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Educational Research to Endorse Productive and Innovative Generation in the 21st Century

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October 16-17, 2017

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Preface

The 2nd Annual International Seminar on Transformative Education and Educational Leadership (AISTEEL with web link is http://aisteel2017.unimed.ac.id/) was held on October 16-17, 2017 in Medan City, Indonesia. This conference was organized by Postgraduate School, State University of Medan (Unimed) and is the routine agenda at Unimed now. The Second Annual International Seminar on Transformative Education and Educational Leadership is realized this year with various presenters, researchers, lecturers and students from universities both in and out of North Sumatera participate in the theme of which is “Educational Research to Endorse Productive and Innovative Generation in the 21st Century.”

2nd AISTEEL is the annual international seminar with main aim is to discuss of recent research special for Transformative Education and Education Leadership. Several topics like: Teachers Education Model, Research Global Issue in Education, Mathematics and Science Education, Social, Language Education, Vocational Education, Curriculum, Economic, History and Management Education have been discussed at the 2nd AISTEEL 2017. 2nd AISTEEL international seminar provided experts’ view on transformative education and educational leadership as well as curriculum article presentation. There were five keynote speakers have been came Professor Keiichiro Yoshinaga, Dr. Bambang Sumintono, Dr. Sitti Maesuri Patahuddin, and Dr. Yulia Rahmawaty. The organizer had been use online submission system to receive all abstract, full paper and also communication with authors. All of information include with comment of reviewer can be checked real time by author.

Chairperson

Dr. Rahmad Husein, M.Ed
Welcoming Speech of Director of Postgraduate School State University of Medan

The Second Annual International Seminar on Transformative Education and Educational Leadership (AISTEEL)

The honorable,
- Rector of State University of Medan, Prof. Dr. Syawal Gultom, M.Pd.
- Vice Rectors of UNIMED
- Professor Keiichiro Yoshinaga, PhD, Institute of Liberal Arts and Science, Kanazawa University – Japan
- Dr. Bambang Sumintono, M.Ed., University Malaya – Malaysia
- Dr. Sitti Maesuri Patahuddin, Faculty of Education, Science, Technology and Mathematics, University of Canberra – Australia
- Yuli Rahmawati, Chemistry Education Program, Universitas Negeri Jakarta
- Deans of Faculties of Education, Languages and Arts, Social Sciences, Natural Sciences and Mathematics, Engineering, Sports Sciences, and Economics
- Vice Directors of Postgraduate School of UNIMED
- All speakers, lecturers, researchers, students, and participants

Good Morning
Welcome the honorable guests speakers Professor Keiichiro Yoshinaga, Dr. Bambang Sumintono, Dr. Sitti Maesuri Patahuddin, Assoc. Prof. Emilia Zulmira de FAN, and other speakers, lecturers and students from outside and inside Unimed to this international seminar which is the routine agenda at Postgraduate program of Unimed now. I’m glad that ‘The Second Annual International Seminar on Transformative Education and Educational Leadership’ is realized this year with various presenters, lecturers and students from universities both in and out of North Sumatera and participate in the theme of which is “Educational Research to Endorse Productive and Innovative Generation in the 21st Century.”

Ladies and Gentlemen,

In this second seminar exels the first one related to the administration by online and the publication index by either Thomson Reuters or Google Scholar. By the new policy on student’s publication, postgraduate program really matches the system, particularly for the students who will sit in the oral defence examination. Through the seminar, the postgraduate students improve their article journal writing and it is proved by many articles are submitted by the students.

The plenary speakers coming from 15 provinces in Indonesia will present topics covering multi disciplines. They will contribute a lot of inspiring inputs and new knowledge on current trending educational research topics all over the world. The expectation is that all potential lecturers will share their research findings to educational scientists and researchers as well for improving their teaching process and quality. Thus, this will contribute to the next young generation researchers to produce innovative research findings in education and educational leadership contexts.

This second seminar continues the promotion of the first sequel ‘Developing Future Teachers’ Education Model. Therefore, the propose of this second seminar on the transformative education and educational leadership research will trigger the young professional lecturers and educators to compete in the invention of innovative educational teaching and learning strategies, techniques and leadership.

I hope that the scientific attitude and skills through research will promote Unimed to be a well-known university which persists to be developed and excelled in the future.

Thank you the Rector of Unimed who always supports us in organizing the seminar. Thank you all guest and plenary speakers. Special thanks to both steering and organizing committee who have well-coordinated and collaborated in actualizing the seminar.

