

Development Of Learning Device Approach Realistic Mathematics To Improve Mathematical Communication Skills Of Students

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Abstract

Products of research development of this device is an educational learning realistic mathematics that is valid, practical and effective, which can improve the ability of mathematical communication students. This research aims to develop learning tools education math realistic valid, practical and effective. The research design used is 4-D. The subject of the trials in this study were students of VIII-1 and VIII-2 SMP Negeri 27 Medan T.A. 2020/2021. The results of the process of the development of these learning tools are (1) the education learning realistic mathematics and the learning included in the category of valid; (2) criteria of learning education of realistic mathematics using the learning tools included in the high category; and (3) the criteria of the effectiveness of learning tools education math realistic based on: (a) mastery learning students in the classical style of 85,71%; (b) the criteria for the attainment of the use of the learning time is included in the high category; (c) criteria for the achievement of the ability of teachers to manage the learning included in the good category; and (d) many students gave a positive response against the components and activities of the learning has been achieved.

Keywords: *The Development Of Learning Tools, Realistic Mathematics, Mathematical Communication*

INTRODUCTION

Math is one of the subjects in school that can be used to achieve these goals. In addition, the mathematics included one of the fields of study that are most preferred during the process of teaching and learning in schools. It can be seen from the hours of lessons which must be in the mileage of the students in the school. Not only in school, even the majority of the parents in the house gives her son learn math in a way to register his son to follow a course of Math. Grace (2020) Learning is successful if the learning is meaningful and in accordance with one of the general purpose of learning Mathematics is to prepare students in the use of it in daily life.. It is also disclosed Sinaga (1999) who said that: "Mathematics is the knowledge that is essential as a basis for the work of a lifetime in the century of globalization". Therefore, mastery of a certain level of mathematics necessary for all learners so that later in his life allows to get a decent job because of the century of globalization, none of the work without mathematics. "More than that, man cannot be separated from mathematics because mathematics is a human activity (a human activity)" (freudental, 1973). In studying mathematics, students are expected to achieve the goals of mathematics learning as formulated by the National Council of Teacher of Mathematics (2000) five standard process of mathematics learning that is Problem solving (problem solving), reasoning and proof (reasoning and proof), communication (communication), connections (connections), and critical thinking (critical thinking). While the 5 content standards in math standards, namely numbers and operations, problem solving, geometry, measurement, opportunities and analysis (Hasibuan, 2017).

However, a serious problem in academic achievement of students in Indonesia is the low quality of education. Especially in learning mathematics, students perceive mathematics as subjects that are difficult. One of the abilities that must be owned by students in order to increase the learning of mathematics is mathematical communication skills. Because with communication in mathematics learners will have the description, data, and facts about their understanding in the process and applications of mathematics. Through communication students can organize and consolidate think math and the students can explore mathematical ideas. One of the factors that can improve mathematical communication skills of students is the use of a model of innovative learning and student-centered. However, the use of innovative learning model still has not been effectively implemented in SMP Negeri 27 Medan. This is obtained from the interviews with mathematics teachers in SMP Negeri 27 Medan. Therefore, the learning model used in this research is the learning approach of realistic mathematics “By using the learning model approach realistic mathematics will help students to develop thinking skills, skills to solve problems, and learn about the role-the role of the adult so that it becomes independent learners” (Arends, 2008).

To support the implementation of the learning approach of realistic mathematics necessary learning tools that facilitate at the stage of planning, implementation and evaluation of learning. Learning tools is a set of learning resources that allow students and teachers take part in learning activities. Device learning consists of Learning Implementation Plan (RPP), Teachers Book (BG), Student Book (BS), and test of learning outcomes. Learning tools that teachers use not directed to educate mathematical communication skills of students, so that needs to be developed learning tools that learn mathematical communication skills of students. The device used by teachers are not related one to the other and never validated and tested before use. It does look from the recognition of the teacher that they say “learning device is made only to fulfill the obligations when there is a supervision of the chairman and that too made by other people”. Based on the conditions and expectations of the above, then in this research will be developed device of learning, namely in the form of Learning Implementation Plan (RPP), Sheet Activities Students (LAS), Teachers Book (BG), Student Book (BS), a Test of Mathematical Communication Skills by asking a study with the title “Development of Learning Device Approach Realistic Mathematics to Improve Mathematical Communication Skills of Students”.

