

HOW TO UTILIZE A CALCULATOR ON JUNIOR HIGH SCHOOL FOR SPECIAL INTELLIGENT STUDENTS IN MATH ENRICHMENT LEARNING?

¹CAHYA MAR'A SALIHA SUMANTRI, ²SUGIMAN, ²HERI RETNAWATI

¹Postgraduate of Mathematics Education, Yogyakarta State University, Indonesia

²Department of Mathematics, Faculty of Mathematics and Natural Science, Yogyakarta State University
Indonesia

E-mail: ¹cahyamara.2018@student.uny.ac.id, ²sugiman_uny@yahoo.com, ²heri_retnawati@uny.ac.id

ABSTRACT

So far, enrichment learning has been conducted by only giving practice test without using supporting media. Therefore, students on enrichment class feel bored because they are only given working exercises and discuss the solutions. Based on the problem, this research aims to develop calculator-assisted enrichment learning tool to facilitate students, mainly the special intelligent students who take enrichment learning to obtain new knowledge and experience in using calculators. This research was Research and Development of Plomp model. Research subjects consisted of 33 students of VIII grade of Junior High Schools in Pasuruan. Validation instruments consisted of validation sheets. Practical assessment instrument consisted of an assessment sheet by teacher and students, and observation sheet of learning implementation. Effectiveness evaluation instrument was student's final test sheet. Analysis techniques of enrichment learning tools data were classified into two, qualitative and quantitative. Based on result, math enrichment learning tools meet valid criteria by successive scores of 119.5, 95, and 48.5 with good classification. Then, the tools meet practical criteria in terms of assessments by teachers and students by 119 and 76.64 with very good classification. Learning implementation achieves a percentage of 85% and student mastery achieves 95.45%. Therefore, a calculator-assisted enrichment learning tool appropriate to be used as one of the learning tools that has fulfilled the valid, practical, and effective criteria.

Keywords: *Calculator, Special Intelligent Students, Enrichment Learning*

1. INTRODUCTION

Indonesia's education aims to provide opportunities for students to develop their acquiring knowledge and share it back to community as one of the tangible forms of developed talent and ability. Special intelligent children are categorized as children with strength in their intelligence and they have creativity and are diligent in performing tasks [1]. Therefore, special intelligent students need special handling in school education system.

There are various terms to label intellectually intelligent children, such as special intelligent, talented, or gifted. Renzulli [2] defines special intelligent through three rings conception of giftedness as follows: students with skills/talents that are exceeding the average (above average ability), task commitment, and high creativity. Special intelligent students characteristics are they love to

learn new materials, have above-average academics, able to analyze and solve a high-level problem, have high enthusiasm, have good self-motivation, focus, and tenacious in performing assignments [3]. Their advantages are usually treated by teacher only in the form of usual practice test for example is when the teacher provides remedial questions for students who have not finished learning process yet. Relevant to a research by Mary and Ann [4], there are some gifted students who claim they are not given a special learning program, so, need special attention related to their background and abilities. Therefore, the school must become more sensitive to them by using learning instruments that can be adapted to these gifted students. Junior high school student's intelligence level can be determined not only by IQ test but also school rankings or interviewing the teacher concerned to obtain achievement information from certain students.

According to the Decree of the Ministry of Education and Culture 2016, enrichment learning is a given learning or activity to students that exceeded the Minimum Completeness Criteria (KKM). So, enrichment learning has the role as additional learning containing activities to solve problems, but with higher difficulties. Therefore, special intelligent students do not only need teachers as facilitators but also supporting facilities in their learning. As stated in Law Number 20 of 2003 article 5 paragraph 4, every citizen who has special intelligence and talent has a right to receive special education. On the cognitive development theory by Piaget, children in the age of junior high school (around 12 to 15 years old) have not been able to think abstractly, so, the learning process requires concrete objects [5].

There are various types of learning by teachers that can be implemented, one of them is developing an enrichment learning tool consists of a Learning Implementation Plan, Student Worksheet and supported by a media, calculator. Activities in the lesson plan are very important processes to determine the success or smoothness of learning in the classroom, as well as the initial ability of students to be important to be identified so that teachers can develop the learning scenarios [6]. According to STEM understanding by Ismayanti [7], this is an approach used in learning process by combining one, two, or more other fields of science in STEM such as approach in the field of science and technology (IPTEK), engineering, and math. Therefore, use of technology such as calculators in learning process is an example of STEM application that refers to the increasingly sophisticated technology in calculators in the current era. According to Roschelle and Singleton [8] calculator is an element of large-scale information and technology adoption success in education and link the use of technology by increasing student achievement. Other study by Harskamp [9] indicates that students who use calculators tend to try many challenges and obtain high scores compared to students who do not use calculators. Other research by Drijvers and Doorman [10] states that student's behavior during learning when they use a calculator can stimulate real contexts in math and also flexible in problem solving.

