based on STMCpE validity, effective, and practically. The research used the development of 4D method. They are define, design, develop, and disseminate. Besides, this research uses mixed method that consist of qualitative and quantitative method. Qualitative method is used to develop the teaching material based on STMCpE. And quantitative method used the experimental method post test only control design. In the normality test got the homogeneous data. So, it is needed the parametric analysis data. That is used independent test (t-test). Based on the research result the researcher conclude that (1) the development of teaching material is valid, effective, and practice. (2) The applied of scientific teaching based on STMCpE is significantly influence the creative thinking of the students. It is showed 0,000 (P<0,05).

[RA29] INTEGRATED STEM-BASED PROJECT-BASED LEARNING (STEM-PjBL)’ EFFECT ON STUDENTS’ CREATIVE THINKING SKILLS
Muhammad Reza Firdinantara (Department of Biology Education, Faculty of Teacher Training and Education, Jember University)

Abstract: The purpose of this study is to overcome the increased of creative thinking’ students after they used worksheet with STEM-PjBL. This research method is experiment method that consist of preparing, implementation, and data processing. Increasing of creative thinking measured by pretest-posttest problems included project of solving the respiration’ systems issue. The result of data normalization show that data have normal distributed so next test is n-gain test. Result of the n-gain test according to pretest-posttest scores around 0.6 (medium level categorized). The highest improvement is 0.7 at variety of idea context and lowest increase is 0.4 at communicating something new aspect.
[RA30] Need Assessment Analysis for Developing Biotechnology STEAM-Based Module

Hilya Wildana Sofia, Slamet Hariyadi, Erlia Narulita (Jember University)

Abstract: The purpose of this study was to analyze the need for the development of learning science biotechnology materials in class IX. This research was conducted using descriptive methods. Data collection techniques used in the form of online and offline questionnaires. The research sample involved 90 science teachers from 35 public school and 31 private school. As for the students involved 130 student in Jember Regency. The findings in this study are: 1) Science teachers are aware of the need to use approaches that are in line with 21st century developments; 2) 72% of teachers are not familiar with the STEAM approach and 69% feel the need to be applied in science learning; 3) science materials that are classified as difficult are Biotechnology according to students and teachers; 4) according to students 75% of teachers have never applied games in Biotechnology, 57% of students agree with the use of games in biotechnology materials; 5) as many as 33% of teachers have developed teaching materials and use them. Most teaching materials developed 57% were worksheets while for modules only 11%. So in conclusion Biotechnology in junior high schools needs to be taught using the STEAM approach which can be integrated through module teaching materials that are equipped with mobile games.

[RA31] Implementation of Preservice Science Teachers’ Professional Knowledge, Including Pedagogical Content Knowledge in STEM education

Pramudya Putra, Yoshisuke Kumano (Graduate School of Science informatics and Technology, shizuoka university)

Abstract: The purpose of this research was to implement STEM approach in the classroom, and self-reflection about their performance in teaching STEM education. The data collected using an interview protocol and an observation lesson plan protocol. The finding indicated that the professional teacher knowledge needed for pre-service science teacher to develop a STEM lesson in the classroom are STEM pedagogical knowledge, STEM content knowledge, understanding of student’s knowledge, circular knowledge regarding of STEM, and Assessment knowledge. Conceptualization of pre-service science teachers about STEM education influenced how pre-service science teachers develop STEM lesson in the classroom. Based on this study, the suggestion arises for the teacher educator who wants to prepare a STEM teacher to build a conceptualization of integrated STEM and regard to the teacher professional skill for implementation STEM in the classroom effectively.

[RA32] The Influence of Science Technology, Engineering and Mathematics Approach by Learning Model Problem Based Learning to Learning Achievement of Students’

Siti Magfiroh, Slamet Hariyadi (University of Jember)

Abstract: Education plays a very important role in efforts to improve the quality of human resources. The existence of excellent education can develop positive potentials that are hidden in students, so it can create excellent human resources. One of approach and learning model that is able to increase students’ potential is the Science, Technology, Engineering and Mathematics (STEM) approach with the Problem Based Learning (PBL) learning model. This study aimed to determine the effect of the STEM approach to the Problem Based Learning model on the students’ learning achievement of class X at SMAN 1 Arjasa, Jember on the subject of environmental change. The research referred to a quasi experimental research by using both experimental class and control class. Data on learning achievement included the cognitive and psychomotor domains. Students’ learning achievement data were obtained from the pre-test and post-test questions which consisted of 15 multiple choice questions and 5 essays, while the psychomotor domain learning achievement data was gained through observation when students did the lab work. The average learning achievement in the cognitive domain in the experimental class is higher at 75.65 compared to the control class of 57.09 with a probability value of 0,000. The average psychomotor learning achievement of students in the experimental class amounted to 80.46 and the control class about 75.97 with a probability value of 0,000.

[RA33] How to Create Alternative Biology Book Using Brain-based Principles

Jekti Prihatin (University of Jember)

Abstract: Abstract. Biology books currently used by secondary school students seem to be too formal and not attractive. Making meaningful books requires innovation by optimizing students’ brainpower. Aims this paper to describe the basic principles of making brain-based biology textbooks using 12 Brain-Based Learning principles. The developed book will have characteristics: fun, relax, active learning, facilitate Higher Order Thinking Skills (HOTS), and displaying lots of pictures and examples. So, it can change short-term memory into long-term memory.
[RA34] Appliance of Textbook Based of Brain in Material of The Organizational System of Life for The Junior High School Science

Vivin Kusumaningrum (Department of Science Education Magister, University of Jember, Jember, Indonesia)

Ihsan Ullah (Department of Zoology University of Karachi, Karachi, Pakistan)

Abstract: This study in 21st century having much transformation in science and Technology An effective knowledge is a knowledge that include student’s ability in understanding study object. There fore, to support an optimum study process there is a need of a text book. Study in science especially in a main study of organization system of life is study that have the most complexity.

The purpose of this research is investigating the impact of brain based textbooks on knowledge and skill in the organitational system of life from cellular level to the organism. This book is accompanied by constituant of abstract cell comprotion and can’t be seen directly because it is inside in organism so that it becomes apparent. This brain – based comes with games, pneumonice, comics and motivation so it trains long term thingking and memory skills. Objective of this research is to know the effectivity of textbook basic on brain against Junior High School Science Student’s ability in retention.

This research was conducted in SMP Negeri 1 Rogojampi and MTs Negeri 10 Banyuwangi with research subjects of Class VII in the academic year 2019/2020. The Type of this research was (research and development), using 4-D model Thiagarajan, with stages define, design, develop and deseminates. The technique of collecting data is by collecting product validation data, test methods, interviews with teachers, questionnaire teachers and students and observations. The data analysis technique consisted of product validation analysis, analytic analysis with N-gain and learning retention, and practicality analysis. At the define stage, the data is obtained The results of need needs questionnaire From the results of the questionnaire need assessment of learning in junior high school data obtained by teachers in East Java stated 96% have not made a brain-based textbook that can activate students while students In East Java, 94% also stated that in the material organization, life tends to be difficult to remember in the long run and low retention.