RESEARCH METHODS

The method in this research is research development (development research) by using 4-D Thiagarajan. This research was conducted online through the google meeting and WhatsApp group.

The Subject And Object Of Research

The subject in this research is the students of SMP Negeri 27 Medan kelas VIII-1 and VIII-2 which amounts to each of 35 students and as the object in this research is a learning mathematics in the form of Learning Implementation Plan (RPP), the Book of the Teacher, Students ' Books, Sheet Activities Students (LAS), a Test of Mathematical Communication Skills (TKKM).

Instruments and Data Collection Techniques

Then, instruments and tools for collecting data in this research is the validation sheet, questionnaire and observation sheet. To more clearly shown in Table 1 below :

| Aspect | Instrument | Observation Data | Respondents |
|----------------------|---------------------------------------|--|-------------|
| Validity | The Validation Sheet | RPP, Teachers Book, Student Book , LAS, TKKM | Expert |
| Practical | The Validation Sheet | RPP, Teachers Book, Student Book , LAS, TKKM | Expert |
| | Interview sheet Teachers and Students | The components of the development of learning device | Observer |
| | Observation Sheet | The components of the development of learning device | Observer |
| effectiveness | Test | The completeness of the class | Subject |
| | Observation Sheet | Student Activity | Observer |
| | Questionnaire | The Response Of The Students | Subject |

These criteria indicate that the device is education learning realistic mathematics have a level of validity that high, if the validity of the minimum rate achieved is valid with the level ($4 \leq V_a < 5$). Then, the criteria states that the critical thinking skills of students ' mathematical based education learning realistic mathematics has a level of good practice, which consists of 2 indicators, namely (1) all validator / expert declare that the device education learning realistic mathematics can be used with "minor revision" or "no revision". Meanwhile, To see the ability of mathematical communication with educational learning realistic mathematics is to have a coefficient of 0.75 or 75%. Furthermore, the criteria of device education learning realistic mathematics developed effective with 85% of students who take the test the ability of mathematical communication with some of the standard; the average score is 75 or in the category C.

RESULTS AND DISCUSSION

After doing research, there are some findings that are found, namely; the validity, practicality, and effectiveness of the learning model pendidikan matematika realistik, improve the ability of mathematical communication students.

The Validity Of The Learning Device

The validity of the learning device is measured by experts. Based on the results of the material expert Journal of Education and Practice analysis, the device education learning realistic mathematics for RPP, BG, BS, WELDING, obtained the average value of the total validity as shown in Table 2 :

| Aspek | Aspect Average(A _i) | | | | Total (V ₀) | | | | Validity Degree |
|---------------------|---------------------------------|------|---------------|--------------|-------------------------|------|---------------|--------------|-----------------|
| | RPP | LAS | Teachers Book | Student Book | RPP | LAS | Teachers Book | Student Book | |
| Format | 4.40 | 4.20 | 4.53 | 4.56 | 4.31 | 4.34 | 4.42 | 4.39 | Valid |
| Language | 4.24 | 4.40 | 4.45 | 4.34 | | | | | |
| Illustration | | | 4.24 | 4.26 | | | | | |
| Contents | 4.30 | 4.42 | 4.44 | 4.38 | | | | | |

Based on Table 2 above, the value of the average validity of the total software learning education math realistic with interval: $4 \leq V_a < 5$. That is, the expansion of the software education mathematics realistic is valid.

