# PROCEEDINGS

ICOSEEH 2019

## The Second International Conference on Social, Economy, Education and Humanity

"Sustainable Development in Developing Country for Facing Industrial Revolution 4.0"

September 5-7, 2019
SKA Convention & Exhibition Center, Pekanbaru, Riau, Indonesia


Editors:
Arbi Haza Nasution
Evizal Abdul Kadir
Luiz Moutinho


**Organizer :**

**Co-Organizers :**

UNIVERSITI TEKNOLOGI MARA

Infrastructure University Kuala Lumpur

# ICoSEEH 2019

Proceedings of the
Second International Conference on
Social, Economy, Education and Humanity

Sustainable Development in Developing Country for Facing
Industrial Revolution 4.0

Riau - Indonesia

September 5 - 7, 2019

Edited by Arbi Haza Nasution, Evizal Abdul Kadir and Luiz Moutinho

Printed in Portugal
ISBN: 978-989-758-464-0
Depósito Legal: 473353/20

http://icoseeh.uir.ac.id

# BRIEF CONTENTS

# INVITED SPEAKERS

**Prof. Shigeo Sugimoto**
University of Tsukuba
Japan

**Prof. Dr. Kulthida Tuamsuk**
Khon Kaen University
Thailand

**Prof. Dr. Faridah Ibrahim**
Malaysia Infrastructure University
Kuala Lumpur

# ORGANIZING COMMITTEES

### STEERING COMMITTEE

Prof. Dr. H Syafrinaldi SH, MCL, Universitas Islam Riau, Indonesia
Prof. Shigeo Sugimoto, University of Tsukuba, Japan
Prof. Luiz Moutinho, University of Suffolk, England
Prof. Dr. Kulthida Tuamsuk, Khon Kaen University, Thailand
Prof. Dr. Faridah Ibrahim, Malaysia Infrastructure University, Kuala Lumpur

### GENERAL CHAIR

Dr. Arbi Haza Nasution, M.IT, Universitas Islam Riau, Indonesia

### GENERAL CO-CHAIR

Dr. Zetriuslita, S.Pd., M.Si., Universitas Islam Riau, Indonesia

### TECHNICAL PROGRAMME CHAIR

Dr. Evizal Abdul Kadir, ST., M.Eng, Universitas Islam Riau, Indonesia

### PUBLICATION AND RELATIONSHIP CHAIR

Dr. Syafriadi, S.H., M.H., Universitas Islam Riau, Indonesia

### FINANCIAL CHAIR

Ause Labellapansa, ST., M.Cs., M.Kom., Universitas Islam Riau, Indonesia

### EDITORIAL CHAIR

Yudhi Arta, S.Kom., M.Kom., Universitas Islam Riau, Indonesia

### EDITORIAL BOARD

Putra Efri Rahman, S.Kom, Universitas Islam Riau, Indonesia
Khairul Umam Syaliman, S.T., M.Kom, Politeknik Caltex Riau, Indonesia
Winda Monika, S.Pd., M.Sc., Universitas Lancang Kuning, Indonesia
Panji Rachmat Setiawan, S.Kom., M.M.S.I., Universitas Islam Riau, Indonesia
Rizdqi Akbar Ramadhan, S.Kom., M.Kom., Universitas Islam Riau, Indonesia
Anggiat, Universitas Islam Riau, Indonesia
Arif Lukman Hakim, Universitas Riau, Indonesia