The research was a Plomp development model consisted of preliminary, development, and assessment stages. The developed products are calculator-based learning tools and higher order

thinking skills (lesson plan, student worksheets, and final tests) in junior high school math subjects. The instrument (lesson plan, student worksheets, and final test) should be analyzed by its validity to find out the quality and attain well-qualified instrument [11]. Material used in this research was the second semester of VIII junior high school material including Pythagorean Theorem, Circles, Flat Side Buildings, Statistics, and Probability. However, due to time limit the researchers only used circle material to test the quality of calculator-assisted enrichment learning tool. This material would be used as enrichment material for students who had met MCC scores on daily tests for circle material.

2. THEORY AND METHODOLOGY

Enrichment learning was conducted for students who had an advantage in learning a material faster than other students [12]. In addition, enrichment learning was one form of service or intended facility for students who exceeded in learning [13]. They were given several additional tasks by the teacher to expand their knowledge and creativity. Enrichment served as any experience that was replacing, adding, or exceeding learning beyond what was normally provided by schools [14]. This was relevant to the Decree of the Ministry of Education and Culture 2016 which stated that enrichment learning was learning or activity given to students with higher than MCC (KKM) grades, or their grade exceeded MCC (KKM). So, before the teacher gave enrichment learning they checked student's exam results to determine number or list of students participated in the enrichment learning.

Another notion of enrichment is a process of connecting a subject's problem to an interdisciplinary concept that has the potential to clarify the subject's problem, combine various kinds of knowledge, and conduct them [15]. Enrichment learning is often associated with an additional activity outside of class hours with participants who are smart students or special intelligent students. In other words, this activity is expected to develop students' talents and abilities. Robert Dehaan and Jack Kough [16] state that enrichment is the process of adjusting the curriculum to the needs, interests, and abilities of gifted students, and adding more and complex activities to their assignments. In line with James Gallagher's opinion [17] regarding enrichment carried out as an activity aimed at developing intellectual abilities and talents of gifted students. Not only that, this activity is also adapted to the real world or events that they have observed

and often do or do. As said by Ruth Martinson in Hill [18] where enrichment as a kind of learning activity that enable students to know the relationship between facts presented in a content and information collected from a extended variety of sources of human knowledge, and make discoveries based on learning experiences that they have been getting.

2.1 Calculator-assisted Enrichment Learning

Technology in the era of 4.0 has quite rapid progress, such as the type of mobile phone that is increasingly growing along with the more sophisticated features provided, computers are increasingly sophisticated both in terms of physical, and applications, as well as calculator technology which is increasingly sophisticated both in terms of form physical features presented. While these technological developments are challenging, the reality is that for some students in affluent countries computers are still very expensive items to have, so to replace these computer technologies schools can replace them with calculator devices, although these items still expensive for students but do not need require funds add to the software as found on the computer [19]. As Kissane said [20] that calculator technology is changing faster than Education organizations can usually handle. This happens because of the increasingly sophisticated features of the newly released calculator, so the use of technology in mathematics should be developed for the advancement of Education in collaboration with technology. Calculators used in daily life have many different users, such as traders using calculators to calculate merchandise or prices to make it faster and more efficient and generally students use calculators to find the final result quickly from a given formula. For students, the calculator is only used to calculate quickly even though there are various features in the calculator that can be used for various formulas in mathematical material.

Several kinds of technology today are increasingly developing and supported by internet networks, so that accessing information both inside and outside the school is easier. Previously, the tests conducted by students only used pencil and paper, but nowadays tests use technology and the internet [21]. In order to combine test using a pencil and paper along with the help of technology that does not require the internet, one of them uses a calculator. Calculator could be used by students to help them master the important concepts and problem solving in math because they could learn more materials than using the textbooks only [8]. The benefits of calculator in Education included

four components: representation, computation, exploration, and affirmation [22]. Calculator used conventional mathematical syntax to represent various types of mathematic ideas such as what were usually received by students from textbooks. Mathematical calculation could be easily performed by students, while the calculator worked as a facility to help mathematical exploration and not only as numerical calculation. Therefore, when using the calculator students should be able to convince themselves of the estimation which could later conflicted by the obtained results. Another advantage in using a calculator contained in Retnawati's research, et al [23] says that the calculator has a positive impact on student, one of them is helping student learn, which indirectly encourages the development of high-level thinking skills of students. Although learning that uses a higher order thinking skills system by teacher still needs training in making it happen, one way to improve the quality of mathematics teacher is the need for media assistance to improve qualifications in organizing and implementing innovative learning [24].

The use of a calculator could be combined by enrichment learning which was usually conducted with independent learning. Students were given a guidance in using a calculator to solve problems. Mathematical problems should adjust to calculator features, so that not all mathematical material could be answered by using a calculator. The results of research from Dunham [25] said that calculators can improve the quality of almost all activities in mathematics learning including problem solving. Although students are still given problems, to solve them they can use the help of a calculator as a way to solve the problem. Use of graphic calculators was suggested by the NCTM [26] in mathematics learning to provide students with a new approach, such as multiplication representation, and other mathematical ideas. The more new knowledge with a combination of technology was given to students, and then the student's skills would expand, so that they could develop their knowledge to be a new knowledge with their own way.