Director of Postgraduate Unimed

Prof. Dr. Bornok Sinaga, M.Pd
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Developing of Learning Material Based on Problem Based Learning to Increase Students’ Mathematical Reasoning Ability and Self-Efficacy in Grade X SMA Negeri 1 Medan

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Abstract - The purpose of this research are to describe: 1) the validity, practically, and effectiveness of developing learning materials oriented in the model of Problem Based Learning (PBL), 2) the increase of students’ mathematical reasoning ability with the use of the developing learning materials oriented in the model of problem-based learning, and 3) The increase of students’ self-efficacy using questionnaire. This research is a research and development, the resulted products are teachers’ book, students’ book, students’ worksheet (LKS), test of mathematical reasoning ability (TKPM), and students’ self-efficacy. The development of learning materials oriented in the model of problem based learning (PBL) using Dick and Carey development model. The subject in this research are the students of grade X Mia 3 and grade X Mia 4 of SMA Negeri 1 Medan. From the result of Test I and test II obtained: 1) the developing learning materials fulfill the validity criteria, both in content and construct validity, 2) the developing learning material fulfill the practicality criteria, reviewed from: a) validator assessment and b) implementation of the learning materials, 3) the developing learning material fulfill the effectiveness criteria, reviewed from: a) mastery of learning b) time in teaching, and c) students’ positive responses. 4) there is an increase in students’ mathematical reasoning ability and 5) there is an increase in students’ self efficacy that was tested using questionnaire.

Keywords—developing, PBL, dick and carey, mathematical reasoning ability, self-efficacy

I. INTRODUCTION

Learning is a process of an individual who seeks to achieve learning objectives or learning outcomes, which is a form of behavior change that is relatively settled (Mulyono Abdurrahman, 2003: 28). Learning math is not just enough to memorize, it takes deep understanding of the concept. The success of the process of learning on learning mathematics could be measured from success students who take activities.

There is students complain about difficulty on trigonometry. Krulik and Rudnick (1999) capability reasoning is aspect key in develop ability think critical and creative from students. Remembering how importance aspect reasoning This, then need existence development ability reasoning students in learning mathematics including reasoning in material trigonometry. As has been mentioned no all activities think base self on reasoning. Reasoning mathematical important for knowing and do mathematics. Ability for reasoning make students could solve problem in life, in and outside school.

Besides look importance ability reasoning mathematical students in learning, another aspect that needs to be too developed is trust (self-efficacy) students. Bandura (1998) defines self-efficacy as confidence someone about ability they for produce performance has influence on life them. Self-efficacy determine How someone feel, think, motivate self and behave.

Purpose from this research is (1) to analyze mathematical reasoning ability students, (2) to analyze self-efficacy students, and (3) finding device learning effective.
II. LITERATURE

A. Ability Reasoning Mathematical

Term reasoning is translation of the reasoning which means a person's way of thinking. Suriasontrani (2007: 42) says that "reasoning is a process of thinking in drawing a CONCLUSION in the form of knowledge". Keraf (in Sadiq, 2004: 4) explains that the reasoning is "the thought process that seeks relationship facts or evidence of evidence of which is unknown towards to something CONCLUSIONs ".

B. Self-Efficacy

Increasingly someone experience success in life, the similarly high self-efficacy in himself. Besides that, if success achieved more because of by factors externally.

C. Dick and Carey

Dick and Carey's model consists of 10 steps. Each step is very clear intent and purpose so for the beginner designer is suitable as a basis for studying other design models. The tenth step in the Dick and Carey model shows a very clear and uninterrupted relationship between one step and another. In other words, the system found on the Dick and Carey was very quick, but the content is solid and clear from one order to order next.

D. Valid, Practical, and Effective

Device good learning, or in invalid required for each teacher to reach success activities learning optimally. For that need careful planning in arrangement before used in process learning and measure validation with indicator validation content and validation construct. Practical in meaning language means "easy to use in practice". Make it easy in meaning that device structured learning easy for understood and too easy for held or used. Practical indicators namely, (1) validator stated that device learning developed could used with little or no revision and (2) implementation component learning mathematics PBL-based used located on category good or very good.

Effectiveness device defined as "achievement aim learning conducted by students and learning the earn responsepositiv e students. Effectiveness learning is results order obtained after implementation learn teaching. The indicator namely: (1) completeness learn Classical minimum 85%, (2) achieve aim minimum learning 75%, (3)time learning efficient, and (4) response students.

III. RESEARCH METHOD

The type of this research is Research and Development. The development model used was the dick and carey development model which consisted of 10 development stages.