[RA35] Understanding Motorcycle Combustion Engine Work as the Application of Carnot Cycle

Nur Ahmad (University of Jember, Jember, Indonesia)

Abstract: The Carnot cycle is a difficult discussion enough, abstract and often get misunderstood by student. The Carnot cycle is a thermodynamic part in physics. Thermodynamics is spontaneously mechanics of transferring heat energy from high temperatures to low temperatures. The understanding working of a motorcycle combustion engine can connect to thermodynamic concept in Carnot Cycle. The workings of this combustion engine include 4 steps, namely intake, compression, power and exhaust. That four step can explain thermodynamic processes like as adiabatic, isothermic, and isochoric are studied in the Carnot cycle. The purpose of this study is to connect the thermodynamic concepts of motorbike engine combustion to facilitate the learning of physics. The research type is literature review and to develop media learning. The method uses 4 stages are media creation, expert assessment, trial and evaluation. The result of the research were motorcycle combustion engine work learning media with a feasibility level based on the assessment of material expert assessors obtained 76 %, media expert assessors were 83%, and learning experts were 87%. Student trials include simplicity, clarity, ease, educative and attractiveness average 84%. The evaluation phase produces final media. This motorcycle combustion engine learning media is should be apply in Carnot cycle matter.

[RA36] Assessing Teacher's Knowledge, Applications and Attitudes at STEM: for the Development of STEM approaches in the circulatory system material of student's junior high school

Meliyana Aini, Suratno and Iis Nur Asyiah (University of Jember, Jember, Indonesia)

Abstract: The circulatory system is one of the junior high school materials relating to organs which functions to move substances to and from cells. Cells are the smallest structural and functional unit in living things, so to understanding them is very difficult. To overcome this, an integrated model development STEM approach was made to help improve material understanding. The application requires teacher knowledge about the STEM approach and the level of difficulty of the material by students. To determine teacher knowledge about STEM, three assessments were conducted, namely knowledge, applications related to the model used, and attitudes. Based on the assessment obtained teacher perceptions about the difficulties in implementing the STEM approach. This type of research is a mix of methods (qualitative and quantitative). The quantitative analysis method is carried out to overcome the comparative value of the three assessments, while the qualitative analysis method is to strengthen the results of the quantitative analysis through the perception of the teacher and students. The results showed that knowledge about STEM education was still in the low category, applications in the medium category, and attitudes in the good category. This is due to differences in teacher education background, teacher experience in teaching, and teacher understanding in applying learning models that are integrated with STEM.
[RA37] Identification of Ethnobotany Coconut Plants by Local Communities
Zidna Qurotta Aini, Erilu Nusufi, and Anjar Putro Utomo (University of Jember, Jember, Indonesia)

Abstract: This study aims to determine the parts of coconut plants (Cocos nucifera) commonly used by local communities to meet the needs of daily life and determine the use of coconut plants for the community based on ethnobotany studies. The research method used is a literature study method with quantitative descriptive. Four types of coconut were found, namely quail coconut, green coconut, red coconut, and ivory coconut, using 10 regions including Dukia-Dukia Jaya Village in Southeast Sulawesi, Karangwangi Village, West Java, Banyuwangi Regency, Pekuncen District, Banyumas Regency, Sarude Sarjo Village, West Sulawesi, Kasimbar Village, Parigi Moutong Regency, Indigenous Village Community of Hamlet in Garut Regency, West Java. Based on the results of previous research analysis, shows the equality of utilization of the four types of coconuts namely for building materials 100%, consumption 100%, crafts 100%, traditional medicine 50%, preservatives 25%, flavoring 100%, coloring 25%, fuel 100%, cosmetics 25%, agro-industry 100%, traditional ceremonies and religious 50%. The similarities in the use of the four types of coconut in the ten regions above are for building materials 20%, consumption 30%, crafts 30%, traditional medicine 30%, preservatives 10%, flavoring 20%, coloring 20%, fuel 20%, cosmetics 20%, agro-industry 20%, traditional and religious ceremonies.

[RA38] Identification of Ralstonia Solanacearum Infections in Types of Tobacco (Nicotiana Tabacum L.)
Nisa Dewi Ariska, Anjar Putro Utomo and Erilu Nusufi (University of Jember, Jember, Indonesia)

Abstract: This study aims to identify the race or biovar of Ralstonia solanacearum which has been found from tobacco plants (Nicotiana tabacum L.). This study uses a literature study method with a qualitative descriptive approach. Based on the results of the analysis in previous studies showed that the results of Ralstonia solanacearum isolates have different virulence. This bacterium attacks Voor Oosg tobacco. Ralstonia solanacearum has a fairly wide range of hosts covering 200 species from 50 plant families. Ralstonia solanacearum is known as a bacterium that has many races. These bacteria are divided into 5 races based on the host range. Race 1 attacks tobacco plants, tomatoes and other solanaceae, race 2 attacks banana (triploid) and Helcolina, race 3 attacks potato, tomato and geranium ornamental plants. Race 3 is generally found in high-altitude areas with cold temperatures, race 4 attacks the ginger plant and race 5 attacks the mulberry plant. Withered bacteria caused by Ralstonia solanacearum can also be grouped into biovar, where the biovar grouping is based on the ability of bacteria to oxidize 6 types of carbohydrates namely disaccharides, lactose, maltose, alcohol, mannitol and sorbitol.

[RA39] EFFECT OF LEARNING MODEL PROJECT BASED LEARNING ON INTEGRATED STEM STUDENT RETENTION OF LEARNING PHYSICS HIGH SCHOOL
Amirah Onne Okitavia, Albertus Djoko Lesmono, Arik Aguk Wardoyo, and Kendid Mahmudi (University of Jember, Jember, Indonesia)

Abstract: STEM is one approach that can be integrated into the model of project-based learning. Science, Technology, Engineering, and Mathematics (STEM) Education applied in learning by using multiple disciplines. STEM integration has been performed at various school curriculum in 2013. It is intended that students can learn to be more active and able to solve the solution of a problem that is authentic in real life so that students better understand the overall concept and the maximum. This study aims to determine the effect on the model STEM integration project-based learning on the retention of high school physics learning outcomes. The method used is pre-experimental design with one group pretest-posttest design implemented in class X MIPA 7 in SMAN 2 Jember with 36 Students were comprising boys (18) and girls (18). The data collection is done by using the initial test, the final test, and test delay. The results of the students’ learning retention after application of an integrated model of project-based learning is 98.96 belonging STEM strong category.