2.2 Participants

The trial subjects were 33 VIII grade junior high school students around 13-14 years old. Student with that age range usually start to communicate by each other closely, and try to establish interaction, socialize with many people, mainly friends of the same age. Regardless of their

elementary school age, students who begin junior high school age are increasingly curious about any issues and they love to try new and unknown experiment.

2.3 Data Analysis Technique

The data analysis techniques of enrichment learning tools in the form of lesson plans and student worksheets are classified into two namely qualitative data and quantitative data. Qualitative data that will be used is from the results of the validation sheet, teacher assessment sheet, student assessment sheet, learning observation sheet, and questionnaire sheet. As for the quantitative data obtained from the final test results of learning enrichment for special intelligent students who use a calculator. In converting quantitative data into qualitative data using five classifications based on the formula of Widoyoko [27], namely as in the table below:

Table 1: Classification of Learning Tools .

| Formula | Classification |
|---|----------------|
| $X > \bar{X}_i + 1,8 s_{bi}$ | Very Good |
| $\bar{X}_i + 0,6 s_{bi} < X < \bar{X}_i + 1,8 s_{bi}$ | Good |
| $\bar{X}_i - 0,6 s_{bi} < X < \bar{X}_i + 0,6 s_{bi}$ | Sufficiently |
| $\bar{X}_i - 1,8 s_{bi} < X < \bar{X}_i - 0,6 s_{bi}$ | Deficient |
| $X < \bar{X}_i - 1,8 s_{bi}$ | Very Deficient |

Annotation:

X = empirical score

\bar{X}_i = ideal average = $\frac{1}{2}(\text{ideal maximum score} + \text{ideal minimum score})$

s_{bi} = ideal standard deviation = $\frac{1}{6}(\text{ideal maximum score} - \text{ideal minimum score})$

2.3.1 Validity Analysis of Enrichment Learning Tools

Validity analysis on the enrichment learning tool was conducted to determine the validity criteria that fulfilled and were previously assessed by the validator using a validation sheet. Enrichment learning tools can be concluded valid if the results of validation by the validators of the enrichment learning tools are included in the valid criteria. Enrichment learning tools and other instruments that will be tested for validity consist of lesson plans, student worksheets, and the final test for enrichment learning.

Table 2: Criteria of Validity from Enrichment Learning Tools .

| Learning Tools | Interval | Classification |
|--------------------|-------------------------|----------------|
| Lesson Plan | $X > 181,74$ | Very Good |
| | $98,88 < X \leq 181,74$ | Good |
| | $76,48 < X \leq 98,88$ | Sufficiently |
| | $52,26 < X \leq 76,42$ | Deficient |
| | $X \leq 52,26$ | Very Deficient |
| Student Worksheets | $X > 100,8$ | Very Good |
| | $81,6 < X \leq 100,8$ | Good |
| | $62,4 < X \leq 81,6$ | Sufficiently |
| | $43,2 < X \leq 62,4$ | Deficient |
| | $X \leq 43,2$ | Very Deficient |
| Final Test | $X > 54,64$ | Very Good |
| | $44,88 < X \leq 54,64$ | Good |
| | $38,78 < X \leq 44,22$ | Sufficiently |
| | $28,84 < X \leq 38,78$ | Deficient |
| | $X \leq 28,84$ | Very Deficient |

2.3.2 Practical Analysis of Enrichment Learning Tools

To conduct practicality analysis on enrichment learning tools, data can be obtained from (1) the teacher's assessment sheet, (2) the student's assessment sheet, and (3) the observation sheet in the learning activities.

Practicality analysis by teachers is used to determine the extent to which the lesson plan and student worksheets for enrichment meet practical criteria based on the teacher's assessment sheet on lesson plan and student worksheets for enrichment. The teacher uses the lesson plan and student worksheets in learning assisted with calculator assisted and give an assessment.

Table 3: Criteria of Practical Analysis by the Teacher

| Aspect | Interval | Classification |
|--------------------|--------------------------|----------------|
| Lesson Plan | $X > 88,884$ | Very Good |
| | $87,188 < X \leq 88,884$ | Good |
| | $80,802 < X \leq 87,188$ | Sufficiently |
| | $14,406 < X \leq 80,802$ | Deficient |
| | $X \leq 14,406$ | Very Deficient |
| Student Worksheets | $X > 87,8$ | Very Good |
| | $80,6 < X \leq 87,8$ | Good |
| | $80,4 < X \leq 80,6$ | Sufficiently |
| | $16,2 < X \leq 20,4$ | Deficient |
| | $X \leq 16,2$ | Very Deficient |
| | $X > 88,884$ | Very Good |

| | | |
|-------------------------|--------------------------|----------------|
| Performance of Learning | $87.188 < X \leq 88.884$ | Good |
| | $80.892 < X \leq 87.188$ | Sufficiently |
| | $74.406 < X \leq 80.892$ | Deficient |
| | $X \leq 74.406$ | Very Deficient |

Practicality analysis by students is carried out to determine the extent of student assessment of mathematics learning in the classroom using student worksheets that have been developed. The practicality criteria for the learning tools of student worksheets consist of attractiveness, convenience, and usefulness.