# PROGRAM COMMITTEE

**Prof. H. Yaya S Kusumah, M.Sc., Ph.D**, Universitas Pendidikan Indonesia, Indonesia

**Prof. Dr. Dinn Wahyudin**, Universitas Pendidikan Indonesia, Indonesia

**Prof. Dr. Detri Karya, SE., MA**, Universitas Islam Riau, Indonesia

**Prof. Dr. Seno Himala Putra, M.Pd**, Universitas Islam Riau, Indonesia

**Prof. Dr. Yusri Munaf**, Universitas Islam Riau, Indonesia

**Assoc. Prof. Irina Safitri Zen**, Universiti Teknologi Malaysia, Malaysia

**Dr. Andrew D. Garner**, University of Wyoming, USA

**Dr. Kanyarat Kwiecien**, Khon Kaen University, Thailand

**Dr. Norhayati Ibrahim**, Universiti Kebangsaan Malaysia, Malaysia

**Dr. Hutkemri Zulnaidi**, University of Malaya, Malaysia

**Dr. George Towar Ikbal Tawakkal, S.IP., M.Si.**, Universitas Brawijaya, Indonesia

**Dr. Ismail Suardi Wekke, S.Ag., M.A.**, STAIN Sorong, Indonesia

**Dr. Belli Nasution**, Universitas Riau, Indonesia

**Dr. Elfis, M.Si**, Universitas Islam Riau, Indonesia

**Dr. Sri Yuliani**, Universitas Islam Riau, Indonesia

**Dr. Abdul Aziz**, Universitas Islam Riau, Indonesia

**Dr. Eka nuraini**, Universitas Islam Riau, Indonesia

**Dr. Syahraini Tambak**, Universitas Islam Riau, Indonesia

**Dr. Dafrizal Samsudin**, Universitas Islam Riau, Indonesia

**Dr. Sri Rezeki**, Universitas Islam Riau, Indonesia

**Dr. Hamdi Agustin**, Universitas Islam Riau, Indonesia

**Dr. Prima Wahyu Titisari**, Universitas Islam Riau, Indonesia

**Dr. Ranggi Ade Febrian**, Universitas Islam Riau, Indonesia

**Dr. Dedek Andrian. M. Pd**, Universitas Islam Riau, Indonesia

**Dr. Husnu Abadi**, Universitas Islam Riau, Indonesia

**Dr. M. Nurul Huda**, Universitas Islam Riau, Indonesia

**Dr. Suriski**, Universitas Islam Riau, Indonesia

**Dr. Fikri**, Universitas Islam Riau, Indonesia

**Dr. Lilis M. Angraini, M.Pd**, Universitas Islam Riau, Indonesia

**Dr. Zulhelmi**, Universitas Islam Riau, Indonesia

**Dr. Nofriyandi**, Universitas Islam Riau, Indonesia

**Dr. Sudirman Shomary**, Universitas Islam Riau, Indonesia

# FOREWORD

In the name of Allah, Most Gracious, Most Merciful
Assalamu'alaikum Wr. Wb.,

Welcome to the Second International Conference on Social, Economy, Education, and Humanity (ICoSEEH 2019). The advancement of today's computing technology, science, engineering and industrial revolution 4.0 play a big role in the sustainable development of social, economic, education, and humanity in developing countries. Institute of higher education is one of many parties that need to be involved in the process. Academicians and researchers should promote the concept of sustainable development. The Second International Conference on Social, Economy, Education, and Humanity (ICoSEEH 2019) is organized to gather researchers to disseminate their relevant work on Social, Economy, Education, and Humanity. The conference is co-located with The Second International Conference on Science, Engineering and Technology (ICoSET 2019) at SKA Co-EX Pekanbaru Riau.

I would like to express my hearty gratitude to all participants for coming, sharing, and presenting your research at this joint conference. There are a total of 108 manuscripts submitted to ICoSEEH 2019. However only high-quality selected papers are accepted to be presented in this event, with the acceptance rates of ICoSEEH 2019 is 71%. We are very grateful to all steering committees and both international and local reviewers for their valuable work. I would like to give a compliment to all co-organizers, publisher, and sponsors for their incredible supports.

Organizing such prestigious conferences was very challenging and it would be impossible to be held without the hard work of the program committee and organizing committee members. I would like to express my sincere gratitude to all committees and volunteers from Singapore Management University, Kyoto University, Kyushu University, University of Tsukuba, Khon Kaen University, Ho Chi Minh City University of Technology, University of Suffolk, Universiti Teknologi Malaysia, Infrastructure University Kuala Lumpur, Universiti Malaya, Universiti Kebangsaan Malaysia, Universiti Utara Malaysia, Universiti Teknologi Mara, and Universiti Pendidikan Indonesia for providing us with so much support, advice, and assistance on all aspects of the conference. We do hope that this event will encourage collaboration among us now and in the future.

We wish you all find the opportunity to get rewarding technical programs, intellectual inspiration, and extended networking.

Pekanbaru, 27th August 2019

Dr. Arbi Haza Nasution, M.IT
Chair of ICoSEEH 2019

# The Development of Integration Technique Teaching Materials based on Problem Based Learning in Integral Calculus Course

Zetriuslita and Rezi Ariawan
*Mathematics Education Study Program, Universitas Islam Riau, Pekanbaru, Indonesia*
{*zetriuslita, reziariawan*}*@edu.uir.ac.id*

Keywords: Integration Technique, Teaching Materials, Problem Based Learning.

