PROCEEDINGS
AISTEEL 2017
THE 2nd ANNUAL INTERNATIONAL SEMINAR ON TRANSFORMATIVE EDUCATION AND EDUCATIONAL LEADERSHIP

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

16-17 October 2017
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“Educational Research to Endorse Productive and Innovation Generation in The 21th Century”

Grand Mercure Hotel, Medan City, North Sumatera, Indonesia
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 check 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 colaborated in actualizing the seminar.

Director of Postgraduate Unimed

Prof. Dr. Bornok Sinaga, M.Pd
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Abstract—This study aimed to describe how: 1) the validity, practicality and effectiveness of learning materials using problem based learning, and 2) the improve of student’s mathematical disposition and representation ability by using the learning materials. Method of this research used 4-D development model which consist of four steps that were defining step, designing step, developing step and disseminating step. The research resulted product are lesson plan, teacher’s book, student’s book, student’s worksheet, tests representation and disposition questionnaire. The trial took place in two class. Result of this research showed that : 1) learning materials was valid, both in content and construct validity, 2) learning materials was practical to be used, reviewed from validator assessmen, teacher and student responses and implementation of the learning materials, 3) learning materials was effective, reviewed from mastery of learning, student’s activity and student’s positive responses, 4) increasing of student’s representation ability was on medium category and 5) the increase in student’s mathematical disposition of trial 1 to trial 2.

Keywords—developing learning materials, problem based learning, mathematical disposition, representation ability

I. INTRODUCTION

A good learning is planned learning with the preparation of materials in accordance with the needs of children with a fixed to the curriculum that became the reference and national standard in order to achieve learning objectives. [1] said “before the teacher taught, a teacher is expected to prepare materials that will be taught, preparing props to be used, preparing questions and directions to lure students to actively learn, learn the state of students, and learn the initial knowledge of students, all this will unravel its implementation in the learning materials.” Therefore, all teachers as educators are required to make learning materials to support and achieve learning objectives.

The purpose of developing learning materials is to improve and produce a new product. In addition, it aims to produce learning materials that are able to solve the learning problem in the classroom, because actually there is no single source of learning that can meet all kinds of learning process needs. In other words, in order to select the learning materials, teachers need to think about the learning objective first, especially in improving student’s mathematical ability including the mathematical disposition and representation ability.

Based on interviews of researchers with math teachers at Istiqlal Delitua Senior High School, found some problems that teachers are still difficult in making or composing learning tools. These difficulties include: (1) a little teacher’s understanding of an interesting learning model and can stimulate student’s thinking, it appears in the preparation of lesson plans where the learning method still uses ordinary learning so that the preparation of the lesson plan is not yet
effective, (2) student’s book has not yet addressed the contextual problem and the problems are still routine issues that have an impact on the student's difficulties in solving non-routine problems and (3) the teacher does not provide the student’s worksheet with the excuse of only doing the handbook questions.

Student’s mathematical representation ability in Indonesia, can be seen from the results of research conducted by The International Trends In Mathematics and Science Study (TIMSS), coordinated by The International Association for the Evaluation of Educational Achievement (IEA). The results of the TIMSS in 2011 showed that Indonesia has an average score of 386 from a maximum score of 1000, it means it is still low level [2].

The result of preliminary observation has also been done by giving the test of mathematical representation ability in Istiqal Delitua Senior High School and it is found that there are 23 students (63.9%) wrong in answer test. These results indicate that student’s mathematical representation ability is still low.

In addition to developing cognitive ability, mathematics learning also develops affective attitudes. This is in line with long term goals in mathematics learning, which instill higher abilities to think like analytic, critic and creative, resulting in mathematical disposition and cultivation of social ability [3]. The fifth objective of mathematics learning in schools with mathematical disposition [4].

Viewed from the affective sphere, the student’s mathematical disposition needs to be developed because mathematical disposition affects the success of students in solving mathematical problems well. In line with that, the mathematical disposition of students should be improved because mathematical disposition is a strong tendency in students to think and do mathematically in a positive way and is based on faith, taqwa, and noble moral [5]. And mathematical disposition is a strong desire, awareness and dedication to students to learn math and carry out various mathematical activities.

However, the student’s mathematical disposition is still underestimated. This is evidenced in the preliminary study of researchers to school. From the results of questionnaires given that the student’s responses to math is still negative as students are less interested, not confident and easily desperate when solving math problems. The result was obtained from questionnaire of mathematical disposition in the form of statement of 20 items with choice of answer strongly agree, agree, disagree and strongly disagree to Istiqal Delitua Senior High School.