Table 4: Criteria of Practical Analysis by the Students

| Interval | Classification |
|----------------------|----------------|
| $X > 78.6$ | Very Good |
| $61.2 < X \leq 78.6$ | Good |
| $46.8 < X \leq 61.2$ | Sufficiently |
| $32.4 < X \leq 46.8$ | Deficient |
| $X \leq 32.4$ | Very Deficient |

2.3.3 Analysis of the Effectiveness of Enrichment Learning Tools

When conducting an effectiveness analysis that aims to determine the extent to which the lesson plan and student worksheets of this calculator-assisted enrichment meet the effective criteria, it can be determined from the final test of students' enrichment learning. The score obtained from the final test is in the form of grades 0-100. This value is compared with the minimal completeness criteria (MCC) that has been previously set by a special school for mathematics subjects which is 71. Which can be said to be effective if the enrichment learning device developed has a percentage of students completeness learning $\geq 78\%$.

$$\text{the completeness percentage } (c) = \frac{\text{number of passed students}}{\text{number of students}} \times 100\%$$

2.4 Data Analysis

The research type used was Research and Development. In this development research, math enrichment learning tools for Semester II VIII Grade Students of Junior High School assisted by a calculator and used Plomp model [28] had three stages in their development included: (1) preliminary research, (2) development stage or prototyping stage, and (3) assessment phase. Quality assessment referred to criteria of Nieveen [29] included validity, practically, and effectiveness.

Data analysis techniques of enrichment learning tools in the form of lesson plan and student worksheets were then classified into two which were qualitative and quantitative. Used qualitative data was the result of validation sheet, teacher assessment sheet, student assessment sheet, learning observation sheet, and questionnaire sheet. Meanwhile quantitative data was obtained from final test results of learning enrichment for special intelligent students who used calculator.

3. RESULTS AND DISCUSSION

3.1 Math Enrichment Learning Tool Developing Process

3.1.1 Preliminary Research

The observation was conducted on two different schools by the same VIII grade. The result of observation in VIII class, questionnaire, and interview with mathematics teachers, it was found that students of class VIII in the first school were students with high average grade compared to other class VIII in the school. Then the usual enrichment learning activities were performed by the teacher only by providing exercises related to their materials, and they did not use tools/media. Next, in the enrichment learning process, students had never used a calculator as a means to calculate. This could be seen from the trial test questions on circle material, where students were asked to count simple operation only by using number, subtraction, and multiplication. It indicated that almost all students let their final answers in the form of fractions instead of usual decimal numbers. It occurred because students did not understand how to change number into fractions decimal form by using a calculator, and the final finding indicated that students did not have enrichment materials such as student worksheets which contained practice questions alongside a guidance to use a calculator in solving these problems. Other observations could also be found in the second school, and the result was almost the same as the first school, but, the second school indicated that the teacher had never conducted enrichment learning because the next chapter material required time to be completed immediately.

The material selection for VIII class in second semester consisted of Pythagorean material, circles, flat side buildings, statistics, and probability. Then, the researcher selected basic competencies (KD) in all VIII materials in second semester by using calculator-assisted enrichment learning. In addition, all material selection in

second semester and student activities in student worksheets were also arranged with the aim to teach the use of a calculator on problems that could be solved with a calculator. It could be concluded that, Basic Competence (KD) which was used as development material had 6 materials consisted of Pythagorean, circles, flat side buildings, statistics, and probability.

The application of this calculator is not used during class learning every day, but one of them in a discussion of certain materials or enrichment learning activities. The researcher asked the teacher concerned about the activities given to students while carrying out enrichment learning, the teacher said that the activity was filled with working on questions as usual without using learning media. Therefore, based on these findings the researcher observed basic competencies (KD) and class VIII semester 2 materials in the 2013 Curriculum.

Field observation activities were conducted on the teacher about the knowledge of using a calculator by giving questionnaires. From the questionnaire it could be seen that the teachers had conducted enrichment learning without a calculator, although they had used other props in regular learning such as building frameworks, learning videos, etc. This situation occurred since not all students had a calculator, so, it would inhibit the time if calculator usage was conducted alternately. The teacher wishes to try to use a calculator in both regular and enrichment learning activities, although there are obstacles to the habits of students who only rely on calculators. So, the use of the calculator is planned to be done by the teacher on certain materials but not every time, because it can become a habit for students to calculate with a calculator without a manual. Other results in the questionnaire conducted by the teacher stated that students were only able to operate the calculator for simple calculations without knowing the other features contained in the calculator.