Abstract: This study aims to develop teaching materials of integration technique in Calculus course based on Problem Based Learning approach that meet valid and practical criteria. The research method is development research which consists of three stages: planning, development, and testing. The subjects of this study were the third semester students of Mathematics Education involving 40 people. The data collection instrument consists of validityand practicality sheets of teaching materials. The data collection technique was conducted with non-test technique. The data analysis used descriptive quantitative technique. Based on the results of the study, the teaching materials have met the valid criteria by 88.96% with Very Valid criteria. Furthermore, the teaching materials also met practical criteria by 88.75%)with Very Practical criteria. Therefore, the findings of this study indicate that the integration technique teaching materials based on Problem Based Learning in Integral Calculus course meet very valid and very practical criteria.

## 1 INTRODUCTION

To improve the nation's competitiveness in facing the globalization era, higher education is needed to develop science and technology. Higher education as part of the National education system has a strategic role in educating the nation's life and advancing science and technology. According to Law Number 12 of 2012 concerning Higher Education Article 4, the functions of higher education are: (1) developing capabilities and forming dignified national character and civilization in order to educate the nation's life; (2) developing academicians who are innovative, responsive, creative, skilled, competitive, and cooperative through the implementation of Tridharma Perguruan Tinggi (the University's three main purposes); (3) developing science and technology by paying attention to and implementing the values of humanities.

As one of the formal education institutions, Universitas Islam Riau (UIR) is one of the institutions which take part in realizing the function of higher education that has been described above. In the field of teacher training and education, FKIP (Fakultas Keguruan dan Pendidikan—Faculty of Teaching Training and Education) is a pioneer in producing professional and reliable education personnel.

So far, the Mathematics Education, one of the study programs in FKIP UIR, has tried to take various actions in order to achieve the goals of higher education, namely by trying to produce professional and reliable education personnel. There are several important elements, one of which is teaching staff or lecturers. Law Number 12 of 2012 concerning Higher Education Article 12 states that: (1) lecturers as members of the academic community have the task of transforming the knowledge and/or technology they master to students by creating a learning atmosphere so that active students develop their potential; (2) lecturers as scientists have the task of developing a branch of science and/or technology through reasoning and scientific research and disseminating it; (3) lecturers individually or in groups must write academic textbooks, which are published by universities and/or scientific publications as a source of learning and for the development of academic culture and civilization of writing activities.

The reality, however, contradicts the statement above. Scientific writing in Indonesian universities is unsatisfactory. The contribution of scientific publications by Indonesian universities is only 0.0125% (Suroso, 2004; Mokhtar et al., 2010). He supposes that Indonesia has 45 state universities and 1400 private universities with a total of 1,850,000 lecturers. If every lecturer in one year writes a book, there will be 1,850,000 titles. But in reality, it is



Zetriuslita and Ariawan, R.
The Development of Integration Technique Teaching Materials based on Problem Based Learning in Integral Calculus Course.
In *Proceedings of the Second International Conference on Social, Economy, Education and Humanity (ICoSEEH 2019) - Sustainable Development in Developing Country for Facing Industrial Revolution 4.0*, pages 123-129
ISBN: 978-989-758-464-0

different. He added that the cause of lecturers' weak writing ability is the low activity of accessing the internet. Lecturers do not have writing facilities such as availability of collections, laziness in library visits or downloading on the website. Furthermore, the ability of lecturers to buy books, subscribe to journals, and allocate a portion of their money to complete their writing activities is also low, and include poor translation skills. Besides, their weak writing ability is also caused by people's low interest in buying books.

Meanwhile, according to Team Jago Nulis Publisher Deepublish (2016), there are several benefits from writing activities, including: (1) obtaining passive income; (2) as a medium for promotion / position; (3) self-promotion and institution of work; (4) obtaining invaluable pride; (5) getting credit points; (6) giving valuable contribution to the people; (7) avoiding senility and improving self-quality; (8) passing on the knowledge of future civilizations.

