Jurnal Matematika Vol. 22 No. 1, Mei 2023
ISSN: 1412-5056 / 2598-8980
https://journals.unisba.ac.id/index.php/matematika

Diterima: 14/05/2022
Disetujui: 06/05/2023
Publikasi Online: 30/05/2023

The Use of Digital Games Media in Mathematical Thinking Courses to Improve Literacy Skills

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Abstract. This study aims to improve the literacy skills taken by students in the mathematical thinking course through the use of digital media. The method used in this research is classroom research by observing the improvement of learning carried out in the mathematical thinking course class through the steps of the Hopkins model with a cycle of planning, action, observation, and reflection. The subjects of this study were students of the Mathematics Education Study Program at one university in Bandung totaling 34 people. The statistics used in this study are descriptive statistics with the data analyzed qualitative data. The data collected includes observations, questionnaires, reflections, and the Digital Games application on Microsoft Powerpoint. Based on the analysis of observations, it can be concluded that the use of digital games media in mathematical thinking courses can improve literacy skills. Based on the questionnaire analysis, students responded positively to the use of Digital Games media in mathematical thinking courses.

Keywords: digital games, literacy skills, and mathematical thinking.

1. Introduction

Mathematics is one of the fields of study that has an important role in the development of science and technology, because it requires a careful attitude in counting, analyzing a concept, high reasoning, logical thinking, systematic, critical, careful, creative, able to communicate ideas and solve problems. Thus, Mathematics can develop human intellectuals to the needs of the 21st century in supporting the 4.0 revolution where the learning process utilizes a lot of advances in information and communication technology which is completely supported by the Internet [1].

The Industrial Revolution 4.0 is an integration between the world of the Internet or online with the world of business or production in an industry. This means that all production processes are supported by the Internet. Revolution has the meaning of major changes to humans in living with the times or orders, from time to time changes occur starting from the 1.0 revolution to the current 4.0 revolution. Revolution 1.0 is marked by the growth of mechanization and energy based on steam and water, Revolution 2.0 is marked by the development of electrical energy and motors, and Revolution 3.0 is marked by the growth of industries based on electronics, information technology, and automation. Digital technology and the internet began to be known at the end of this era. While the Industrial Revolution 4.0 is marked by the development of the Internet, its presence is so fast and versatile in all things. [2]

Based on the explanation above, the need for technology-based information is increasing, especially the need for lectures on campus, where the independent learning curriculum requires students to have good literacy skills to wisely choose good information facilities. One of the curriculum is mathematical thinking courses through the use of digital games media. Literacy skills are skills in analyzing through reading and writing. The general idea of the meaning of literacy in Mathematics is the ability to read mathematical problems and rewrite the meaning contained in these problem [3]. To improve the literacy skills of students in teaching this mathematical thinking course is through the use of digital games media. The uniqueness of digital games media is that the learning process is presented in an interesting and fun way so that students happily learn Mathematics without any anxiety or tension. This digital media is presented with the help of the Internet in operating it and designed by the

student together in a team or group and presented in a presentation and applied to their fellow students in class.

2. Research Method

This research was carried out using the Classroom Action Research (CAR) method. Classroom action research is an examination of learning activities in the form of actions, which are deliberately raised and occur in a class simultaneously [4]. This research includes four main interrelated aspects, namely planning, action, observation, and reflection as stated at Figure 1

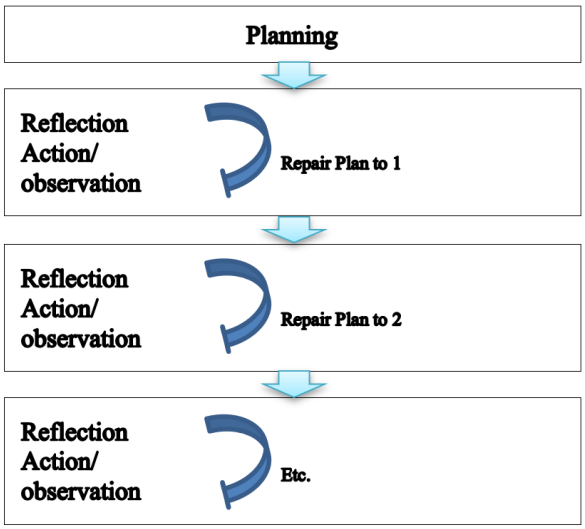

Figure 1. The Hopkins Class Action Research Spiral Chart

The subjects of this study were 34 students of the Mathematics Education study program at a University in Bandung. The statistics used in this study are descriptive statistics with the data analyzed qualitative data. The data collected includes observations, questionnaires, reflections, and the application of Digital Games on Microsoft Powerpoint. Data processing uses analysis on the results of observing student activities during the learning process of mathematical thinking material using Digital Games media by analyzing the increase in literacy skills in each meeting. Other data processing is a questionnaire analysis of student responses to the use of digital games media in learning mathematical thinking courses in improving literacy skills.