3.1.2 Prototyping Stage

Design stage was conducted on lesson plan, student worksheets, and enrichment learning final test assisted by a calculator contained several supporting components in each of these products. Contained components in Lesson Plan were (1) identity; (2) core competencies; (3) basic competencies and competency achievement indicators; (4) learning objectives; (5) learning materials; (6) learning methods; (7) learning activities; (8) media/learning resource materials;

and (9) assessment technique. Meanwhile, for student worksheets it consisted of (1) title component; (2) student identity; (3) basic competencies and competency achievement indicators; (4) student activities and conclusions. It was similar to lesson plan and student worksheets, final test preparation for enrichment learning that based on higher order thinking skills (HOTS) consisted of grid component, student identity, work instructions, items, and scoring guidelines. Compiled learning products were then designed and equipped by a cover sheet, a table of contents that was consistent with the design of general module making.

3.1.3 Assessment Phase

At this stage, the assessment covered a feasibility assessment in terms of practical aspects and effectiveness. Product evaluation was in term of practical aspects and conducted by math teachers among VIII class and students among VIII class. Product evaluation was in term of effectiveness, and it was conducted through product trial process in learning time. Obtained trial result were then analyzed to determine developing product effectiveness.

3.2 Math Enrichment Learning Tool Product

Test Analysis

The implementation of learning activities using a calculator is carried out when students work on the pretest questions of circle chapter and when students carry out enrichment learning after the final chapter circle test. On the first day of study at class VIII-A, researcher do the experiment for using calculator at the time of the pretest aims to determine the students' initial ability to understand the circle material they have learned and the use of a calculator.

The process of implementing students working on the pretest using a calculator namely as follows:

- 1) Each of student is given a calculator and given a pretest to be done individually.
- 2) Students are not told the key functions used to solve questions in the pretest. Thus, almost all students use simple calculation operations to solve these problems.
- 3) Students had difficulty in determining the final result of a form of root operation because what is listed in the calculator screen is the result of the root form only, even though the result that is usually used is the decimal form. That happened because students do not know the

- key functions that can change the root result into a decimal form.
- 4) Similar to the root operation, students also have difficulty determining the final result of a form of fractional operation because what is listed on the calculator screen is the result of a fractional form only.
 - 5) Some students had problems when they turn off the calculator, if some other students immediately let it die themselves, then other students who want to know how to turn off the calculator immediately ask the researcher how.
 - 6) After completing the pretest, the teacher informs students of the function of the key used to convert the root or fraction results into decimal form.

On the last day of study at class VIII-A researcher do the experiment for using the calculator when enrichment learning aims to add the experience and insight of students in using media to help in learning outside of class hours in general. The following below is the process of implementing enrichment learning using a calculator:

- 1) Each of the student is given a calculator and Student worksheets.
- 2) The researcher gives a little explanation about the function of the keys on the calculator that will be used in solving problems in Student worksheets as well as explaining the contents of Student worksheets to students.
- 3) Students are asked to do Student worksheets according to the instructions. In addition, researchers went around to see the process of student work by using a calculator and helping students who have difficulty with the problems.
- 4) One of the problems in Student worksheets is asking students to write down the numbers that appear on the calculator screen itself, because it is not the same among other students. Some students casually write down the numbers listed on the calculator, there are students who are confused, shocked because the numbers that appear are different from their peers. Thus, the researchers reassured students by saying that just write the numbers according to the calculator themselves because indeed at that time the problem was using the random integer key function. When you press the same button the random number will appear again like that continuously because that is the function of the key.
- 5) The next problem in Student worksheets besides using a calculator, it also uses thread, scissor, compass, and a ruler. After all students

- get these materials, students begin to work according to the instructions until the calculation process. At the time of work, researchers went around and observed student activities. Students still remember how to converted to decimal form by using the button that was discussed at the time of the pretest at the beginning of learning when they met the process of calculating the final result in the form of fractions.
- 6) Enrichment learning for circle chapter is ended by asking again what button functions have been learned, researcher did this not only for the students can apply it later but also to facilitate students' final trials by working on the final test questions using a calculator at the next meeting.

After obtaining the results of the validation and trial or experiment implementation activities, the next process is carried out namely data analysis. The data analysis process consists of three aspects, namely validity, practicality and effectiveness data analysis. The purpose of analyzing this data is to determine the quality of the product being developed and at the same time be in the evaluation phase of the product development process. The data obtained consisted of validity, practicality, and effectiveness.

3.2.1 Math Enrichment Learning Tool Product Validity Test

Lesson plan validity result was indicated on table 1 below. Based on the result, average validation score by two validators was 119.5 with a good qualitative classification in range of $98.58 < X \leq 121.74$. Therefore, Lesson Plan quality assisted by calculators for intelligent student's enrichment learning of Junior High School VIII grade was considered valid and feasible.