The Effectiveness Of The Learning Device

The criteria for determining the effectiveness of learning tools education math realistic in trials I and II consist of three indicators as discussed as follows:

The Classical Completeness Mathematical Communication Skills

Based on the findings of research on test I and II, the results obtained by the completion of the as in Table 3:

| Category | Critical Thinking Skills Mathematical | | | |
|----------------------|---------------------------------------|-------------|------------|-------------|
| | Number of students | | Percentage | |
| | Uji Coba I | Uji Coba II | Uji Coba I | Uji Coba II |
| Complete | 27 | 30 | 77,14% | 85,71% |
| Not completed | 8 | 5 | 22,86% | 14,29% |
| Total | 35 | 35 | 100% | 100% |

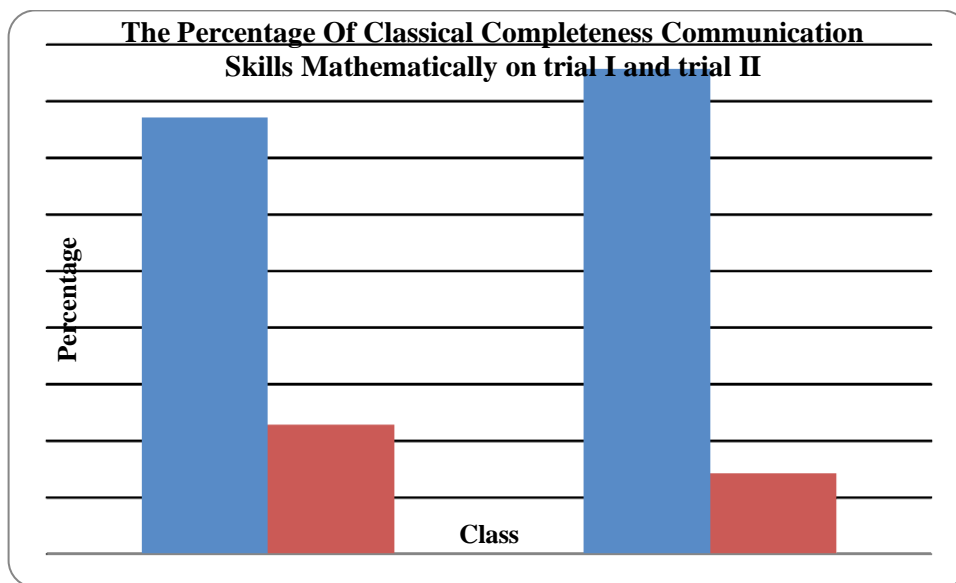


Figure 1

Based on Table 3 and figure 1, indicated that the results of the posttest mathematical communication skills in trial I, which do not meet the completeness criteria in the classical style. In accordance with the criteria of the classical completeness at least 85% of students who follow the learning reached a value of ≥ 75 . While the results of the posttest mathematical communication skills in trial II already meet the criteria completed.

The Attainment Of The Use Of Learning Time

Observation Data towards the achievement of the use of the learning time for each meeting learning (a lot of learning is entirely as much as 3 meeting). The results of the calculation of the average of each indicator observers of each meeting of the learning presented in Table 4 here.

| No. | Indicators Assessed | Meeting | | | Average | Value Aspect |
|-----|--|---------|----|-----|---------|--------------|
| | | I | II | III | | |
| 1. | The duration of learning does not exceed the usual learning | 4 | 5 | 5 | 4,67 | 4,56 |
| 2. | Each of the stages of learning be resolved in accordance with the specified time | 4 | 5 | 5 | 4,67 | |
| 3. | The time given at every stage of learning enough | 4 | 4 | 5 | 4,33 | |

Based on the above table, it can be seen that the average achievement of the use of learning time if the terms of the first indicator that is ever learning does not exceed the usual learning is equal to 5. Score the achievement of the use of the learning time by 4,56 it can be concluded that the effectiveness of learning terms of the achievement of the use of the learning time is in the criteria of high.

The Results Of The Questionnaire Responses Of Students

Based on the results of the analysis of the questionnaire responses of students that the results of the percentage of the first aspect that expressed her pleasure to the subject matter to achieve 84,53%, students who are happy to guide students 88,45%, then students who are happy to components of the activity sheets students is 83,43%, while the students are pleased with the atmosphere in the classroom as much as 84.13% and the percentage of students who are happy in the way of teachers to manage learning as much as 87,15%.