Responding to the above problems and recognizing the importance of mathematical disposition and representation ability, a solution is needed in classroom learning practice. One tendency that is often forgotten is to forget that hecekat learning is the learning of students rather than teaching teachers [6]. Teachers are required to choose a learning model that can spur the spirit of students to be actively involved in the learning experience. Learning should emphasize active involvement of students in understanding mathematical concepts or principles to enable learning to be meaningful, students learn not only to learn about, but also learn to do, learn to be, learn to learn, and learning to live together. Therefore, one of the models that can be used is the Problem Based Learning model.

Problem based learning model is a concept of learning centered on authentic issues so that students can develop their own knowledge, cultivate high-level thinking ability and inquiry, establish students and increase confidence [7]. In addition, Problem Based Learning model is also helps students develop inquiry and problem solving ability to give students experience with adult roles and enable them gain confidence in their ability to think, and make them self-regulating learners [8]. This approach involves inferring information around the problem, synthesizing and representing what one gets to others. In Problem Based Learning, students are faced with challenging problems that can present student’s thinking activities in solving cooperative math problems in small group discussions and reinforce mathematical ideas in shaping new understandings. In the process of discussion and presentation is expected to open the opportunity in an effort to increase student’s mathematical disposition and representation ability.

Based on the problem that has been described, the purpose of this research are: 1) to develop the learning materials using Problem Based Learning that fulfill the valid, practical and effective criteria, 2) to describe the improvement of student’s mathematical disposition and representation ability by using the learning materials.

II. LITERATURE

Representation Ability
Mathematical representation is the representation, translation, disclosure, reappraisal, mining or even modeling of ideas, ideas, mathematical concepts, and relationships contained in a particular configuration, construction, or problem situation in the form diverse in an effort to gain clarity of meaning, to show understanding, or to find solutions to the problems it faces [9]. Correspondingly, representation of mathematical communication are: tables, graphics, graphics, mathematical statements, written texts, or any combination [10].

While, mathematical representation ability required students to find and make a tool or way of thinking in communicating mathematical ideas from the abstract to the concrete, making it easier to understand [11].

Mathematical Disposition
Mathematical disposition is a desire, awareness, dedication and a strong tendency in students to think and do mathematically in a positive way and based on faith, taqwa, and noble moral [5]. The mathematical disposition of students is not a simple habit, but is a tendency to think and act in a positive way. Mathematical dispositions will appear when
students complete math tasks with confidence, responsibility, diligence, abstinence of despair, feel challenged, have the will to look for other ways and reflect on the way of thinking about something that has been done [12].

**Problem Based Learning Model**

Problem Based Learning is a learning that uses real-world problems as a context for learners to learn about critical thinking and learning ability in solving problems, and to acquire essential knowledge and concepts from subject matter [13]. Problem Based Learning also helps students develop investigative and problem solving ability to give students experience with adult roles and enable them to gain confidence in their ability to think, and make them self-governing learners problems are given to students, before students learn concepts or materials relating to problems to solve [8]. Problem Based Learning is an instructional approach, which use problem to trigger learning. Students are in-group to work collaboratively to search resolution of the problem. Teacher plays his role to facilitate learning with scaffolding technique by giving indirect hints or posing stimulated.

Problem-based learning uses five main stages: student orientation to the problem, organizing students to learn, guiding individual and group investigations, developing and presenting the work and analyzing and evaluating the process solution to problem [14].

### III. METHOD

This research includes development research using 4-D model of development [15].

**Subject and Object**

Subjects in this study were students of class X of Istiqlal Delitua Senior High School, 2016/2017 academic year, whereas the object of this research were learning materials using problem based learning. Trial 1 was done in class X IPA 2 and trial 2 was done in class X IPA 3.

**Developing Learning Material**

Learning materials developed in this study were lesson plans, teacher’s book, student’s book, student’s work sheets. Instruments for collecting data in this study are tests, questioners and observation sheets. Developing learning material was done by using the 4-D model which consisted of 4 steps that were defining, designing, developing and disseminating.

**Instruments and Data Data Analysis Techniques**

7. **The Validity of Learning Materials**

Learning materials 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 and will be outlined in Table 1.

<table>
<thead>
<tr>
<th>Average Value (Va)</th>
<th>Criterion Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ≤ Va &lt; 2</td>
<td>Invalid</td>
</tr>
<tr>
<td>2 ≤ Va &lt; 3</td>
<td>Less valid</td>
</tr>
<tr>
<td>3 ≤ Va &lt; 4</td>
<td>Enough valid</td>
</tr>
<tr>
<td>4 ≤ Va &lt; 5</td>
<td>Valid</td>
</tr>
<tr>
<td>Va = 5</td>
<td>Very valid</td>
</tr>
</tbody>
</table>

Note:

Va is the value of determination level validity scale of learning materials.