Table 5: Lesson Plan Validity Assessment Recapitulation.

| Assessment Aspects | Assessment Score | | Average Score |
|---------------------------------------|------------------|-------------|---------------|
| | Validator 1 | Validator 2 | |
| Subject identity | 10 | 9 | 9.5 |
| Indicator formula and objective | 19 | 16 | 17.5 |
| Material suitability | 22 | 24 | 23 |
| Learning model selection | 8 | 8 | 8 |
| Learning activities | 18 | 16 | 17 |
| Media and learning source suitability | 16 | 16 | 16 |

| | | | |
|----------------------------|-----|-----|-------|
| Learning result assessment | 12 | 13 | 12.5 |
| Language use | 16 | 16 | 16 |
| Score total | 121 | 118 | 119.5 |
| Classification | | | Good |

Furthermore, for the student activity sheet product, the validation result obtained was validation score by two validators of 95 with a good qualitative classification within the range of $81.6 < X \leq 100.8$. Therefore, student worksheets quality product assisted by calculator for VIII grade intelligent students on second semester was considered valid and feasible.

Table 6: student worksheets Validity Assessment Recapitulation.

| Assessment Aspects | Assessment Score | | Average Score |
|---|------------------|-------------|---------------|
| | Validator 1 | Validator 2 | |
| Resolving suitability by using calculator | 8 | 8 | 8 |
| Independent suitability learning on enrichment activity | 8 | 8 | 8 |
| Content and material suitability | 20 | 24 | 22 |
| STUDENT WORKSHEETS layout setting | 12 | 12 | 12 |
| Linguistic components suitability | 16 | 16 | 16 |
| Presentation component suitability | 18 | 17 | 17.5 |
| STUDENT WORKSHEETS advantages | 10 | 13 | 11.5 |
| Score total | 92 | 98 | 95 |
| Classification | | | Good |

Final validated product was enrichment learning final test. Based on table 3 result below, validity assessment score by two validators was 48.5 with a good qualitative classification in the range of $44.22 < X \leq 54.66$. Therefore, enrichment learning final test by a calculator-assisted for intelligent students of Junior High School VIII grade on second semester was considered valid and feasible.

Table 7: Final Test Validity Assessment Recapitulation.

| Assessment Aspects | Assessment Score | | Average Score |
|---|------------------|-------------|---------------|
| | Validator 1 | Validator 2 | |
| Assessment technique with the purpose of learning suitability | 12 | 12 | 12 |
| Instrument completeness | 8 | 8 | 8 |
| Content suitability | 4 | 4 | 4 |
| Problems | 11 | 13.5 | 13.5 |
| Language | 8 | 11 | 11 |
| Score total | 92 | 43 | 48.5 |
| Classification | | | Good |

3.2.2 Math Enrichment Learning Tool Practicality Test

The first practicality test was conducted by the teacher with an assessment sheet with an average score of practicality assessment by the teacher was 119, with a very good qualitative classification. Acquisition of each aspect such as Lesson Plan received a score of 39 with a very good classification ($X > 33,954$), student worksheets aspects obtained a score of 41 with a very good classification ($X > 37.8$), and learning implementation aspects obtained a score of 39 with very good classification ($X > 33.594$). Therefore, calculator-assisted enrichment learning tools quality for intelligent students of Junior high school VIII grade on the second semester met the practical criteria.

Furthermore, from the practicality test conducted by students, the results showed that 59.1% of students rated this product in the excellent category, 36.4% of students rated this product in good category, and 4.6% of students rated this product in adequate category. The average assessment score of 22 students was 76.64 with a very good qualitative classification in the range of $x > 75.6$. Therefore, calculator-assisted enrichment learning tools quality for intelligent students of Junior high school VIII grade on the second semester met the practical criteria.

The practicality of the enrichment learning product could be identified through data on learning outcomes. Based on the assessment results, the percentage of teacher performance was 90% and student activity was 85%. Therefore, the quality of calculator-assisted enrichment learning product for intelligent students of Junior High School VIII grade on second semester met the practical criteria and it

was in accordance with the previous criteria of $t \geq 85\%$.

3.2.3 Math Enrichment Learning Tool Effectiveness Test

The effectiveness of enrichment learning tool product was determined based on the result of learning tests conducted by students. Based on the test results, the completeness percentage for the final test after enrichment learning was 95.45% with a final test score of 83.72. The number explained that around 21 out of a total of 22 students who took the test achieved MCC scores by ≥ 71 and had reached at least 75%. Therefore, based on the data, it could be concluded that the previously developed Lesson Plan and student worksheets met the effective classification.