Due to the benefits and the effort to carry out the Law on Higher Education, the researchers are interested in developing teaching materials. In addition, the development of teaching materials is based on several observations, experiences and interviews that the researchers have done as the permanent lecturers in the Mathematics Education Study Program. The researchers found that: (1) most teaching materials are not available for each subject, so that this can raise doubts about the professionalism of the lecturers who teach the subject; (2) learning resources available to students are very limited, especially textbooks that are prepared exclusively for certain subjects by lecturers; (3) the interaction of students in the class when lecturing takes place is very low because some students do not bring the learning resources and some bring the intended learning resources but they have difficulties in learning and understanding the material.

In addition, based on an unstructured interview with several students during the lecture process in the second semester in the academic year of 2017/2018, it was found that; (1) students are easy to find book references related to the subjects, but find difficulties in determining which material should be studied in accordance with the competencies that must be possessed while participating in the course. Then, there are several materials in many different books. Consequently, students must have many books as learning resources, while they have financial constraints to buy them. (2) students often find learning resources that are invalid (incomplete); (3) the authors of the books (articles) they find on the internet are often ambiguous especially from blogs; (4) if the lecturer assigns certain materials to the students, then they only take what is relatively easy to understand, while the relatively difficult one is disposed because it is not understandable, so the urgency or point of learning is not achieved; (5) students are most happy during the group's paper presentations, because their presentations are clarified by lecturers in the class.

The findings presented above also occur in the subjects that the researchers have been able to teach so far, namely Integral Calculus. Integral Calculus is one of the compulsory courses in Mathematics Education study program. With 3 credits, students are required to pass this course, because this course is prerequisite for advanced calculus courses, Differential Equations, and Initial Value Problem and Boundary Condition Problem. Therefore, it must be mastered by the students.

It is considered important and urgent to do a development research that can produce Integral Calculus teaching material.In the teaching of science and biology the didactic materials are fundamental tools in the taeching-learning process, being an important and variable alternative in schools of public scholls system. Teh use of these materials can help the student in the contextualization of knowledge, filling many gaps felt during learning, facilitating the students to build their own conceptions of scientific knowledge in relation to common knowledge, and the socialization to common knowladge and the use the contruction of new designs more elaborate. The availability of references for Integral Calculus is now very large and accessible. However, the references do not support the achievement of competency standards. In addition, several references only teach students to calculate. Even though the demands of integral calculus courses do not only provide skilled students in calculating integrals, but also provide understanding about integrals and using them in solving various problems associated with them. Therefore, teaching materials must be created to teach and encourage students to actively involve and construct their own knowledge.

To be able to develop teaching materials, the teaching materials can be arranged based on problem based learning. Problem-based learning is an alternative learning model that allows students to develop thinking skills (reasoning, communication, and connection) in solving mathematical problems (Rusman, 2010). Ben Martz and Morgan Shepherd. (2005: 1-2) states, *"PBL at its core is an interactive tool that uses prolems as the context for students to acquire knowledge. Problem Based Learning in*

*centered on providing the student with a problem environment which that students can create and store memories and meanings"*.

Furthermore, Wina Sanjaya (2011) suggests that there are 3 main characteristics in a problem-based learning strategy, namely: (a) a problem-based learning strategy is a series of learning activities, meaning that in implementing a problem-based learning strategy there are a number of activities that students must do. The problem-based learning strategy does not expect students to simply record, listen, then memorize the subject matter, but through problem-based learning strategies students actively think, communicate, search and process data, and finally conclude; (b) learning activities are directed at solving problems, meaning that problem-based learning strategies place problems as keywords of the learning process, without problems there is no possible learning process; (c) problem solving is done by using a scientific thinking approach. This is similar to what was conveyed by Savin-Baden in Wendy Barber, et al (2015):

*"There are significant characteristics of PBL that include: (1) Complex real world situations that have no one 'right' answer are the organizing focus for learning; (2) Students work in teams to confornt the problem, to identify gaps, and to develop variabel solutions; (3) Students gain new information through self-directed learning; (4) Staff act as facilitators; (5) Problems lead to the development of clinical problem-solving capabilites"*.

Based on the problems above and due to time constraints, the researchers are interested in conducting this research entitled "The Development of Integration Technique Teaching Materials in Integral Calculus Courses Based on Problem Based Learning". The textbook is systematically organized as follows: Cover, chapter titles, material concepts, competency standards, basic competencies, indicators, sub-chapter headings, material presentation that directs students to do activities with the following steps entitled: (1) let's focus on the problem; (2) let's collaborate with your group members; (3) let's start working; (4) let's innovate and understand the results; (5) let's analyze and evaluate, examples of exercises, summaries, exercises.