Learning materials have been revised based on input from experts and samples tested outside of the classroom in order to get eligible subjects. Then, the test results are analyzed for validity and reliability. The formula used to calculate the validity is the product moment correlation [16], that is:

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

Note:

\[ r_{xy} \] : correlation coefficient between variable \( x \) and \( y \)
\( X \) : score items
\( Y \) : total score
\( N \) : the number of students who take the test (sample)

Then, to determine the coefficient of reliability of a test used in narrative form alpha formula [16], as follows:

\[ \alpha = \left( \frac{k}{k-1} \right) \left( 1 - \frac{\Sigma \sigma^2}{s^2} \right) \]

Note:

\( \alpha \) : reliability coefficient test
\( k \) : the number of test items
\( \Sigma \sigma^2 \) : the number of variance test scores of each item
\( s^2 \) : total variance

8. **The Practicality of Learning Materials**

The practicality of the learning materials was observed based on the validator's assessment, teacher and student responses and the implementation of learning materials. The validator assessment criteria are met if it is found on the validation sheet that all validators states that learning materials can be used with "a few revisions" or "no revision". Teacher and student responses criteria are met if it is found that teacher and student said learning materials was easy to be used.

Furthermore, the learning materials implementation was observed based on the observer's assessment where they chose score 1 to 5 on each aspect of learning materials implementation that were lesson plans, teacher’s book,
student’s book, student’s work sheets. The average total score obtained was categorized into the percentage of learning implementation [17] and will be outlined in Tabel 2.

### 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 ≥ 90</td>
<td>Very Good</td>
</tr>
<tr>
<td>80 ≤ k &lt; 90</td>
<td>Good</td>
</tr>
<tr>
<td>70 ≤ k &lt; 80</td>
<td>Fair</td>
</tr>
<tr>
<td>60 ≤ k &lt; 70</td>
<td>Poor</td>
</tr>
<tr>
<td>&lt; 60</td>
<td>Very Poor</td>
</tr>
</tbody>
</table>

Note: k = Average total of learning materials implementation

9. **The Effectiveness of Learning Materials**

The effectiveness of learning materials was observed based on student’s active activity meets the criteria of achieving the percentage of ideal time set, mastery of student’s representation ability clasically, that is minimum 80% students follow learning able to reach score, and 80% students give positive responses to learning materials.

IV. **RESULT**

Define

The purpose of learning can be identified by first analyzing instructional needs. The process of identifying instructional needs begins with identifying problems in the field. Based on preliminary observations, student’s mathematical disposition and representation ability are still low. That's because students are not accustomed to using the representation ability so that the impact also on the low student’s mathematical disposition. This is also supported by the state of teachers who have not been able to develop learning materials that focus to increase student’s mathematical disposition and representation ability. Based on these findings, the main purpose of developing this materials are to develop learning materials to improve student’s mathematical disposition and representation.

Design

The main activity of this step was to write the initial draft of learning materials including the lesson plans, teacher’s book, student’s books, student’s work sheets, and test of representation ability and questionnaires mathematical disposition. The instructional materials were based on KI, KD, and indicators on trigonometry material, and adjusted to the purpose of learning and improving mathematical disposition and representation ability. Based on these objectives, 5 essays and mathematical disposition questionnaires consisting of 30 questions were prepared.

Develop

2. **Validity**

At this stage content validity and construct validity are performed. Content validity is done by 5 validators. Validation results by the validator indicate that all learning materials developed have met the valid criteria with a total average value of RPP validity of 4.45, teacher book of 4.39, student books 4.41, student’s worksheets 4.44, tests of mathematical representation ability and statement item of mathematical disposition questionnaire has also been in valid category. While the validity of constructs obtained by providing tests of representation and mathematical disposition to students who have learned the material. The result of construct validity indicates that the test grain of representation ability and the questionnaire of mathematical disposition is valid. Then calculated the reliability of the test items of representation ability and the matrix disposition questionnaire and obtained that the pretest reliability of mathematical representation capability of 0.613 (high category), posttest mathematical representation ability of 0.753 (high category) and mathematical disposition questionnaire of 0.86 (high category).