A. Research Subjects and Objects

Subjects in this study were students of class X MIA-3 and X MIA-4 SMA N 1 Medan academic year 2016/2017 which each class consisted of 32 students. While the object in this study was a mathematics learning tool in SMA N 1 Medan Class X which was orientated in developed learning materials.

B. Learning Tools Development

Learning tools developed in this research were Teacher Handbook (BPG), Student Book (BS), Student Activity Sheet (LAS) and research instrument that was Reasoning Ability Test of Mathematics. Learning tools development was done by using the Dick and Carey development model (1974) [14] which consisted of 10 development stages.

C. Instruments and Data Collection Techniques

The instruments used in this study included the instruments for assessing the quality of learning tools i.e. aspects of validity, practicality and effectiveness. Instruments used were observation sheets, questionnaires, and tests.

1. The Validity of Learning Tools

Learning tools are said to be valid if they meet the criteria of content validity and construct validity. The validity of content was done by 5 validators by giving score 1 to 5 in each assessment column based on aspects: 1) format, 2) language, 3) content, and 4) illustrations. Furthermore the overall expert assessment was processed by calculating the average score to obtain the criteria of content validity assessment as follows:

Table 1. Rate Validity Criteria of Learning Tools

<table>
<thead>
<tr>
<th>No</th>
<th>Va or Total Average Score</th>
<th>Validity Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 ≤ Va &lt; 2</td>
<td>Invalid</td>
</tr>
<tr>
<td>2</td>
<td>2 ≤ Va &lt; 3</td>
<td>Less Valid</td>
</tr>
<tr>
<td>3</td>
<td>3 ≤ Va &lt; 4</td>
<td>Valid Enough</td>
</tr>
<tr>
<td>4</td>
<td>4 ≤ Va &lt; 5</td>
<td>Valid</td>
</tr>
<tr>
<td>5</td>
<td>Va = 5</td>
<td>Highly Valid</td>
</tr>
</tbody>
</table>

Information:

Va is the determination score of the validity scale of the learning tools.

Developing of learning materials that the expected content validity if the validator's average assessment of all learning tools is valid or highly valid. If not meet, then it is necessary to re-do the validation activities. And so on until learning tools that meet the content validity are obtained.

Next, construct validity of reasoning and self-efficacy tests was carried out before being used for field trials. Then reasoning ability test items and self-efficacy questionnaires were tested outside the research subjects to measure validity and reliability. To measure the validity of the item, the
The following correlation formula of product moment (Arikunto 2012) [15] can be used:

\[ r_{xy} = \frac{N \sum xy - (\sum x)(\sum y)}{\sqrt{[N \sum x^2 - (\sum x)^2][N \sum y^2 - (\sum y)^2]}} \]

Information:
- \( r_{xy} \): correlation coefficient between variable x and y
- \( \sum xy \): the number of multiplications between x and y
- \( x \): score of test item
- \( y \): total score
- \( N \): number of subjects

Furthermore, to calculate the reliability coefficient of test items, the following Alpha-Cronbach formula (Arikunto 2012) [15] was used:

\[ r_{xx} = \left( \frac{k}{k-1} \right) \left( 1 - \frac{\sum \sigma_x^2}{\sum \sigma_t^2} \right) \]

Information:
- \( r_{xx} \): test reliability coefficient
- \( k \): number of questions
- \( \sum \sigma_x^2 \): the number of variance scores on each questions
- \( \sigma_t^2 \): total variance

2. The Practicality of Learning Tools

The practicality of the learning tools was observed based on the validator's assessment and the implementation of learning tools. The validator assessment criteria are met if it is found on the validation sheet that all validators state that learning tools can be used with "a few revisions" or "no revision".

Furthermore, the learning tools implementation was observed based on the observer's assessment where they chose score 1 to 5 on each aspect of learning tools implementation that were Teacher Handbook (BPG), Student Book (BS), Student Activity Sheet (LAS). The average total score obtained was categorized into the following percentage of learning implementation.

**Table 2. Qualification Percentage of Learning Implementation**

<table>
<thead>
<tr>
<th>The Percentage of the implementation</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>( k \geq 90 )</td>
<td>Very Good</td>
</tr>
<tr>
<td>( 80 \leq k &lt; 90 )</td>
<td>Good</td>
</tr>
<tr>
<td>( 70 \leq k &lt; 80 )</td>
<td>Fair</td>
</tr>
<tr>
<td>( 60 \leq k &lt; 70 )</td>
<td>Poor</td>
</tr>
<tr>
<td>( &lt; 60 )</td>
<td>Very Poor</td>
</tr>
</tbody>
</table>

Source: Sinaga (2007) [16]

Information:
- \( k \): Average total of learning tools implementation

The criteria of learning tools implementation are met if the minimum average total score is in the Good category.