Table 8: Effectiveness results based on the final test.

| Number of Students | Highest Score | Lowest Score | Average | Number of Passed Students | Passing Grade (%) |
|--------------------|---------------|--------------|---------|---------------------------|-------------------|
| 22 | 100 | 58.3 | 83.72 | 21 | 95.45% |

Research conducted did not only obtained data on student achievements, but also data on the student questionnaire results regarding enrichment learning and the use of calculators in enrichment learning. Based on the questionnaire, most of the student said that through enrichment learning they obtained new knowledge, alongside by the use of technology in learning, the calculator might entertain and add new knowledge on the use of calculator because most students said they only knew other functions of calculator other than to calculate.

3.3 Discussion of Validity, Practically, and Effectiveness Analysis Result

The validity of learning implementation plan was reviewed from several aspects which were subject identity, formulation of indicators and objectives, material suitability, learning model selection, learning activities, media and learning resource suitability, assessment of learning outcomes, and language use. The average score of validity assessment by the two validators was 119.5 with a good qualitative classification. The validity of student activity sheet was reviewed from several aspects, namely suitability of problem solving used a calculator, suitability of learning independence in enrichment activities, suitability of content and material, student worksheets layout settings, suitability with linguistic components, suitability of presentation components, and benefits/uses of

student worksheets. The average validation score by the two validators were 95 with a good qualitative classification. The validity of enrichment learning final test was reviewed from several aspects as follows: assessment technique by learning objectives suitability, instrument completeness, content suitability/substance, question construction, and language. The average score of validity assessment by the two validators was 48.5 with a good qualitative classification. Therefore, the quality of Lesson Plan, student worksheets, and final test of learning enrichment assisted by calculators for intelligent students of Junior high school VIII grade on second semester was considered valid and feasible.

Valid categorization is obtained through the development process carried out referring to the guidelines for the preparation of existing learning tools, namely according to Nieveen [29] that the product of development is declared valid if the product is based on current knowledge (content validity) and all its components are consistently related to each other (construct validity). Lesson plan that usually used by teacher not only consist of sequence and systematic delivery of the material, but also integrated the character values in the process of knowledge transfer [30]. Therefore, in addition to providing knowledge, teacher also provide character education such as instilling self-confidence, self-esteem, etc. Lesson plan likely to composing the subject matters, the use of instructional media and learning approach or method or model, and about assesment [31]. Components in the Lesson plan are compiled based on Permendikbud Number 22 of 2016, as well as the preparation of student worksheets compiled by the Ministry of National Education [32]. Thus, the validity aspect is fulfilled for the product development of enrichment learning tools so that it is declared suitable for use.

Data on practicality of enrichment learning products was obtained from results of teacher assessments, student assessments, and learning observations. The assessment was conducted by math teachers and VIII-A students. Sources of practicality assessment came from teacher assessment sheets, student assessment sheets, and learning outcome observation. The average score of practicality assessment by the teacher was 119 with a very good qualitative classification, where the acquisition of each aspect such as Lesson Plan obtained a score of 39 with a very good classification, student worksheets aspect obtained a

score of 41 with a very good classification, and implementation aspect obtained a score of 39 with very good classification. For assessments by students, 59.1% of students rated this product in excellent category, 36.4% of students rated it in good category, and 4.6% students rated this product in adequate category. Meanwhile the assessment of the learning feasibility obtained an average assessment score of 76.64 with a good qualitative classification from 22 students. The percentage of teacher activity was 90% and student activity was 85%. Therefore, the quality of calculator-assisted enrichment learning tool products for intelligent students of Junior high school VIII grade on second semester met the practical criteria.

Enrichment learning tool effectiveness was determined based on the result of learning tests conducted by students. Previously learning tools used in enrichment learning were tools for circle material. The results of final calculator-assisted enrichment learning calculator was the completeness percentage for final test after enrichment learning was performed by 95.45% with an average final test score of 83.72. This number stated that around 21 out of a 22 students who took the test achieved MCC scores ≥ 71 and had reached at least 75%. Therefore, based on these data it could be concluded that developed Lesson Plan and student worksheets had met the effective classification viewed from results of calculator assisted enrichment final test.

The acquisition of effective criteria in using calculators in learning mathematics enrichment is in line with Roschelle and Corrine [8] which states that the use of calculators by students in schools can be used to help them master important concepts and problem solving in mathematics because they can learn more than using books text only. Other studies have resulted that the difficulty in solving test items that based on higher order thinking skills (HOTS) is implementing the formula, errors in mathematics calculation, and errors in algebraic operation and manipulation [33]. Just like the result of this study, one of the findings found that one of student made a mistake while doing multiplication calculations (figure 3b). Therefore, the use of a calculator is one of the companion tools for students other than as an ordinary calculation tool can also be used in other mathematical calculations such as statistics and others. As said by the NCTM [26] where teachers are advised to use a calculator to provide new methods for students, such as the use of several programs or features in calculators to help

identify problems in mathematics, solve problems, and apply them in real investigations.