7. **Practically on Trial 1**

The first criterion of practicality has been met as all validators assume that the developed learning materials can be used with little revision. This assessment is given to experts and practitioners at once with the provision of materials validation sheets. The second criterion of practicality has also been met, the percentage of implementation learning materials reaches 80.94% (good category). The implementation of the learning materials used is reviewed at each meeting. The implementation of all learning materials used in the research is observed by an observer who is a teacher of mathematics studies at every meeting conducted. Thus, learning materials developed in trial 1 can be said to be practical.

8. **Efektiiveness on Trial 1**

The first criterion of effectiveness is the mastery of student’s representation ability in class and it is found that 23 students complete (71.87%) and 9 non students (28.13%) from 32 students who followed postest of representation ability. Thus, the postest result of student’s representation ability in trial 1 has not fulfilled the classical completeness because it only got 71.87%. So it can be concluded that the completeness of the ability of representation ability has not been classically met.

The second criterion of effectiveness is student’s activity fulfills ideal time percentage and it is found that there are 4 categories (category 1, 3, 4 and 5) that have reached percentage of ideal time and there is 1 category not fulfill percentage of ideal time, that is activity category reading student’s book and student’s wersheet (category 2). That's 3 out of 5 categories (categories 4 and 5 are met) has reached the percentage of ideal time in trial 1. The average percentage
of ideal time of student activity time in trial 1 will be outlined in Table 3.

Table 3. Average Percentage of Ideal Time of Student Activity

<table>
<thead>
<tr>
<th>Meeting</th>
<th>Frequency For Each Type of Activity</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (2 x 45')</td>
<td></td>
<td>26,15</td>
<td>9,26</td>
<td>31,50</td>
<td>26,90</td>
<td>5,56</td>
<td>24,15</td>
</tr>
<tr>
<td>II (2 x 45')</td>
<td></td>
<td>22,22</td>
<td>10,20</td>
<td>21,50</td>
<td>27,80</td>
<td>3,70</td>
<td>22,07</td>
</tr>
<tr>
<td>III (2 x 45')</td>
<td></td>
<td>24,07</td>
<td>8,33</td>
<td>32,40</td>
<td>27,80</td>
<td>5,56</td>
<td>24,15</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>24,15</td>
<td>9,26</td>
<td>28,47</td>
<td>27,50</td>
<td>4,94</td>
<td></td>
</tr>
</tbody>
</table>

Criterion activity:
Activity 1 : 20% ≤ Percentage of Ideal Time ≤ 30 %
Activity 2 : 10% ≤ Percentage of Ideal Time ≤ 20 %
Activity 3 : 25% ≤ Percentage of Ideal Time ≤ 35 %
Activity 4 : 25% ≤ Percentage of Ideal Time ≤ 35 %
Activity 5 : 0% ≤ Percentage of Ideal Time ≤ 5%

The third criterion of effectiveness is student’s positive response and it is found that the average percentage of student’s response is above 80% (positive category).

Based on the above description it can be concluded that the learning materials has not met the criteria effectively so that it needs to be revised to learning materials components developed with the hope of problem based learning material can improve the student’s mathematical disposition and representation ability on trial 2.

9. Practically on Trial 2

The first criterion of practicality has been met as all validators assume that the developed learning materials can be used with little revision. The second criterion of practicality has been met, teacher and student said that learning materials was easy to be used. The third criterion of practicality has also been met, the percentage of implementation of learning materials reaches 85.06% (good category). The implementation of all learning materials used in the research is observed by an observer who is a teacher of mathematics studies at every meeting conducted. Thus, the learning materials developed in trial 1 can be said to be practical.

10. Efektivenss on Trial 2

The first criterion of effectiveness is the mastery of student’s representation ability in class and it is found that 28 students complete (87,50%) from 32 students who followed postest of representation ability. Thus, the postest result of student’s representation ability in trial 1 has fulfilled the classical completeness because it got 87,5%. So it can be concluded that the completeness of the representation ability has been classically met.

The second criterion of effectiveness is student’s activity fulfills ideal time percentage and it is found that that all categories of student activity have reached the percentage of ideal time set. So it can be concluded that the percentage of ideal time student activity on trial 2 already meet the criteria of achieving the percentage of ideal time set. The average percentage of ideal time of student activity time in trial 1 will be outlined in Table 4.