[RA40] DEVELOPMENT OF LEARNING MEDIA USING VBA EXCEL IN PHYSICAL LEARNING ON HIGH SCHOOL
Ayu Dini Safitri, Albertus Djoko Lesmono, Maryani Maryani, and Arik Aguk Wardoyo (University of Jember, Jember, Indonesia)

Abstract: This study aims to examine the practicality and effectiveness of instructional media. This research is a research and development study. The development procedure in this study uses 4D which has 4 stages namely define, design, develop, and disseminate. This study examines the disseminate stage of validating testing. The results of the develop stage to state that they are valid, practical and effective. The subject of the dissemination stage of this study were students of class XI MIA-1, XI MIA-2, and XI MIA-4 at Umbulsari High School. Data collection was done by pre-test and post-test and student questionnaire responses. The results of validating testing at the disseminate stage to measure the practicality of learning media carried out by XI MIA-1, XI MIA-2 and XI MIA-4 respectively scored 81.32%, 80.20%, and 81.46%, obtaining criteria practical and get effective enough criteria for the effectiveness of instructional media using VBA Excel with a score of 40.05% at XI MIA 1, 36.21% at XI MIA 2 and 39.23% at XI MIA 4 based on the N-gain test criteria.
[RA41] RESULTS OF HIGH SCHOOL STUDENT LEARNING IN PHYSICS LEARNING USING PROBLEM-BASED LEARNING (PBL) MODELS WITH STEM (SCIENCE, TECHNOLOGY, MATHEMATICS, AND ENGINEERING) APPROACHES
Yully Erlina Eka Putri, Albertus Djoko Lesmono, Arik Aguk Wardoyo and Kendid Mahmudi (University of Jember, Jember, Indonesia)
Ismanto Ismanto (SMAN 2 Jember, Jember, Indonesia)
Abstract: This article discusses the learning outcomes of high school students using the Problem Based Learning (PBL) model by discussing STEM (Science, Technology, Engineering, and Mathematics). The purpose of this article is to describe how students learn in the cognitive domain in learning physics at SMA Negeri 2 Jember using PBL models with STEM learning. This type of research uses a true experimental research and the sample of this study is students of class X MIPA 6 in SMA Negeri 2 Jember. Data collected through Student Worksheets (LKS) and tests. The instrument used in this study was a student learning achievement test consisting of posttest questions. The data obtained were analyzed using the N-get test in order to obtain student learning outcomes before and finally using the PBL model using STEM. The results of this study are the use of PBL models using STEM can improve student learning outcomes X MIPA 6 in SMA Negeri 2 Jember.

[RA42] Literacy of Mathematics in PISA Test Type A
Inge Wiliandani Setya Putri (University of Jember, Jember, Indonesia)
Abstract: Literacy of Mathematics in PISA Test Type A is used to describe reasoning and communication of mathematical skills. The subject of research is student of IX-A class SMPN 1 Jember. The research are obtained some PISA Test which one is type A on PISA test. The result shows score in reasoning and communication of mathematical skills are 103 and 20. 103 is the highest score in reasoning and communication of mathematical skills, but 20 is the lowest score in reasoning and communication of mathematical skills.

[RA43] ANALYSIS OF MATHEMATICS CREATIVITY OF HIGH SCHOOL STUDENTS THROUGH STEM INTEGRATED PROJECT-BASED LEARNING IN ELASTICITY PHYSICS LEARNING IN CLASS XI MIPA 6 OF SMAN 2 JEMBER
Nuri Ade Iksani Devi, Albertus Djoko Lesmono, Arik Aguk Wardoyo and Kendid Mahmudi (University of Jember, Jember, Indonesia)
Henri Mulyo Widodo (SMAN 2 Jember, Jember, Indonesia)
Abstract: This study examines STEM (Science, Technology, Engineering, and Mathematics) as one approach that is integrated with the project-based learning model. This study aims to analyze the mathematical creativity of high school students through the integrated STEM project-based learning model in learning physics material elasticity. The research method used was a pre-experimental design with the One Group Post-test Only Design which was carried out in class XI MIPA 6 of SMAN 2 Jember with 36 students consisting of 14 male students and 22 female students formed in 6 heterogeneous groups each - each group consisted of 6 people. Data collection was performed using the final test in the form of analysis of student worksheets and video analysis of student learning processes to measure students' mathematical creativity. Based on the results of the study, it was found that the application of STEM integrated project-based learning affected the mathematical creativity of high school students in class XI MIPA 6 of SMAN 2 Jember.

[RA44] ANALYSIS OF STUDENT LEARNING INTEREST USING PROBLEM BASED LEARNING MODEL WITH STEM APPROACH ON MATERIALS VECTOR IN CLASS X MIPA 3 SMAN 2 JEMBER
Irma Septiani, Albertus Djoko Lesmono, Arik Aguk Wardoyo and Kendid Mahmudi (University of Jember, Jember, Indonesia)
Arif Harimukti (SMAN 2 Jember, Jember, Indonesia)
Abstract: This study aims to describe the learning interests of students of class X MIPA 3 of SMAN 2 Jember on vector material using the Problem Based Learning model with a STEM approach. The method used in this study is a survey using a questionnaire. Indicators of learning interest questionnaire include feelings of pleasure, attention, interest, and student participation. The questionnaire has 20 statements that represent indicators of student interest in learning. The questionnaire was distributed to students of SMAN 2 Jember in MIPA 3 class X, with a total of 36 students. The average percentage results obtained for each indicator are feeling happy 72.3% in the "medium" category, 77.5% in the "high" category, 75.2% interest in the "medium" category, and 53.1% student participation in the "low" category. These results indicate that attention gets the highest percentage while the lowest participation.
[RA45] Science Textbook Based on Socio-Scientific Issues on Environmental Pollution Materials to Improve Science Literacy of Middle School Students

Septian Anggraini (Magister Science Education, Faculty of Teacher Training and Education)

Abstract: 21st century learning leads to problem solving, social-emotional skills to face the challenges of RI 4.0, so that it will have an influence on scientific understanding. This scientific understanding is still low in analyzing and applying the concept of a problem that has an impact on the ability of scientific literacy. Science literacy is related to the ability to think scientifically by using knowledge and identifying natural phenomena. The results of the distribution of questionnaires in 18 middle schools in Jember in the middle region of 89% stated the concept of scientific literacy of students was still lacking. Science literacy has a close relationship with Socio-Scientific Issues (SSI) which are described as social problems with a scientific context that connects students with scientific issues that are developing in society to be explored such as environmental pollution problems. The type of research used is development research with a 4-D development model consisting of the stages of define, design, develop, and disseminate. This research focuses on improving students' scientific literacy skills. The results showed that students experienced an increase in literacy from low to good categories.

[RA46] LEVEL OF STUDENTS CRITICAL THINKING SKILLS USING WORKSHEET WITH STEM (SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS) APPROACH IN MATERIAL VECTOR AT X MIPA 8 GRADE OF SMAN 2 JEMBER

Elisa Octaviyanti, Albertus Djoko Lesmono, Arik Aguk Wardoyo and Kendid Mahmudi (University of Jember, Jember, Indonesia)

Ismanto Ismanto (SMAN 2 Jember, Jember, Indonesia)

Abstract: Science education into the 21st century-oriented development strategies and solutions to solve problems in everyday life. This requires the learning process to develop thinking skills, one of which is critical thinking skills. TIMSS and PISA study results show that the high-level thinking skills of students are still low. The purpose of this study was to determine the level of critical thinking skills students use worksheets with the approach of STEM (science, technology, engineering, and mathematics). A research approach is a qualitative approach with descriptive research. Data collection methods used in this study is the observation, documentation, and interview as supporting data. The subject of this research is class X MIPA 8 in SMAN 2 Jember. The results of this study indicate that the critical thinking skills students use worksheets with STEM approaches fall into either category. This is indicated by the percentage of each indicator that shows the high category. It can be concluded that, overall, students' critical thinking skills in the learning vectors using worksheets with STEM approach is fair. There are activities that appear means a reflection of the critical thinking activities, either from individuals or groups for learning by using worksheets with STEM approach. It can be concluded that, overall, students' critical thinking skills in the learning vectors using worksheets with STEM approach is fair. There are activities that appear means a reflection of the critical thinking activities, either from individuals or groups for learning by using worksheets with STEM approach. It can be concluded that, overall, students' critical thinking skills in the learning vectors using worksheets with STEM approach is fair. There are activities that appear means a reflection of the critical thinking activities, either from individuals or groups for learning by using worksheets with STEM approach.

