Development of Mathematics Learning Device Based on Cooperative Model Type of Think Talk Write that Supported by Edmodo for Developing the Mathematics Problem Solving Skills

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Abstract. This research aims to gather the mathematics learning device based on cooperative model type of think talk write that supported by Edmodo that has a validity, practical, and effective as an effort to improve student problem solving skills on mathematics. This research classified as a type of design research by following the design research procedure by Plomp that includes preliminary phase, prototype phase, and assessment phase. The subject of this research are students of grade X of Senior High School Number 2 Negara, they are 20 students of grade X MIPA 4 for limited tests, 36 students of grade X MIPA 2 for field test I, and 36 students of grade X MIPA 1 for field test II. Learning device that developed are students’ books and teachers’ books that supported by Edmodo. Students book is a mathematics book that intended by the researcher is a mathematics book that discuss the trigonometry for grade X. Results of the research shows that learning device that developed fulfilled the validity criteria, practically criteria, and effectivity criteria that expected. Characteristics on the students’ book and teacher’s book are interestingly designed and adapted to the syntax of cooperative model type of think talk write that supported by Edmodo. 

Keywords: Edmondo, Learning Devise, Problem Solving Skill

1. Introduction
Mathematics problem solving is a student’s skill working with problem solving questions. Soemarmo & Hendrina [1] said that mathematics assignment could be stated as mathematics problem if could not find the way to solve, but throughout another relevant activities. Polya [2] advises four problem solving steps, they are problem understanding, solving planning, execution plan, and review. Krakas & Baki [3] stated that “Problem solving is recognized as an important life skill involving a range of processes including analyzing, interpreting, reasoning, predicting, evaluating and reflecting”. Factors that influence student’s mathematics problem solving are experiences, mathematics background, motivation and willing, and problem structure that given to students. Those four factors located on mathematics problem solving [4].

Even problem solving skills have an important position as mentioned above, but the implementation in reality is still far from what is expected. Those facts also in line with observation and interview that done with mathematics teacher in SMA Negeri 2 Negara. Teachers discovered that
most of students still hard on mathematics problem solving, especially on trigonometry explanation questions. Aside of that, observation and interview results show that problem that faced by students year by year is student’s low involvement on exploring trigonometry that learned during mathematics class actively. This is expected due lack of mathematics learning devices that could developing student’s problem solving skills.

Based on explanation above, it is necessary to develop mathematics learning devices that could motivate students on increasing mathematics problem solving skills. Sumartini [5] it is necessary to develop mathematics learning devices that could motivate students on increasing mathematics problem solving skills, it is important to be assisted by learning method that is suitable and cooperative that is adjusted by class condition. One of learning devices is model type think talk write. Yamin and Ansari [6] explained that model think talk write could enriching student’s problem solving skills, thus teacher’s role as stimulation of learning could helping students to construct knowledge [6]. Huinker and Laughlin [7] stated that learning model think talk write basically developed through three steps, thinking, talking, and writing. This model is started by students that reading mathematics material that already packaged to understand the content (think), then students communicate for uniforming perception (talk), and then creating discussion and negotiation, students write their understanding and knowledge in form of summary (write) [8]. Aside of that, Palupi [9] shows that cooperative learning model type Think Talk Write can enrich student’s mathematics problem-solving skills.

Learning process think talk write is not only could be done in school, thus teacher should provide interesting learning devices that information and communication oriented like Edmodo for enriching student’s mathematics problem solving skills. By Edmodo usage, teacher could manage online learning by including Think Talk Write. Edmodo is created as social media learning platform for teacher, student, and parents. This application is designed to increase student’s learning spirit in more close environment [10].

Based explanation above, aims of this research is to find mathematics learning device by model cooperative type think talk write assisted by Edmodo to enrich student’s mathematics problem solving skills on trigonometry.

2. Methods

This research classifies on type developing research, because this research focus on developing learning devices. Learning devices quality could be reviewed by three aspects, they are validity, practical, and effectivity [11].