Table 4. Average Percentage of Ideal Time of Student Activity

<table>
<thead>
<tr>
<th>Meeting</th>
<th>Frequency For Each Type of Activity</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (2 x 45')</td>
<td></td>
<td>25,00</td>
<td>15,74</td>
<td>30,56</td>
<td>25,90</td>
<td>2,78</td>
<td></td>
</tr>
<tr>
<td>II (2 x 45')</td>
<td></td>
<td>23,10</td>
<td>16,70</td>
<td>31,50</td>
<td>26,90</td>
<td>3,70</td>
<td></td>
</tr>
<tr>
<td>III (2 x 45')</td>
<td></td>
<td>22,20</td>
<td>14,80</td>
<td>32,40</td>
<td>28,70</td>
<td>2,78</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>23,43</td>
<td>15,75</td>
<td>31,49</td>
<td>27,17</td>
<td>3,09</td>
<td></td>
</tr>
</tbody>
</table>

Criterion activity:
Activity 1 : 20% ≤ Percentage of Ideal Time ≤ 30 %
Activity 2 : 10% ≤ Percentage of Ideal Time ≤ 20 %
Activity 3 : 25% ≤ Percentage of Ideal Time ≤ 35 %
Activity 4 : 25% ≤ Percentage of Ideal Time ≤ 35 %
Activity 5 : 0% ≤ Percentage of Ideal Time ≤ 5%

The third criterion of effectiveness is student’s positive response and it is found that the average percentage of student response aspect is above 80%. So it can be concluded that the student response is in positive category.

Based on the above description it can be concluded that the learning materials has met the criteria valid, practical and effective.

11. The Improvement of Representation Ability

The improvement representation ability the fulfillment of indicators of the representation ability in a better direction according to the criteria established through the process of improving the development of learning materials and reflection of the practice of learning.

The improvement of student’s representation ability with the developed material was seen by calculating the normalized gain index from the pretest and posttest result of representation capability obtained by the students on trial 1 and trial 2. The average gain value in test 1 was 0.35 included in the medium category. While the average value of gain in trial 2 is 0.44 included in the medium category as well. The results indicate that there is an increase in the student’s representation ability from trial 1 to trial 2. Gain of student’s representation ability can be seen in the Table 5.

Table 5. Gain of Student Mathematical Representation in Test 1 and Test 2

<table>
<thead>
<tr>
<th>Trial</th>
<th>Gain Score</th>
<th>The number of Student</th>
<th>Average of Gain</th>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trial 1</td>
<td>g &gt; 0,7</td>
<td>1</td>
<td>0,35</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>0,3 ≤ g ≤ 0,7</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>g ≤ 0,3</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trial 2</td>
<td>g &gt; 0,7</td>
<td>2</td>
<td>0,44</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>0,3 ≤ g ≤ 0,7</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>g ≤ 0,3</td>
<td>7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
12. The Improvement of Mathematical Disposition

The improvement of mathematical disposition seen by comparing the mean score of student’s mathematical disposition questionnaire on trial 1 and trial 2.

Based on student disposition questionnaire it was found that confident indicators in using mathematics on trial 1 were 3.19 increased to 3.25 on trial 2, persistent and tenacious indicators in doing mathematics task on trial 1 was 3.09 increased to 3.29 on trial 2, the indicator had a curiosity in maths on trial 1 was 3.02 increased to 3.31 on trial 2, the indicator did reflect on the way on trial 1 was 3.23 increased to 3.30 on trial 2, the indicator of flexibility in doing mathematics work on trial 1 was 3.12 increased to 3.32 on trial 2 and the indicators applied mathematics in life daily in trial 1 was 3.18 increased to 3.2 on the trial 2. So it can be concluded that all indicators of mathematical disposition increased from trial 1 to trial 2.

Disseminate

After the learning materials were valid, practical and effective is met at the end of trial 2, then the final materials is obtained. The next step is to do a limited distribution of final materials handover to Istiqlal Delitua Senior High School. Submission of learning material to Istiqlal Delitua Senior High School in the hope that the math teachers incorporated in the forum can apply the learning materials to the next lesson.

V. CONCLUSION

The validity of learning materials have met the valid criteria with the average value of total validity of RPP of 4.45, teacher book 4.39, student books 4.41, LKS 4.44, item test mathematical representation ability and the statement item of the mathematical disposition questionnaire has also been in a valid category.

Learning materials havemet the practical criteria in terms of the validator response to learning materials is good and can be used with little revision, teacher and student responses said that learning materials was easy to be used and the implementation of problem-based learning materials is good.

Learning materials have met the effective criteria in terms of the percentage of student’s active activities during the learning process met the frame of ideal frame; (2) 87.50% of student’s achieve mastery of student’s representation ability classically and (3) more than 80% of students who give positive responses to the components of learning material.

Learning materials can improve student’s representation ability in terms of average gain of student’s representation ability in test 1 of 0.35 including in medium category, while in trial 2 increased by 0.44 also included in medium category.

Learning materials can improve student’s mathematical disposition in terms of the average indicator of mathematical disposition on trial 1 and trial 2.