[RA47] AN ANALYSIS OF STUDENTS' CREATIVE THINKING SKILLS USING PBL (PROBLEM BASED LEARNING) MODEL WITH STEM APPROACH IN VECTOR MATERIAL AT X MIPA 4 GRADE OF SMA NEGERI 2 JEMBER

Mardiyah Sari Dewi, Albertus Djoko Lesmono and Arif Harimukti (University of Jember, Jember, Indonesia)

Abstract: This study discusses how students think about vector material through PBL (Problem Based Learning) models using STEM (Science, Technology, Engineering, and Mathematics). The method used in this study uses qualitative descriptive research. The subjects of this study were students of grade X MIPA 4 SMA Negeri 2 Jember with a total of 35 students. The instruments of collecting data in this study consisted of student worksheets and questionnaires to measure students' creative thinking skills. Student worksheets are provided using STEM (Science, Technology, Engineering, and Mathematics) which have been adapted to the 2013 curriculum that directs students to be actively involved in learning activities. fluency, flexibility, elaboration and originality which contains 6 indicators. The results of the questionnaire data were analyzed based on its indicators, namely for the first indicator getting a percentage of creative thinking skills by 74%, the second indicator by 78%, the third indicator by 74%, the percentage indicator by 69%, the percentage indicator by 74%, and for the sixth indicator by 70%. The number of students who reached the criteria was quite creative there were 33 students with a percentage of 94%. Based on the results of data analysis obtained, students think a high percentage. The PBL (Problem Based Learning) model using STEM (Science, Technology, Engineering, and Mathematics) on vector material has good implications and supports an effective and enjoyable learning process for students.
Abstract:
Chaerun Anwar, Wahyu Sopandi, Udin Saefudin Saud, Wiwi Tin Pratiwi and Hendi Inderawan (Universitas Pendidikan Indonesia, Indonesia)

The Investigation of STEM-based TGT (Team Games And Tournament) Learning Models in High School
Faizah Firdaus, Wachju Subchan and Erlia Narulita (Magister of Science Department, FKIP University of Jember, Jember, Indonesia)

Development and Validation of Instruments in Appearing Multiliteration in Learning at Elementary School
Muh. Erwinto Imran (Universitas Pendidikan Indonesia, Indonesia)

The Analysis of Students Activeness Using the Project Based Learning Model with the STEM Approach to Learning Physics of Elasticity Material for XI MIPA 5 Class at 2 Jember Senior High School
Nanda Rizky Fitrian Kanza, Albertus Djoko Lesmono and Heny Mulyo Widodo (University of Jember, Jember, Indonesia)

The Analysis of Students Activeness Using the Project Based Learning Model with the STEM Approach to Learning
Nanda Rizky Fitrian Kanza, Albertus Djoko Lesmono and Heny Mulyo Widodo (University of Jember, Jember, Indonesia)

The Analysis of Students Activeness Using the Project Based Learning Model with the STEM Approach to Learning
Nanda Rizky Fitrian Kanza, Albertus Djoko Lesmono and Heny Mulyo Widodo (University of Jember, Jember, Indonesia)

Development and Validation of POKSD-PORS Protocol Assessment of Engineering in Elementary Classroom
Chaerun Anwar, Wahyu Sopandi, Udin Saefudin Saud, Wiwi Tin Pratiwi and Hendi Inderawan (Universitas Pendidikan Indonesia, Indonesia)
[RA52] The analysis of the implementation of multi techniques based learning media in improving the elementary school students’ higher order thinking skill in solving exponential problem
Lailatul Masruroh and Suparti Suparti (Universitas terbuka)
Dafik Dafik (University of Jember, Jember, Indonesia)

Abstract: Improving high-order thinking skills is very important, but in reality, higher-order thinking skills of students have not met an expectation. In this study, researchers tried to implement multi techniques based learning media. This type of research is using a mixed research that is a combination of quantitative and qualitative methods. The quantitative method will be used to analyze the type of interval data of student learning outcomes, while the qualitative method will be used to analyze an ordinal data types of high thinking skills. The research respondents consist of two classes, namely control class as many as 25 people and experimental class as many as 24 students. The analysis of the implementation of multi techniques based learning media process consists of 5 techniques. Validation is done by calculating the average assessing expert and teacher answer, while the effectiveness of learning devices using the results of individual student tests. The multi-techniques based learning media proved to be valid, practical and effective with the fulfillment of the requirements for learning steps.

The results showed that after the implementation of a multi techniques based learning media, it was found that the percentage of high-order thinking skills for the control class was 84% focus, 81% reason, 82% conclusion, 83% decision, 80% clarity, 82% rearrangement. While the experimental class had 94% focus, 93% reason, 92% conclusion, 93% decision, 91% clarity, 92% rearrangement. Then the score of the independent sample t-test value from the post test shows that there is a significant difference between the control class and the experimental class with sig (2 tailed) values of 0.036 (p = <0.05). It can be concluded that the implementation of multi technique based learning media can improve the high-order thinking skills through the Exponential Problem.

[RA53] The analysis of the implementation of multi source based learning media to improve the elementary students critical thinking skills in solving addition and subtraction problems
Yulike Retno Sari and Suparti Suparti (Universitas terbuka)
Dafik Dafik (University of Jember, Jember, Indonesia)

Abstract: Students' critical thinking skills are an important thing, but the reality is not as expected. In this study researchers tried to apply multi source based learing to improve critical thinking skills. This type of research is using mixed research, namely a combination of quantitative methods and qualitative methods. Quantitative methods will be used to analyze the types of interval data on student learning outcomes, while qualitative methods will be used to analyze ordinal data types of critical thinking skills. The respondents of the study consisted of two classes, namely the control of 30 students and the experimental class as many as 32 students. The results showed that after the application of multi-source learning devices it was found that the value of critical thinking skills for the control class was 49% for interpretation, 48,2% for analysis, 52,3% for evaluation. While the experimental class are 52,9% for interpretation, 57,8% for analysis, 58,3% for evaluation. The sample t-test from the post-test showed that there was a significant difference between the control class and the experimental class with the sig (2 tailed) value was 0.003 (p = <0.05). It can be concluded that the application of multi-source learning media-based learning devices can improve critical thinking skills of elementary students in solving addition and subtraction problems.