## 2 RESEARCH METHODS

Research that produces a product is known as development research. According to Sugiyono (2010), research and development is a research method used to produce certain products and test the effectiveness of these products.

Nana Syaodi Sukmadinata (2008) (Sukmadinata, 2011) stated that the steps of research and development broadly consist of: (1) a preliminary study consisting of literature review. In the literature review, find and read articles in international journals and national journals as well as source books related to the textbook material that you want to develop; (2) product development; activities carried out from drafting instruments, validating instruments and revising instruments, lastly (3) product testing. The activity is to test the testing instruments that have been valid and revised by the validators, and carry out the analysis. Thus, in general the research design consists of three stages including: development stage (conducting observations and interviews, conducting material analysis, analysis of competency standards and learning indicators), planning stage (compiling teaching materials according to material that has been analyzed at the planning stage, compiling the validity sheet and practicality sheet of teaching materials, validating teaching materials to 3 experts, conducting an analysis of the validity result, revising the teaching materials that have been validatedby the experts, and the testing stage (conducting trials and revise teaching materials based on the result of the tests).

This research was conducted in the Mathematics Education Program FKIP UIR in the odd semester of 2018/2019. The subjects in this study were the third semester students of the FKIP UIR Mathematics Education study program who had taken part in Integral Calculus course. The location, research time and the subject of this study were selected on certain considerations, namely:

- Ease of communication between researchers and students because researchers are lecturers from the students concerned.
- A research on the development of teaching materials for integration techniques based on Problem Based Learning in integral calculus course has never been conducted in Mathematics education study program.

The research instrument used to collect data in this study is the validity sheet of teaching materials compiled using several aspects: presentation, content, compatibility with the principles of problem based learning and mathematical critical thinking skills, and language. Then, the practicality sheet of teaching materials is compiled using the following indicators: Interest in mathematics teaching materials based on Problem Based Learning, Effect of Problem Based Learning teaching materials on student learning activities and motivation, Use of sentences in teaching

materials based on Problem Based Learning, Ease of understanding material in teaching materials based on Problem Based Learning, teaching materials support mastery of material, teaching materials based on Problem Based Learning in accordance with students' thinking background, Teaching materials help construct understanding of a material, Delivery of the material is associated with daily life, Teaching materials help facilitate the students' mathematical critical thinkingability, Questions based on Problem Based Learning are straightforward and challenging, and It is good or not to be used in Mathematics learning.

Data collection technique is carried out with non-test technique. To get the data about the validity of teaching materials, the researcher requested validity from the experts by using the validity sheet that had been designed. Lastly, to obtain the data about the practicality of teaching materials, the researchers used a practicality sheet given to students during the testing process.The result of validity test was analyzed in the following stages:

- Add the values of each indicator of the validity sheet.
- Find the average value of each indicator given by the validator with the following formula:
- Determine the combined validity with the following formula:
- Determine the average value category based on the Likert scale and determine the textbook validity category. The following are the validity categories of teaching materials.

Table 1: Interpretation Criteria for Teaching Material Validity

| Mean Score | Category |
|---|---|
| $85{,}01\% \leq V \leq 100\%$ | Very practical, or can be used without revision |
| $70{,}01\% \leq V < 85{,}01\%$ | Quite practical, or can be used with minor revisions |
| $50{,}01\% \leq V < 70{,}01\%$ | Less practical, it is recommended not to use because it requires major revisions |
| $V < 50{,}01\%$ | Not practical, or may not be used. |

Source: Sa'dun Akbar, 2013

Next, the data from the practicality questionnaire was analyzed by calculating the percentage of practical teaching materials. According to Sudijono (2008), the percentage of a value can be calculated using the following formula:

$$P = \frac{f}{N} \times 100\% \quad (1)$$

Description:
P: Percentage of assessment
f: Score obtained
N: Total Score

The category of mean score and textbook validity is determined based on the Likert scale. The following table describes the categories of teaching material validity.

Table 2: Interpretation Criteria of Teaching Material Practicality

| Mean Score | Category |
|---|---|
| $85{,}01\% \leq \vee \leq 100\%$ | Very valid, or can be used without revision |
| $70{,}01\% \leq \vee < 85{,}01\%$ | Quite valid, or can be used with minor revisions |
| $50{,}01\% \leq \vee < 70{,}01\%$ | Less valid, it is recommended not to use because it requires major revisions |
| V¡ 50,01% | Not valid, or may not be used. |

Source: Modified from Sa'dun Akbar, 2013

Figure 1 describes the procedures of this research.