This research conducted in SMA Negeri 2 Negara. Subject of this research is experts (validator), student, and teacher. Experts for collecting data about learning devices. Experts are Lecturers on Major of Mathematics in Post Graduate of Ganesha Singaraja University, and teachers of mathematics field in SMA Negeri 2 Negara. Students for collecting data for practical and effectivity of learning devices. Students that involved on this research are students of grade X SMA Negeri 2 Negara, they are 20 students of grade X MIPA 4 for limited tests, 36 students of grade X MIPA 2 for field test I, and 36 students of grade X MIPA 1 for field test II. Teachers for collecting data for practical of learning devices.

Development on this research based on Plomp development model. According to Plomp [12], research phase design based on three phases, they are preliminary research, prototyping, and assessment. There are details about these three phrases.

Preliminary Research Phase. On this phrase researchers collecting data and analyses need and contexts, literature review, field study, and deciding development conceptual. On this research, researcher observing learning process that conduct in the class, interviewing mathematics teachers on grade X about problems on mathematics learning, and observing learning devices especially on trigonometry, and also mathematics syllabus that used in the class. By the identification on learning process and mathematics learning devices, then researchers creating student book, teacher’s guidance book, and research instruments and also arranging basic draft of mathematics learning devices based
3. Results and Discussion
Based on the design research results that had been done, product development procedure is mathematic learning devices based on cooperative learning model type think talk write assisted by Edmodo on the principal same with the development procedure based on Plomp [12].

On the stage of preliminary research, researcher conduct situation and problem identification analysis during the learning. Activity focused on observing learning process in the class that implementing curriculum 2013, interviewing teacher of class X to identify problem that faced during the class, and to observe learning device that used in the class. Based on the investigation, researcher found some problem that caused less optimum learning quality in the class. For resolve problems, researcher review research results that relevant and theory that could resolve this problem. By this review, researcher develop mathematics learning devices based on cooperative learning model type think talk write assisted by Edmodo that expected could increase student’s problem-solving skills on the grade X especially on trigonometry.

Second phase from development that be done is prototyping. On this stage researcher arrange the early draft of learning and instrument device that will be used during the research. Early draft of learning devices are student book and teacher’s guidance book. Instrument that arranged includes validation sheets on student book, validation sheets on teacher’s guidance book, learning device observation sheets, student response sheets, teacher response sheets, and mathematics problem-solving skills test on the essay. Early draft is called as prototype I.

On the student book’s content, there is learning model think talk write activity assisted by Edmodo. On the teacher guidance book, steps think talk write assisted by Edmodo shown detailly for making teacher implementing this model on the classroom easier. Aside of that, this teacher’s guidance book also equipped by explanation or student’s answer alternative for practice that included on the student book. On Edmodo, teacher can post materials that will be discussed and tasks that
should be worked by students on Edmodo. Teacher can give score on the tasks that done by students. Students can response materials or tasks that posted by teacher.

For increasing quality of the learning device that developed, validation for the learning devices and instruments are done. Then continued by conducting limited tests and field trials for the devices. Validation process done by three experts, they are two lecturers of University Education of Ganesha and senior mathematics teacher in SMA Negeri 2 Negara.

Based on the results of the validity test on the learning devices, a revision was done to obtain learning devices in the form of prototype II and the criteria of the developed learning devices are provided on Table 1 as follow.

| Validator | Lesson Plan | Student’s Textbook | Teacher’s Guidebook |
|-----------|-------------|---------------------|---------------------|
| 1         | 3.13        | 2.85                | 2.70                |
| 2         | 3.00        | 2.65                | 2.80                |
| 3         | 3.17        | 3.00                | 3.00                |
| Average   | 3.10        | 2.83                | 2.83                |

Based on validation by experts, learning device that arranged is valid. Every test steps from planning, observation and evaluation, and also reflection to find out efficiency of learning device that developed.

| Phase                | Sr  | Category |
|----------------------|-----|----------|
| Limited Trial        | 2.75| Practical|
| Field Trial I        | 3.10| Practical|
| Field Trial II       | 3.22| Practical|
| **Average**          | **3.02**| Practical|

Efficiency of the learning device can be seen from learning process while using device that developed. Based on the student’s response result, researcher collect average efficiency score on 3.07. Average score on the teacher’s response score is 3.38 on the efficiency category. This means learning device based model think talk write assisted by Edmodo could be use by teacher or students.