[RA54] The analysis of the implementation of learning materials base on research- based learning to improve the elementary school students creative thinking skills in solving “Polamatika” problems
Sucik Ike Wahyuni and Mohammad Imam Farisi (Universitas terbuka)
Dafik Dafik (University of Jember, Jember, Indonesia)

Abstract: The student's creative thinking skills are very important, but in fact, it has not met an expectation. In this study, researchers tried to apply learning materials base on research- based learning to improve their creative thinking skills. This type of research is using a mixed method, namely a combination of quantitative and qualitative methods. Quantitative method will be used to analyze the type of interval data of student learning outcomes, while the qualitative method will be used to analyze an ordinal data of creative thinking skills. The research respondents consist of two classes, namely a control class as many as 33 students and an experimental class as many as 31 students. The results show after the implementation of learning materials base on research-based learning, it was found that the percentage of creative thinking skills for the control class are 70% for fluency, 68% for flexibility, 60% for novelty. While the experimental class is 80% for fluency, 77% for flexibility, 72% for novelty. The score of the independent sample t-test from post-test shows that there is a significant difference between the control class and the experimental class with the sig (2- tailed) value is 0.003 (p = <0.05). It can be concluded that the
implementation of learning materials base on research-based learning can improve the elementary school students creative thinking skills in solving “Polamatioka” problems.

[RA55] Process Skills of Science in Work and Energy Class X through an Integrated STEM Approach with Problem Based Learning (PBL)
Dian Rani Permatasari, Albertus Djoko Lesmono, Supeno Supeno, Arik Aguk Wardoyo and Kendid Mahmudi (University of Jember, Jember, Indonesia)

Abstract: This research aims to determine students’ science process skills in business and energy materials by using the Integrated STEM approach with the Problem Based Learning (PBL) model and knowing students’ responses to learning using the Integrated STEM approach. The research method used was an experiment with a time series design carried out at SMAN Ambulu class X Science 6 as many as 34 students. Data collection is done by using the initial test and the final test along with a questionnaire. Based on the results of data analysis obtained by students’ science process skills with an average of less than 0.5 besides the results of student responses obtained an average of 85%. Overall student responses showed that almost all students expressed satisfaction with learning the STEM approach with the Problem Based Learning (PBL) model and gained a very memorable experience following the learning stages so as to generate motivation and interest in learning.

[RA56] APPROACH TO STUDENT LEARNING RESULTS OF SMKN 2 JEMBER MATERIAL OF FORCE AND NEWTON’S LAW
Siti Magfirah, Sudarti Sudarti and Arik Aguk Wardoyo (University of Jember, Jember, Indonesia)
Sri Wihandari (SMKN 2 Jember, Indonesia)

Abstract: This research aims to determine the effect of the Problem Based Learning model with the STEM approach to student learning outcomes on force and Newton’s Law material. The research method used is a true experimental research type and uses a posttest only control group design. The data collection technique used is to provide a test item description to determine student learning outcomes. According to the learning outcomes, data obtained before the implementation of learning using the Science Technology Engineering and Mathematics (STEM) approach the results are still not optimal. So this becomes the basis of the application of the Problem Based Learning model with the STEM approach. The STEM approach combines scientific knowledge, technology, engineering, and mathematics that affect student thinking patterns and enhance creativity and learning outcomes. Data analysis using the average N-Gain formula. The results showed that the learning model Problem Based Learning with the STEM approach can improve student learning outcomes in material force and Newton’s law.

[RA57] The analysis of the implementation learning material based on discovery based learning and its effect to student creative thinking skills in solving the multiplication problem
Sumartiningsih Sumartiningsih and Suparti Suparti (Universitas Terbuka)
Dafik Dafik (University of Jember, Jember, Indonesia)

Abstract: Students’ creative thinking skills are very important, but in reality, they have not met expectations. In this study, researchers tried to apply learning material that aims to construct Mathematics Learning by using the Development of Learning Tools Based on Discovery Based Learning (DBL) and see the extent of its influence in improving creative thinking skills of elementary students in overcoming difficulties and solving multiplication problems of elementary school students. This type of research uses a research and development research method, then proceed with a combination of research to analyze the application of Discovery Based Learning (DBL). Quantitative methods will be used to analyze interval data types of student learning outcomes, while qualitative methods will be used to analyze ordinal data for creative thinking skills. The research respondents consisted of two classes, namely the control class as many as 32 students and the experimental class as many as 34 students. The results showed that after the implementation of research-based learning materials, it was found that the percentage of creative thinking skills for the control class are 60% for manage, 65% for fluency, 59% for flexibility, 51% for novelty, and 56% for evaluate. While the experimental class was 73% for management, 75% for fluency, 78% for flexibility, novelty 61%, and 68% for evaluate. Then the independent sample t-test score from the post-test showed that there was a significant difference between the control class and the experimental class with the sig (2-tailed) value was 0.003 (p = <0.05). It can be concluded that the implementation of discovery-based learning materials and their effects on evaluative skills of elementary school students in solving multiplication problems. The result reveal that the implementation of Discovery Based Learning (DBL) learning material product increase the student’s creative thinking skills in solving multiplication of elementary school students.
[RA58] THE INFLUENCE OF PROJECT-BASED LEARNING (PjBL) MODELS WITH STEM APPROACH ON SCIENCE PROCESS SKILLS IN VOCATIONAL HIGH SCHOOL
Cendy Eka Erlinawati, Sudarti, Albertus Djoko Lesmono and Arik Aguk Wardoyo (University of Jember, Jember, Indonesia)
Rohatin (SMKN 2 Jember, Indonesia)
Abstract: This article discusses the science process skills of students in SMK using the PjBL model with the STEM approach. The purpose of this article is to describe how the science process skills of students in learning physics at SMK Negeri 2 Jember using the PjBL model with the STEM approach. This type of research is a true experiment and the sample of this study is the students of class X TBSM 1 at SMK Negeri 2 Jember. Data collected through Student Worksheets (LKS) and observation sheets. The data obtained were analyzed using the N-gain test in order to know the increase in students’ science process skills before and after using the PjBL model with the STEM approach. The results of this study are the use of the PjBL model with the STEM approach can improve the science process skills of students in class X TBSM 1 at SMK Negeri 2 Jember.

[RA59] ANALYSIS OF THE INTEREST IN LEARNING PHYSICS OF SMK STUDENTS ON THE PROJECT BASED LEARNING MODEL WITH THE STEM APPROACH TO THE SUBJECT OF FORCE AND NEWTON'S LAW
Listyany Yuniar Saraoh, Sudarti and Arik Aguk Wardoyo (University of Jember, Jember, Indonesia)
Sri Wihandari (SMKN 2 Jember, Indonesia)
Abstract: The Project-Based Learning model is a learning model that utilizes project creation in the learning process. The STEM approach is a learning approach that combines four aspects, namely Science, Technology, Engineering, and Mathematics. Student learning interest is one of the important things that students must have in the learning process. This study aims to describe the interest of vocational student learning towards STEM-based Project Based Learning models on the subject of Force and Newton’s Law. The study was conducted in class X Multimedia SMKN 2 Jember. This research is a survey research with data collection techniques in the form of a questionnaire. The interest in learning questionnaire contained 15 items given to students of Class X Multimedia SMKN 2 Jember. Based on the analysis conducted, it is known that the interest in learning physics of SMK students towards the Project-Based Learning model with the STEM approach is relatively high.