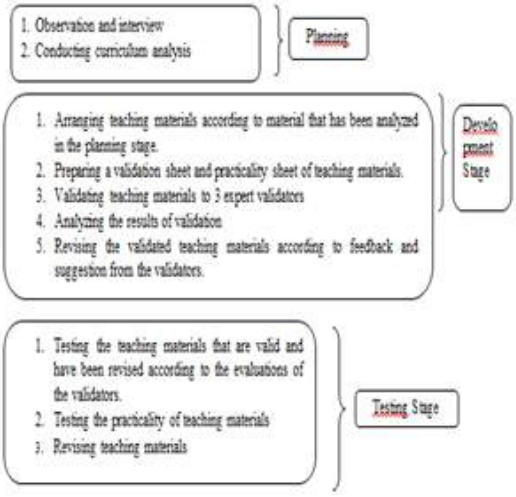


Figure 1: Procedures of the Research

# 3 FINDINGS AND DISCUSSIONS

## 3.1 Findings

Based on the development procedure in the planning stage, the researcher conducted several things, including:

### 3.1.1 Planning

The planning phase gins by analyzing the curriculum. Curriculum analysis is carried out by conducting reviews and discussions. The results of curriculum analysis of the teaching material to be examined are presented in Figure 2.

Moreover, in the planning stage, researchers have also done observations and interviews with the

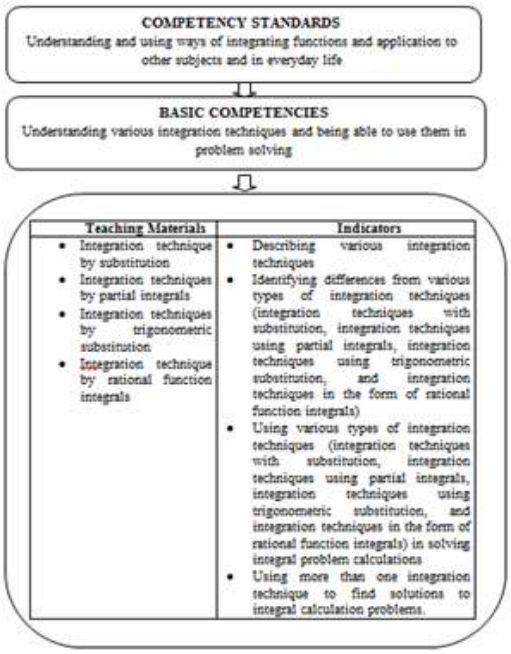


Figure 2: Curriculum analysis of the teaching material.

lecturers who teach integral calculus courses. The information was obtained that innovation is needed in conducting integral calculus learning. One of the innovations is the development of teaching materials that can involve students actively. In addition, most students want integral calculus material to be straightforward especially the material of integration technique. Then, the learning process can involve students and improve their mathematical thinking ability.

### 3.1.2 Development

After the planning stage is carried out, the next step that the researchers do is to develop teaching materials. Teaching materials include: (1) cover; (2) introduction; (3) table of contents; (4) Explanation of basic learning competencies; (5) Explanation of learning indicators; (6) A description of the focus of teaching materials; (7) Instructions for using teaching materials; (8) Exposure to teaching material presented with the following activities namely let's focus on the problem, let's have a discussion with your group members, let's start working, let's innovate and understand the results, let's analyze and evaluate ; (9) Sample Questions; (10) Summary; (11) Exercise.

The draft of teaching materials will be validated by 3 experts. Experts will provide validity of teaching materials with aspects of presentation feasibility, content feasibility, conformity with the principles of Problem Based Learning and mathematical critical thinking skills and language feasibility. The results of the validity can be seen in Table 3 and Figure 3 below.