Final step on this mathematics learning device development is assessment phase. On this phase researcher are conducting field II trial. Focus on the field II trial is to gain final product from prototype that developed. After the trial, researcher continue on revision so it can be a final prototype of mathematics learning device based on cooperative learning model type think talk write based on Edmodo that valid, efficient, and effective.

Aside of the validity and efficiency, learning device that developed also assessed by the effectivity. Effectivity measure on learning devices conduct to check whether usage of student’s book, teacher’s guidance book that developed, and Edmodo could increase student’s problem-solving skills on mathematics, especially trigonometry, also changes in aspects of the attitude from the beginning to appear to be a minimum attitude to develop. Observations made on giving tests of problem-solving abilities is one of priority on the research. Effectivity by the device measured by achievement of learning goals on using mathematics learning device that developed. Effectivity can be seen by student’s problem-solving test on mathematics.

Data about problem-solving skills collected by giving students problem-solving skill’s exam on the field trial I and II.

| Phase       | Average | Category  |
|-------------|---------|-----------|
| Field Trial I | 73.56   | >Passing Grade |
| Field Trial II | 79.94  | >Passing Grade |
| **Average** | **76.75** |         |
Based on analysis, on the field trial I student’s average score is 73.56. On the field trial II student’s average score is 79.94. Results shown that there is a developing score on mathematics problem-solving skills that achieved by students from field trial I and II, and average score that achieved by students is more than the minimum standard 70. It means mathematics learning device based on model think talk write assisted by Edmodo gives positive influence on the student’s problem-solving skills. It can be said that Edmodo effectively on increasing student’s problem-solving skills on mathematics. This is in line with research’s result that conducted by Angriani, Bernard, Nur, and Nurjawahirah [13] that stated cooperative model think talk write are effective on enriching student’s mathematics problem solving skills. Yamasari [14] also discover that mathematics learning media based on ICT is effective on enriching student’s learning results. Aside of that, mathematics learning media that practical to use because it helps teacher and students to achieve learning goals that planned. Thus, by learning devices based on ICT like Edmodo, students will be more interesting to learn mathematics.

Characteristics on the student’s book and teacher’s guidance book that developed is about the design that created attractively and learning activities that suited with learning model think talk write assisted by Edmodo. Aside of that characteristic learning that determined during the research, especially that linked with student’s problem-solving skills on math, also influenced by usage of cooperative learning model type think talk write assisted by Edmodo whereas students are get used to solve mathematics through think, talk, and write. Aside of that, continuous assignment through Edmodo can get used students to solve mathematics questions.

4. Conclusions

Based on the research and discussion above, it can be conclude that mathematics learning device based on cooperative model type think talk write assisted by Edmodo that already fulfill validity, efficiency, and effectivity criteria that expected also can increase student’s problem-solving learning on mathematics in SMA Negeri 2 negara grade X. Characteristic on the learning device based on cooperative model type think talk write assisted by Edmodo is developed on this research is with attractive design and also learning activities that suited with cooperative learning model type think talk write assisted by Edmodo. It can be concluding that mathematics learning devices that developed fulfill validity, efficiency and effective criteria and also can increase student’s problem-solving skills on grade X SMA Negeri 2 Negara. Mathematics learning device based on cooperative model type think talk write assisted by Edmodo that developed still need to be trialed broadly in other schools with various conditions.

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