[RA60] STEM Learning and its Barrier in Schools: The Case of Biology Teachers in Malang City
Herawati Susilo and Ahmad Kamal Sudrajat (Universitas Negeri Malang, Malang, Indonesia)
Abstract: The purpose of this paper is to determine the teacher’s understanding of STEM and the barriers faced by teachers in implementing STEM learning. The study was a qualitative descriptive study. Qualitative data were obtained through a questionnaire given to 15 teachers who are members of the biology teachers learning community (MGMP Biologi) in Malang City. Data analysis was carried out qualitatively based on the results of the questionnaire given to the teacher. The results showed that teachers’ understanding of STEM was still low. The main barrier faced in the implementation of STEM-based learning is teacher understanding about STEM still low and students’ motivation to learn STEM is less. Suggestions for increasing the intensity and quality of STEM learning in schools are held training to improve teacher skills and collaboration between schools, government, and universities to improve the quality of STEM learning.

[RA61] The analysis of the application learning materials base on project-based learning to improve the elementary school students innovative creative thinking skills in solving division problems
R.A. Nurul Hidayatus Shalihah and Tri Dyah Prastiti (Universitas Terbuka)
Dafik Dafik (University of Jember, Jember, Indonesia)
Abstract: Improving students ‘innovative creative thingking skills is very necessary, but in fact, students’ innovative creative thinking skills have not been fully in line with expectations. In this study, researchers tried to apply the application learning materials base on project-based learning to improve students’ innovative creative thinking skills. This type of research is using a mixed research, which is a combination of quantitative and qualitative methods. Quantitative methods will be used to analyze the type of interval data of student learning outcomes, while the qualitative method will be used to analyze the types of an ordinal data students’ innovative creative thinking skills. The research respondents consist of two classes, namely a control class as many as 19 students and an experimental class as many as 20 students. The results shows after the implementation using the application learning materials base on project-based learning, it was found that the presentation of students’ innovative creative thinking skills for the control class are 63% for fluency, 62% for flexibility, 60% for innovation, and 65% for novelty. While the experimental class are 76% for fluency, 80% for flexibility, 82% for innovation, and 85% for novelty. Then the score of the indepent sample t-test from post-test shows that there is a significant difference between the control class and the experimental
class with the sig (2-tailed) value is 0.003 (p = <0.05). It can be concluded that the application learning materials base on project-based learning can improve students’ innovative creative thinking skills in solving division problems.

[RA62] The analysis of implementation of 5M scientific approach of learning material and the effect to elementary school students on critical thinking skills in the solving problem sequence of fraction

Rofika Rofika and Tri Dyah Prastiti (Universitas Terbuka)
Dafik Dafik (University of Jember, Jember, Indonesia)

Abstract: Students’ critical thinking skills are important, but the reality is not as expected. In this study researchers tried to develop learning devices using a scientific 5M-based approach to improve critical thinking skills of elementary school students. The type of research used is mixed research, which is a combination of quantitative methods and qualitative methods. Quantitative methods are used to analyze the types of interval data on student learning outcomes, while qualitative methods are used to analyze the types of ordinal data students’ critical thinking skills. Respondents in this study consisted of two classes, namely the control class consisting of 27 students and the experimental class consisting of 24 students. The result shows after the implementation of 5M scientific approach of learning material, it was found that the percentage of critical skills for control class are 65% for interpretation, 63% for analysis, 62% for evaluation, and 60% for inference. While the experimental class are 74% for interpretation, 72% for analysis, 72% for evaluation and 71% for inference. Then the score of independent sample t-test from post-test show that there is a significant difference between the control class and the experimental class with the sig (2-tailed) value is 0.003 (p = <0.05). It can be concluded that the implementation of 5M scientific approach of learning material can improve the elementary school students critical thinking skills in the solving problem sequence of fraction.

[RA63] Analysis of Similarities and Differences Between STEM Education and Revised Curriculum 2013

Dyah Intan Prisamasari, Anjar Putro Utomo and Erlia Narulita (Jember University, Indonesia)

Abstract: This study aims to analyze the differences and similarities of STEM learning towards the 2013 revised curriculum. This study use literature review method with qualitative descriptive approach. Data collection done with reviewing 18 articles that discuss about STEM curriculum policy in USA. Based on the article analyst about STEM policy, the result obtained that STEM education and revised K-13 has general equation that prosecute the student to be a problem solver, competency realm covering knowledge, attitude and skill, also assessment aspec based on competency realm. Beside that, STEM education and revised K-13 also has difference that is on K-13 the student could think scientifically and also has scientific attitude, while on STEM the student could think multiinterpretation and integrated. On K-13’s competency realm the student have spiritual attitude competency and unintegrated competency, while on STEM has no spiritual attitude competency but has integrated science, technology, engineering, mathematics competency. K-13’s assessment aspec tend to summative while STEM’s assessment done summative and formatively. Therefore, concluded that there is differences and equation between K-13 and STEM, so STEM implementation on K-13 need Engineering Design Process (STEM) adjustment with scientific approach (K-13).

[RA64] Analysis of Similarities and Differences Between STEAM Education and Revised Curriculum 2013

Lailatul Bulgis, Anjar Putro Utomo and Erlia Narulita (University of Jember, Indonesia)

Abstract: This study aims to analyze the differences and similarities of STEAM learning towards the 2013 revised Curriculum. This study used the literature study method with a qualitative descriptive approach. Data was collected by reviewing 34 articles in the STEAM curriculum context in Korea. From 34 articles, there is 27 articles that discuss STEAM curriculum policies in Korea. Based on the results of reviewing articles in this context, it was obtained that, STEAM learning with the revised 2013 curriculum revision has similarities: the goal of requiring students to be solver problems, and competency and cognitive, affective, and psychedelic aspects. Other than that, Steam study with the 2013 revision curriculum also has a difference, which means the k13 more stresses the left brain. While STEAM has an integrated capacity, it builds emotional intelligence through art. In the capacity of competency in the k13 students has no competency which is just science. Whereas STEAM education has integrated competence, namely science, technology, engineering, mathematics and art. Differences in the judgment aspect, the k13 tends to be summative while STEAM tends to be integration of summative and formative. hus, it has been concluded that there is a difference and equation between k-13 and steam, so the implementation of steam in k-13 needs emphasis.
Abstract: Learning materials are the important thing that will support teaching and learning process at school. The existence of a good learning materials will help the students to understand the given subject matter. Mathematics is a subject matter which has a higher level of difficulty than other subjects. So teacher needs the right learning materials when delivering the material. a method that can be used to improve student’s understanding related to mathematics learning material, especially the subject of two dimensional is inquiry-based learning. This method emphasize the active participation of students to understand the material provided. So using this method for implementing learning materials are expected to develop student’s critical thinking skills. Type of this research is mixed method research which combining qualitative and quantitative method. Quantitative methods are used to analyze the types of interval data on student learning outcomes while qualitative methods are used to analyze ordinal data types of student’s critical thinking skills. Respondents of this research consisted of one control class and one experimental class consisting of 30 students at 4th grade class in SDN Sawaran Kulon 02 Lumajang. Based on the experiment result, control class was obtained 65% of interpretation, 65% of analysis, 59% of evaluation and 52% of inference. Meanwhile, the experimental class was obtained 75% of interpretation, 75% of analysis, 69% of evaluation and 82% of inference. The t-test result of independent sample shows that there is a significant difference between control class and experimental class with a sig (2-tailed) value of 0.00 (p = <0.05). It can be concluded that the implementation of learning materials using inquiry-based learning method can improve the critical thinking of elementary school students.