Improvement Of Mathematical Communication Skills

To determine the improvement of mathematical communication skills, data obtained from the trial I and trial II were analyzed by comparing the average value of the students. The description of the improvement of mathematical communication skills using the device education learning realistic mathematics which was developed in trial I and trial II are shown in Table 5:

Table 5. Description Of The Results Of Mathematical Communication Skills

| Description | Mathematical Communication Skills Test I | Mathematical Communication Skills Test II |
|---------------|--|---|
| Highest Value | 88 | 90 |
| Lowest Value | 65 | 70 |
| average | 76,40 | 81,60 |

Based on Table 5, the results of the analysis of the improvement of mathematical communication of students in trial I and trial II shows that the average mathematical communication skills of students on the posttest trial I is equal to 76,40 increased to 81,60 in trial II.

Furthermore, the description of the improvement of mathematical communication skills of students by using the developing device education learning realistic mathematics in trial I and trial II for the mathematical communication skills of students each indicator can be shown in Table 6.

Table 6. The average Mathematical Communication Skills of Students for Each of the Indicators

| Indicator Critical Thinking Mathematically | Average | | |
|---|---------|----------|----------|
| | Trial I | Trial II | Increase |
| Presents a mathematical statement in writing in the form of a picture or a description of a contextual problem given | 3,23 | 3,41 | 0.18 |
| Create a mathematical model in the form of mathematical symbols from the contextual problem given, determine the strategy and resolve the issue | 2,80 | 2,97 | 0.17 |
| Explain the idea, settlement strategy, or answers obtained. | 2,47 | 2,85 | 0.38 |

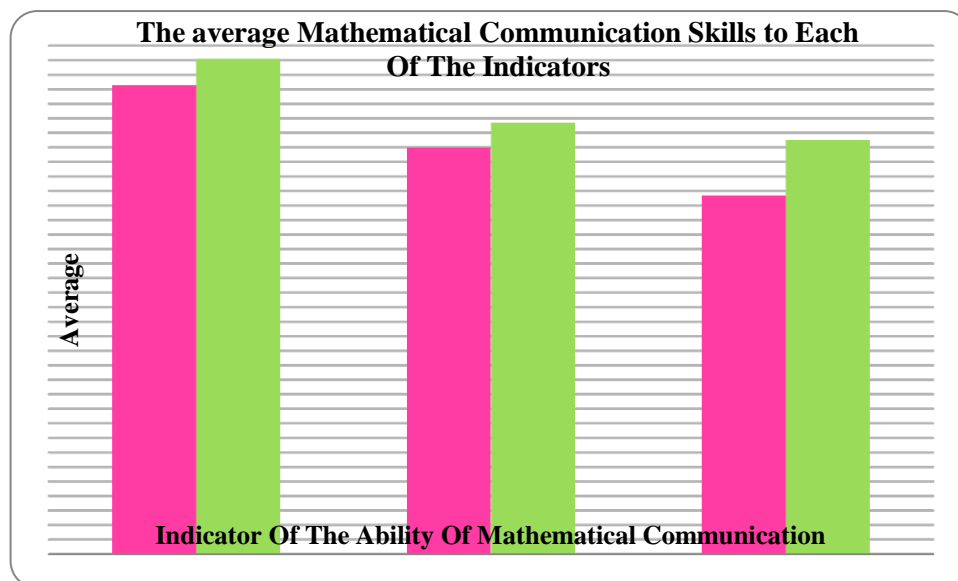


Figure 2. The average Ability of Mathematical Communication for Each Indicator

Based on Table 6 and figure 2. in the above, it can be concluded that the mathematical communication skills of students from trial I to trial II seen from the average value of the total and the average value of each indicator has increased through the application of the device education learning realistic mathematics developed. The increase in the average value of each indicator on the highest indicator 3 because still resolve the issue while the on indicator 1, and 2 are slightly increased because of the already occurring analysis.