Table 3: Teaching Material Validity Result by Experts

| Aspects Assessed | Percentage (%) | Criteria |
|---|---|---|
| Presentation Feasibility | 95.83 | Very Valid |
| Content Feasibility | 88.72 | Very Valid |
| Conformity with the principle of problem based learning and mathematical critical thinking skills | 82.29 | Quite Valid |
| Language Feasibility | 86.46 | Very Valid |
| Overall Percentage (%) | 88.96 | Very Valid |

tSource: Processed Data

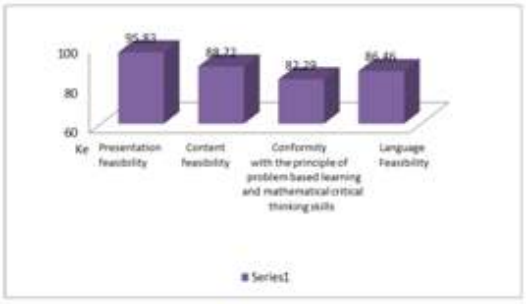


Figure 3: Curriculum analysis of the teaching material.

Based on the result of the validity from the experts, it can be seen that overall the validator assessed that the teaching material has been very valid and feasible for testing with minor revisions. At last, referring to the feedback from the experts, the researchers revised the teaching material that had been developed.

### 3.1.3 Testing

The product testing was conducted on 40 third semester students of Mathematics Education who had attended Calculus II course. The test was conducted on October 18, 2018 in room 6.09 Building A, 2nd floor. The trial process started from 13.30 - 16.00 WIB. The test was carried out in several stages, including: (1) Opening lessons by conveying apperception, giving motivation, delivering learning objectives, and explaining the steps of learning to be carried out by students in the class; (2) instructing students to study in groups that have been formed at the beginning of the meeting; (3) Providing revised teaching materials; (4) Instructing students to study

with other group members by following the learning steps contained in the teaching material; (5) At the end of the meeting, the researcher distributed questionnaire to students which serves to provide an assessment of the new instructional materials in terms of practicality.Table 4 shows the result of the practicality of teaching materials according to students.

Table 4: Practicality Result of Teaching Materials

| No. | Indicators | Percentage (%) | Criteria |
|---|---|---|---|
| 1 | Interest in mathematics teaching materials based on Problem Based Learning | 87.5 | Very practical |
| 2 | Effect of Problem Based Learning based learning materials on student learning activities and motivation | 86.56 | Very practical |
| 3 | Use of sentences in teaching materials based on Problem Based Learning | 90 | Very practical |
| 4 | Ease in understanding the material in teaching materials based on Problem Based Learning | 84.06 | Quite practical |
| 5 | Teaching materials support mastery of the material | 86.88 | Very practical |
| 6 | Teaching materials based on Problem Based Learning are in accordance with students' thinking backgrounds | 88.75 | Very practical |
| 7 | Teaching materials help construct understanding of the subject | 84.34 | Quite practical |
| 8 | Submission of material is associated with everyday life | 88.13 | Very practical |
| 9 | Teaching materials help facilitate students' mathematical critical thinking skills | 79.69 | Quite practical |
| 10 | The questions given in teaching materials based on Problem Based Learning are straightforward and challenging | 70 | Quite practical |
| 11 | It is good or not to be used in mathematics learning | 88.75 | Very practical |
| | Overall Percentage (%) | 88.75 | Very practical |

After testing and getting the students' practicality result of teaching materials with very practical criteria, it can be stated that the final product of teaching materials has been produced.

## 3.2 Discussion

In developing both the development of mathematical critical thinking ability test instruments and teaching materials, researchers have followed the stages and procedures. Testing and processing of test result have also been done by researchers with the procedures and steps stated in chapter 3. The results of the validity test showed that the teaching material falls into a very valid category, can be used with a slight revision. But there is avalidator who considers that the sample questions and exercises presented in the teaching material have not been able to stimulate students' HOT skill. It is mentioned that the sample questions and exercises are too easy for students, even though they are based on indicators of mathematical critical thinking. Meanwhile the other validators consider the sample questions and exercises to be appropriate but the variations are lacking, so it must be added. The feedback is actually good, but the researchers have other considerations, related to the difficulty level of the sample questions and exercises. The researchers consider that the sample questions that the researcher presents with steps , but students also still have to find it themselves, adjusted to the level of ability and needs that researchers get based on research and experience of researchers as the lecturer who teach integral calculus course. It is assumed that such teaching materials can help the students' learning process in integral calculus. We can compare this with the results of the practicality questionnaire obtained from the testing of the use of integral technique teaching materials based on *Problem Based Learning*.