Abstract: Foreign teachers have an important role related to strengthening cooperation between countries. This condition is inevitable given that globalization is developing so fast. Through foreign instructors, it is expected that knowledge transfer and positive characters can occur. However, students ‘responses to foreign teachers are not the same, apart from that students’ understanding of the material delivered by foreign teachers is also different. The purpose of this study is to apply character-based learning and reinforcement of foreign teachers in dealing with cultural differences. This research uses descriptive qualitative analysis. The sample of this study was Mattayom 3 students, amounting to 15 regular students. The results of this study indicate that the application of character-based learning applied to students has a positive impact. One of the characters that emerges is confidence. Reinforcement conducted by foreign teachers also has a positive influence, so that it can motivate students to be more confident in communicating, even though they differ in language and culture.

Abstract: The Problem Based Learning (PBL) model has been applied in Indonesia for a long time. The Problem Based Learning and reinforcement of foreign teachers in facing cultural differences in Thailand’s Streesmutprakan School. Student learning outcomes using the Problem Based Learning (PBL) model which is integrated with Science, Technology, Engineering, and Mathematics (STEM) are expected to improve student learning outcomes in the cognitive domain. This study aims to describe student learning outcomes using the Problem Based Learning (PBL) model which is integrated with Science, Technology, Engineering, and Mathematics (STEM) on the subject of elasticity. This type of research is a true experimental research design with pretest-posttest control-design conducted in class XI MIPA 4. The conclusion of this study is the Problem Based Learning (PBL) model with the approach of Science, Technology, Engineering, and Mathematics (STEM) can improve student learning outcomes in the cognitive domain in learning physics in class XI MIPA 4 SMA NEGERI 2 JEMBER.

Abstract: The Problem Based Learning (PBL) model has been applied in Indonesia for a long time. The Problem Based Learning (PBL) model with the approach of Science, Technology, Engineering, and Mathematics (STEM) are new in the world of education. When students are introduced to the new learning model, it will make students have a high curiosity and a great desire to learn. Having a great desire to learn will affect student learning outcomes. Problem Based Learning (PBL) model with the approach of Science, Technology, Engineering, and Mathematics (STEM) is expected to improve student learning outcomes in the cognitive domain. This study aims to describe student learning outcomes using the Problem Based Learning (PBL) model which is integrated with Science, Technology, Engineering, and Mathematics (STEM) on the subject of elasticity. This type of research is a true experimental research design with pretest-posttest control-design conducted in class XI MIPA 4. The conclusion of this study is the Problem Based Learning (PBL) model with the approach of Science, Technology, Engineering, and Mathematics (STEM) can improve student learning outcomes in the cognitive domain in learning physics in class XI MIPA 4 SMA NEGERI 2 JEMBER.
[RA68] ANALYSIS OF STUDENT LEARNING MOTIVATION IN PHYSICAL LEARNING USING PROJECT-BASED LEARNING (PJBL) MODEL BASED ON STEM
Feni Marcelina, Sudarti, Arik Aguk Wardoyo and Kendid Mahmudi (University of Jember, Indonesia)
Rohatin (SMKN 2 Jember, Indonesia)
Abstract: Project-Based Learning (PJBL) model is a project-based learning model that uses projects/activities as a medium. The purpose of this study is to determine student learning motivation at SMKN 2 Jember on learning physics in Force and Newton’s law subject by using STEM-based Project Based Learning (PJBL) models. This research is survey research. Data obtained by giving questionnaires to students of X PBL with a total of 35 students. Based on the data obtained, it is known that students have high learning motivation in physics learning by using STEM-based Project-Based Learning (PJBL) models.

[RA69] Impact of Foreign Teacher towards Student’s Motivation in Hatyaiwittayalaisomboonkulkanya School Thailand
Haidhar Reizal and Agustiningsih (University of Jember, Indonesia)
Abstract: Education on industrial revolution 4.0 has a very broad dimension. Teacher’s role on this era has a strategic position as a learning process designer. Foreign teacher’s role can’t be ruled out on this era. Hatyaiwittayalaisomboonkulkanya school as one of educational institutions on Thailand needs foreign teacher role on their learning process. Foreign teacher expected to give a new nuance on learning process. Foreign teacher existence need to know about the relation with students motivation, because students motivation is one of the important thing on learning process. Formulation of the problem itself is how was the relationship between students motivation towards foreign teacher on Hatyaiwittayalaisomboonkulkanya school Thailand? Research method that used in this research is Qualitative Descriptive. This research performed on Mattayom 2 Hatyaiwittayalaisomboonkulkanya school’s student. Collecting data research used questionnaire with student’s motivation variable. The research result show a positive relation between foreign teacher towards students’ learning motivation.

[RA70] THE INFLUENCE OF PROBLEM-BASED LEARNING (PBL) LEARNING MODEL USING STEM (SCIENCE, TECHNOLOGY, MATHEMATIC, AND ENGINEERING) APPROACHES ON STUDENT PHYSICAL LEARNING ACTIVITIES IN SMK
Ainul Kromah (University of Jember, Indonesia)
Ismanto (SMAN 2 Jember, Indonesia)
Abstract: PBL (Problem Based Learning) learning model with the STEM approach can improve student learning activities. Learning activities undertaken are one indicator of students’ desire to learn. Student learning activities that occur in the learning process include asking questions, submitting opinions, doing assignments, answering questions, and being able to take responsibility for the tasks given. The purpose of this study was to determine the effect of Problem Based Learning learning models with the STEM approach to student learning activities. This type of research is a true experiment and the sample of this study is student of class X IL 2 SMKN 2 Jember. The data obtained in this study were analyzed using the N-gain test to determine whether there was an increase in student learning activities before and after using the Problem Based Learning model with the STEM approach.

[RA71] INNOVATION IN LEARNING FUTURE SCIENCE THROUGH STEM (SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATIC) EDUCATION IN SMA MUHAMMADIYAH 3 JEMBER
Alvi Maulidia (University of Jember, Indonesia)
Agung Sedayu (SMA 3 Muhammadiyah, Indonesia)
Abstract: This article discusses how to find out the level of student creativity in science learning, using the PBL (Problem Based Learning) learning model through the STEM approach (Science, Technology, Engineering, and Mathematics). The goal is to use these learning students who have different thought patterns and levels of creativity can process their thoughts with different outputs on the cognitive domain of students in learning physics in the material elasticity and Hooke law in class XI Mipa 3 students at Muhammadiyah 3 High School Jember. The data obtained in the form of worksheets (Student Worksheets) and the final product. This type of research uses true experimental research. The instruments needed in this research are test sheets. The results of this study are that using the STEM approach can provide innovative thinking for high school students’ creativity in mastering physics learning.
[RA72] Integrated Learning Profile In Science Subjects at Junior High School
Soesy Sri Wulandari (SMP Negeri 10 Jember)
Prabowo, Imam Supardi Za (Science Education, Post Graduate Program, Universitas Negeri Surabaya, Indonesia)
Abstract: This study aims to determine about the integrated learning profile in science subjects in junior high school. The thing that will be analyzed is how to process the integrated learning planning in science subjects in junior high school. The data collection is described and analyzed through the reduction and examination process which validity used triangulation method. The descriptive analysis results found the answers to research questions. Then, the researchers drew a conclusion from the results of research. The results of the study found that teachers did not apply integrated learning that involves cognitive, affective, and psychomotor aspects. Based on these findings, it can be concluded that the integrated learning profile in science subjects in junior high school do not equivalent to the characteristics of integrated learning. The main cause of the condition is that teachers did not understand the characteristics of integrated learning in science subjects.