CONCLUSION

Based on the results of the analysis and discussion in this research, put forward some conclusions as follows:

1. Learning tools developed include RPP, LAS, BG, BS already have the criteria of valid, effective, and practical and can be used in learning, because it has met the indicators of the effectiveness of the learning device. Indicators of the effectiveness of such is:
 - a. a. Mastery learning students in the classical style in trial I by 77,14% and trial II sebesar 85,71% This means the test I have not yet effective while the test is II have been effective.
 - b. Criteria of learning time, i.e. achievement of the learning time at least equal to the usual learning in trial I and trial II has been achieved. This means the criteria of the learning time is effective.
 - c. The criteria of the achievement of the ability of teachers to manage learning in trial I and trial II, in both criteria.
2. The increase in mathematical communication skills of students using learning tools education math realistic on the material social arithmetic is the average achievement of mathematical communication skills of students on the test I by 76,40 increased to 81,60 in trial II. The average of each indicator of the ability of mathematical communication increased from trial I to trial II.

3. Students ' response to the device components education learning realistic mathematics that was developed and learning activities is a positive

REFERENCES

- Adam & Taufik. (2015). Pemanfaatan Media Pembelajaran Berbasis Teknologi Informasi Bagi Siswa Kelas X Sma Ananda Batam. *CBIS Journal*. Vol. 3(2). 78-90.
- Afnibar dan Fajhriani. (2020). Pemanfaatan *WhatsApp* Sebagai Media Komunikasi Antara Dosen Dan Mahasiswa Dalam Menunjang Kegiatan Belajar (Studi Terhadap Mahasiswa Uin Imam Bonjol Padang. *Jurnal Komunikasi dan Penyiaran Islam*. Vol.11(1).70-83.
- Anwar dan Riadi.(2017). Analisis Investigasi Forensik *WhatsApp* Messenger Smartphone Terhadap *WhatsApp* Berbasis Web. *Jurnal Ilmu Teknik elektro Kompuer Dan Informatika*. Vol.3(1). 2-10.
- Astini,S. (2020). Pemanfaatan Teknologi Informasi Dalam Pembelajaran Tingkat Sekolah Dasar Pada Masa Pandemi *Covid-19*. *Jurnal Lampuhyang*. Vol.11(2). 13-25.
- Barhomi, Choki(2015) “ e Eff ectiveness of *WhatsApp* Mobile Learning Activities Guided by Activity eory on Students” Knowledge Mangement” Contemporary Educational Technology, Vol 6 (3). 221-238.
- Basori. (2013). Pemanfaatan Social Learning Network “Edmodo” dalam Membantu Perkuliahan Teori Bodi Otomotif di Prodi PTM JPTK FKIP UNS. *JIPTEK*, VI, 99– 105.
- Daheri, dkk. (2020). Efektifitas *WhatsApp* sebagai Media Belajar Daring. *Jurnal Basiced*.Vol.4(4). 775-783.
- Dewi, W. A. F. (2020). *Dampak Covid-19 Terhadap Implementasi Pembelajaran Daring di Sekolah Dasar*. Vol. 2(1). 7.
- Firman & Rahman. (2020). Pembelajaran Online Di Tengah Pandemi *Covid-19*. *Indonesian Journal Of Educatoinal Science (IJES)*. Vol.2(2). 81-89.
- Jumiatmoko. (2016). *WhatsApp* Messenger Dalam Tinjauan Manfaat Dan Adab. *Wahana Akademika*. Vol 3 (1). 52-66
- Khoiroh, Nazmi. (2019). *Penggunaan WhatsApp dalam pembelajaran pada mahasiswa pendidikan fisika*.Jambi: Fakultas Keguruan Dan Ilmu Pendidikan Universitas Jambi.
- Kuntarto, E. (2017). Keefektifan Model Pembelajaran Daring Dalam Perkuliahan Bahasa Indonesia Di Perguruan Tinggi. *Journal Indonesian Language Education And Literature*. Vol.3(1).99-110.