The result of the testing shows that that the teaching materials are "very practical". However, there are Problem Based Learning indicators in teaching materials that are straightforward and challenging. Teaching materials that help facilitate the students' mathematical critical ability have practical criteria and have the smallest percentage score compared to other indicators. This was in line with the statement that the sample questions and exercises had not been able to stimulate HOT students. But based on the interviews with the students, the sample questions and exercises were too difficult for them to complete. Based on these statements, the researcher assumed that the statement by the validators and the students had different meanings. The former stated that the questions and exercises must be changed and the level of difficulty increased so as to stimulate students' higher order thinking skills, while the latter stated that the sample questions and exercises were too difficult for them. In conclusion, the teaching materials that the researchers have developed are "very valid" and "very practical".

# 4 CONCLUSIONS AND SUGGESTIONS

In conclusion, teaching materials of integration technique based on Problem Based Learning are considered very valid and very practical. The researchers have developed valid and practical materials to be used in teaching integration technique

in integral calculus course. The researchers suggest that the practicality of students in using teaching materials should not be used as a benchmark in determining or seeing an increase in students' abilities. The practicality does not describe their abilities. Then, teaching materials must be presented in steps with a variety of problems that are more straightforward.

## ACKNOWLEDGMENTS

The authors would like to thank the financial support provided by University of Indonesia University through the PITTA 2019 funding scheme managed by Directorate for Research and Public Services (DRPM) University of Indonesia.

## REFERENCES

Akbar, S. (2013). *Instrumen Perangkat Pembelajaran*. Rosda karya, Bandung.

Barber, W., King, S., and Buchanan, S. (2015). Problem based learning and authentic assessment in digital pedagogy: Embracing the role of collaborative communities. *Electronic Journal of E-Learning*, 13(2):59–67.

Martz, B. and Shepherd, M. (2005). Problem Based Learning and the business school environment. *Proceedings of the Annual Hawaii International Conference on System Sciences*, 00(C):40.

Mokhtar, M., Tarmizi, R. A., Ayub, M., and Tarmizi, M. A. A. (2010). Enhancing calculus learning engineering students through problem-based learning. *WSEAS transactions on Advances in Engineering Education*, 7(8):255–264.

Rusman (2010). *Model-model Pembelajaran (Mengembangkan Profesionalisme Guru)*. Rajawali Pers, Jakarta.

Sanjaya, W. (2011). *Strategi Pembelajaran Berorientasi Standar Proses Pendidikan*.

Sudijono, A. (2008). *Pengantar Statistik Pendidikan*. Jakarta: Raja Grafindo Persada.

Sugiyono (2010). *Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif dan R&D)*. Alfabeta, Bandung.

Sukmadinata, N. S. (2011). *Metode Penelitian Pendidikan*. Rosdakarya, Bandung.

Suroso (2004). Penulisan Buku ajar Perguruan Tinggi. Makalah disampaikan Dalam Penulisan Buku Sekolah Alkitab Baptis.




ISBN: 978-989-758-464-0

*Certificate Number:* 021/Certificate/ICoSEEH/2017

YAYASAN LEMBAGA PENDIDIKAN ISLAM (YLPI) RIAU
UNIVERSITAS ISLAM RIAU

UIR INTERNATIONAL CONFERENCE 2017

# ICOSEEH

INTERNATIONAL CONFERENCE ON SOCIAL, ECONOMIC, EDUCATION AND HUMANIORA

# CERTIFICATE

This is to certify that

**ZETRIUSLITA**

has participated in International Conference on Social, Economic, Education and Humaniora (ICOSEEH) ***"Sustainable Development in Developing Country"*** as

***PRESENTER***

held by Lembaga Penelitian dan Pengabdian Masyarakat (LPPM) Universitas Islam Riau, Indonesia

*Pekanbaru, 8-10 November 2017*

University Partners:

UNIVERSITI TEKNOLOGI MARA

UUM Universiti Utara Malaysia

CHIBA UNIVERSITY

NGUYEN TRAI UNIVERSITY

UNIVERSITAS ISLAM RIAU REKTOR

**Prof. Dr. H. Syafrinaldi, SH., M.C.L**
*Rector of Universitas Islam Riau*

UNIVERSITAS ISLAM RIAU LEMBAGA PENELITIAN PENGABDIAN KEPADA MASYARAKAT

**Dr. Evizal Abdul Kadir, M. Eng**
*Conference Chair*