[RA73] Effectiveness of Learning Integrated Science of Webbed Type on Energy Themes in Life Systems
Iwan Wicaksono and Riski Yani (University of Jember, Indonesia)
Abstract: Natural Sciences is one of the subjects of Junior High School which has the potential to build students' high thinking skills (High Other Thinking Skills). The purpose of Integrated Science learning research that teaches material concepts in an integrated manner so that it can make learning more meaningful than learning provided with separate and overlapping concepts. However, in reality Integrated Science learning in junior high schools tends to be provided with separate concepts. The research method uses SPSS statistical analysis. The characteristics of junior high school students in general, which are in a very rapid development stage from all aspects and have a high curiosity about something and prefer the learning process that varies according to the subject matter.

[RA74] THE COMPARATIVE STUDY OF CONVENTIONAL MEDIA AND VIRTUAL MEDIA IN INCREASING STUDENTS' SCIENCE PROCESS SKILL ON STRAIGHT MOTION SUBJECT
Dini Febrianti, Bambang Supriadi, Lailatul Nuraini (University of Jember, Indonesia)
Syaihun Atiq LR. (SMA Muhammadiyah 3 Jember, Indonesia)
Abstract: This study aims to: 1) analyze the comparison of the process of learning of students with research methods with the model PBI (Problem Based Instruction) on two classes of each grade will be tested learning systems are different: (1) X IPA 1 using the conventional system, the teacher explains material to students. (2) X IPA 2 using the virtual system, which is the practice of using Phet Simulation. 2) Determine which is more effective learning system that is tested on students, which will be used for learning systems to be more effective in teaching students learning process. The data collection technique using pre-test and post-test given to students. Analysis process of the data is the pre-test students in class X IPA 1 and 2 is taken as the average of reference values for comparing. Once given the different media learning, students are given a post-test and take the average, then analyzed. Increase in the average highest from pre-test to post-test. The results showed that the virtual system by using Phet Simulation in class X IPA 2 have better results than conventional systems at X grade IPA 1.

[RA75] THE EFFECT OF PROJECT BASED LEARNING MODEL WITH STEM APPROACH IN IMPROVING STUDENTS' LEARNING ACHIEVEMENT IN SENIOR HIGH SCHOOL
Teguh Wijayanto, Bambang Supriadi, Lailatul Nuraini (University of Jember, Indonesia)
Syaihun Atiq LR. (SMA Muhammadiyah 3 Jember, Indonesia)
Abstract: The learning model project based learning is an instructional model that can be applied to the STEM approach. Approach STEM (Science, Technology in, Engineering and Mathematic) is an approach that can be used in learning by using multiple disciplines. STEM approach in learning is very suitable to be applied in the curriculum in 2013 so that students are able to be more active, creative, and better understand the concepts taught in a material for a project which produced students in learning directly related to real-life experience of students in the everyday. The purpose of this study to determine the influence is learning model project-based learning with STEM approach to the learning outcomes of high school students. The research was conducted in class X IPA 1 SMA Muhammadiyah 3 Jember, with 32 students at 15 male students and 17 female students. The method used in this research is the method pre-experiment design with one group pretest-posttest design. Collecting data in this study using the initial test and final test. Student learning outcomes obtained after application project-based learning model STEM learning approach shows N-gain category was at 0.62.
[RA76] THE INNOVATION OF LEARNING PHYSICS THROUGH STEM EDUCATION IN IMPROVING STUDENTS’ CREATIVITY IN ELASTICITY AND HOOKE LAWS SUBJECT IN SENIOR HIGH SCHOOL
Alvi Maulidia, Bambang Supriadi, Lailatul Nuraini (University of Jember, Indonesia)
Abstract: This article discusses how to find out the level of student creativity in science learning, using the PBL (Problem Based Learning) learning model through the STEM approach (Science, Technology, Engineering, and Mathematics). The purpose of this study is to use these learning students who have different thought patterns and levels of creativity can process their thoughts with different outputs in the cognitive domain of students. The research method used is descriptive research. This research was applied to students of class XI Mipa 3 in Muhammadiyah 3 Jember High School, material elasticity and hooke law. Data collection techniques using observation or direct observation. Data analysis techniques obtained from student worksheets and student work outcomes products. The results of the study show that using the STEM approach can provide innovative thinking for high school students’ creativity in mastering physics learning.

[RA77] INCREASING STUDENT AWARENESS OF PLANTS THROUGH CONTEXTUAL LEARNING BASED ON ENVIRONMENT IN THE PLANT MORPHOLOGY COURSE
Ika Lia Novenda, Pujiastuti (University of Jember, Indonesia)
Abstract: Plant Morphology courses is one of the subjects Biology, in which one basically competence is to increase awareness of students to plant around. Contextual learning environment based not only develop the realm of knowledge and process skills, but also develop the attitudes, values, and creativity of students in solving problems related to their daily lives through interaction with peers. The purpose of this study to determine the level of student awareness of the surrounding vegetation. This study is a qualitative descriptive study through a questionnaire to 34 students. Results showed of 34 students, 53% of students answered strongly agree that contextual learning environment based around being able to raise awareness of the plant; 41% answered agree and 6% answered less agree.

[RA78] Development of STEMI (Science, Technology, Engineering, Mathematics, Indonesia) in Learning Chemistry inorder to face Industrial 4.0
Prof. Tatang Suhery (Universitas Sriwijaya, Palembang)
Abstract: In this paper, the authors try to approach used in order to improve the quality of learning at the Institute of Teacher Training and Education need to develop relevant approaches to curriculum learning 2013. Model Approach STEMI (Science, Technology, Engineering, and Mathematics Indonesia) at this time become one of the important issues in the development of the world. This refers to the basic concepts of design integration technologies / techniques in teaching and learning of science / mathematics in the school curriculum. STEMI education to concentrate on learning toward problem solving (problem solving) and problem posing (formulation of the problem). In this paper we propose a STEM approach of Indonesia in order to support the implementation of the curriculum in 2013 needs to be developed a model based STEMI Indonesian based on local content of Indonesian culture, system of education, and the facilities study at School. Results STEMI Indonesia has implemented in teacher candidate student in order to study prepare chemistry teacher in college, has shown tangible results in developing creativity and student innovation. We also need to develop STEMI is the basis of learning achievement of the industrial revolution 4.0
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<td>Aini Meitanti Rosalina</td>
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<td>6</td>
<td>Aulya Nanda Prafitasari, S.Pd., M.Pd</td>
<td>Contained Testing: The Comparison of Scientific Literacy Ability of Middle and High School Students Aged 15 Years Old</td>
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# Second Day of Conference for Presenter

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(The 1st ICoSTEM-Ed), Symposium, and Workshop

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