Research conducted did not only obtained the data on student achievements, but also the data on student questionnaire results regarding enrichment learning and the use of calculators in enrichment learning. Based on the questionnaire, most of the student said that through enrichment learning they obtained new knowledge, and by the use of technology in learning, the calculator might entertain and add new knowledge on the use of calculator because most students said they only knew other functions of calculator other than to calculate.

The results of the data analysis are relevant to some previous studies such as those conducted by Kenneth Ruthven and Di Chaplin [34] which concluded that the importance of developing students' skills in using calculators in addition to simple calculations and the needs of students to connect between mathematical concepts and operate them on a technology. Seen in the process of research, students initially use the calculator only for simple calculations, but after exploring other calculator features for example to use the random integer feature students are able to associate it to circle material, in Pythagorean material there is also a true or false feature on the calculator to check a triple Pythagoras. Furthermore, research from Penglase and Arnold [35] which states that students have found that after being introduced to technology (calculators) has caused them to adapt mathematical behavior that is considered helpful in learning, specifically using more depth in solving a problem. It is almost the same as the responses of students in class VIII-A who have been given a questionnaire about their opinions with a calculator, on average students say that they are made easy using a calculator, besides that they feel entertained and gain new knowledge about using a calculator because most students say that they only know about other functions from a calculator other than counting.

Other supporting research has been carried out by Muhtadi, et al [36] regarding the use of technology in mathematics learning to conclude that technology can help students develop understanding of mathematics and influence teacher practices in teaching. It can be seen in the results of student questionnaires that say that they are facilitated and the diverse features of the calculator can broaden their knowledge. In addition,

the teacher in his questionnaire said that he wanted to try using a calculator in learning even if only occasionally. Research conducted by Zurqoni, Retnawati, Arlinwibowo, and Apino [37] showed that IT facilities in the schools that located outside the center of the city relatively not supported by internet connection, so that schools should be creative. It means that calculator can be used as one of solution for schools that do not have an internet connection for learning media, especially mathematics.

3.4 Findings During the Research

A total of 32 students in VIII-A were divided into 2 parts, in which 16 students worked on pretest by using a calculator, while 16 other students worked on the pretest without using calculator. On pretest, there were students who forgot their calculators, so they calculated by using papers instead.

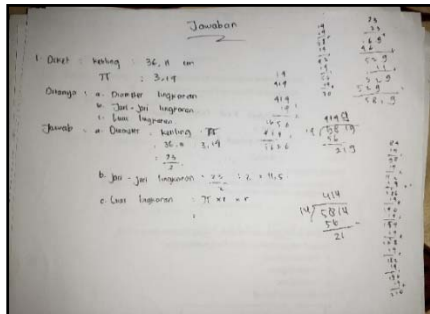


Figure 1: Students Calculated manually even when they had a calculator

Another finding was students who used calculators simply used a calculator to calculate the final result, but they wrote what was written on the calculator screen in the form of fractions and root shapes instead of the decimal number.



Figure 2: Students calculated simple operations without changing to decimal

Students who were not provided with calculator used the manual calculation method as

usual. However, because the number reached a decimal number which was complicated for root-form operations, the students were emptying the answer. In addition, some students also made mistakes in multiplication calculations such as in figure 3 (a) and 3 (b) below.

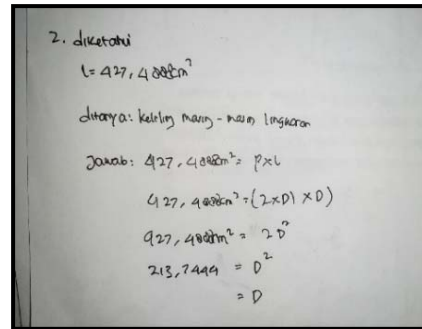


Figure 3(a): Non-calculator user students were emptying the answer recapitulation

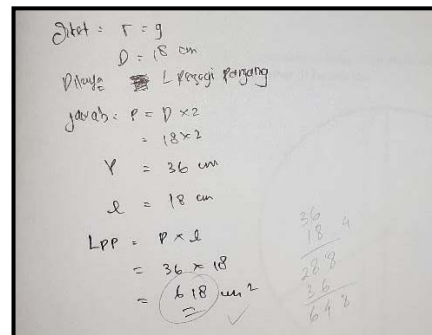


Figure 3(b): Non-calculator user students made mistake in a simple multiplication

4. CONCLUSION

Math enrichment learning tools for VIII grade on even semester by using a calculator have many characteristics. First, the enrichment learning activities that are arranged to the use of calculator in solving problems accompanied by illustrations on how to use the menu in calculator. Second, the use of problems that have many solutions. Third, the use of final test instrument in the form of higher order thinking skills with the help of calculator. Based on the explanation above, it can be concluded that math enrichment learning tool for intelligent students of VIII grade on even semester is feasible as a learning tool for math enrichment that has fulfilled the valid, practical, and effective criteria.

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