3. The Effectiveness of Learning Tools

The effectiveness of instructional tools was observed based on: 1) the completeness of students' learning outcomes based on reasoning and self-efficacy, and 2) students’ responses to learning components and tools.

Completeness of student learning outcomes was seen based on the results of spatial ability test in the form of essay test consisting of 5 questions. The effectiveness criteria based on students’ learning completeness classically are met if \( \geq 85\% \) get the score \( \geq 2.67 \) from the scale of 4.

Student responses were observed based on student responses to questionnaire. Effectiveness criteria based on student responses are met if \( \geq 80\% \) subject classically give a positive response (Sinaga 2007) [16], that is on all aspects being asked related to the learning tools and implementation.

IV. RESEARCH RESULTS

A. Description Results Research

Research development Dick and Carey model that includes ten stages namely:
1. Identify Instructional Goal
2. Conduct Instructional Analysis.
3. Identify Entry Behaviors, Characteristics,
4. Write Performance Objectives,
5. Develop Criterion-Referenced Test Items,
7. Develop and Instructional Materials,
8. Design and Conduct Formative Evaluation,
9. Revise Instruction, and

These stages will be described into three groups: 1) the preliminary study, 2) planning, and 3) validation and test trial.

B. Trial I

In class X MIA 3 with 32 students. In practicality learning material the analysis is based on response of experts and a practitioner expresses devices based learning PBL is generally well developed and can be used with little revision.

Implementation learning materials not yet practicality. And effectiveness learning materials not yet effective because test reasoning ability only 65.62%.

C. Revision

Do revision alittle on device learning as book students and on test ability reasoning mathematical students.

D. Trial II

In class X MIA-4 with 32 students. The learning materials has practicality and effectiveness because the practicality in
implementation get 84.5%, 82.5% and 86.29%. And the the effectiveness already achieved completeness on classical. Test mathematical reasoning ability (90,62%) and the result for aim learning achieved because achievement aim learning at least 75%. In the time used in learning efficient as learning ordinary. To response students has reach more of 80%.

Achieved. And the self-efficacy whole students have an average of 83,08%.

E. Enchancement on learning materials

- Ability Reasoning Mathematical
  Test I tried for 76, 56% and test try II by 80.46% so enhancement amounted to 4.90%.

- Self-efficacy
  Enhancement greatest there on 2 indicators that strength at 0, 67 and enhancement smallest there on 3indicators namely generality 0.32. So it can be concluded that all indicators of self-efficacy students has increased from the first trial to trial II.

V. CONCLUSION

Based on results analysis and discussion in research. This was raised some conclusion as:

1. The improvement of students' mathematical reasoning ability of trial I reached 65.62% with total of 21 students and 11 students complete and 90.62% complete with 29 students complete and 3 complete students, increase from trial I to trial II by 25%.

2. Increased self-efficacy of students in the first trial in the first indicator reached 2.99, in the second indicator reached 2.88, and in the third indicator reached 3.02. While in trial II in indicator I reached 3.53, in indicator 2 reached 3.55, and in indicator 3 reach 3.34. So that in each indicator has increased. And at the percentage level in trial I reached 71.13% and trial II reached 83.08%, so increased by 11.95%.

3. Learning tools developed include Master Books, Student Books, and worksheets based on Problem Based Learning is effective for use in learning, because it has met the indicator of the effectiveness of the learning device. The effectiveness indicators are:
   a. Compleness of student learning outcomes in the minimum classical 85%, on trial I of 65.62% and on trial II of 90.62%. This means trial I has not been effective while trial II has been effective.
   b. Achievement of learning objectives of at least 75%, in the first test in the goal of learning 3 has not reached the achievement of only 62.50% it means not effective while in the second trial II learning objectives have reached that means for trial II has been effective.
   c. Criteria of learning time is the achievement of the minimum learning time is the same as regular learning on trial I and trial II. This means the learning time criteria is already effective.
   d. Student responses to the components of learning tools based on PBL developed as well as learning activities are positive.

4. Learning devices are said to be effective if they have characteristics, including:
   a. Using language and delivery is easy to understand
   b. Clear and systematic learning materials
   c. Contains contextual issues
   d. Presents an interesting image as well as in harmony with the given problem

REFERENCES