Classroom action research is that looks at objects and takes action on activities that are intentionally carried out with certain goals with various series of activity cycles for the same class or group of objects and the same lessons from the treatment of a teacher [5].

Processing of observational data is carried out by calculating the percentage score as a component observed using the formula:

$$\text{Percentage} = \frac{Score\ Obtained}{Maximum\ score} \times 100\%$$

The criteria for scoring on the observation sheet are 0 (very bad), 1 (poor), 2 (medium), 3 (good), and 4 (very good) as shown at Table 1. After the data is analyzed, then interpretation is carried out using the five scale [6].

Table 1. Category of Interpretation of Observation Results

Percentage of Answers (%)	Criteria
90% < A ≤ 100%	Very good
75% < B ≤ 90%	Good
55% < C ≤ 75%	Enough
40% < D ≤ 55%	Not Enough
0% < E ≤ 40%	Bad

The indicator of the success of this research is seen from the classical absorption of literacy ability by calculating the percentage as follows:

$$\text{Percentage} = \frac{Number\ of\ students\ who\ obtained\ mastery\ level > 65\%}{\text{Total students}} \text{x}100\%$$

After the data on students' literacy skills were analyzed, then the data were grouped into very good, good, sufficient, poor, and bad categories using the scale as shown at table 2:

Table 2. Category of Interpretation of Students' Literacy Skills

Percentage of Answers (%)	Criteria
80% ≤ A < 100%	Very Good
70% ≤ B < 79%	Good
60% ≤ C < 69%	Enough
45% ≤ D < 59%	Not Enough
E < 44%	Bad

The questionnaire data were scored for each answer to a closing statement on a Likert scale as shown at Table 3. Closed statement answers are divided into positive statements and negative statements through the scoring of the questionnaire [7].

Table 3. Questionnaire Scoring

Statement	Strongly Agree	Agree	Don't Agree	Strongly Disagree
Positive	5	4	2	1
Negative	1	2	4	5

This literacy ability data analysis went through the observation stages with data processing listed above, each stage of the observation carried out a reflection on whether the learning treatment using digital media significantly increased learning outcomes. If learning outcomes do not increase, it is necessary to make improvements until the learning is feasible to use to improve student's literacy skills in the mathematical thinking ability course. After the observations are made, then measure the classical absorption which can be used as an indicator of the achievement of literacy skills in students.

To find out student responses to the use of digital media in learning mathematical thinking courses, an analysis of the questionnaire was carried out with the data processing described above. This research is hoped that it can improve students' literacy skills, one of which is learning to think mathematically through the use of digital media.

3. Result and Discussion

This study aims to determine the improvement of student literacy skills in mathematical thinking courses through the use of digital games media. Processing of research through classroom action on students of the Mathematics study program for one semester. To determine the increase in literacy skills, several cycles of formative tests were carried out and observations and questionnaires were used to determine student responses to the learning process using digital games.
The recap of the formative test results is as follows:

a. Formative Test Results 1

Formative test 1 was carried out after the learning cycle I ended to evaluate the literacy skills of mathematical thinking material using digital games. The recap of formative test results 1 can be seen in Table 4.

Table 4. Formative Test Results 1

No.	Category	Value
1	Maximum Value	100
2	Minimum Value	40
3	Average	76,77
4	DSK (%)	67,65%

b. Formative Test Results 2

Formative test 2 was carried out after the end of the second cycle of learning to evaluate literacy skills on mathematical thinking material using digital games. The recap of formative test results 2 can be seen in Table 5.

Table 5. Formative Test Results 2

No.	Category	Value
1	Maximum Value	100
2	Minimum Value	50
3	Average	78,70
4	DSK (%)	69,75%

c. Formative Test Results 3

Formative test 3 is carried out after learning cycle III ends to evaluate literacy skills on mathematical thinking material using digital games. The recap of formative test results 3 can be seen in Table 6.

Table 6. Formative Test Results 3

No.	Category	Value
1	Maximum Value	100
2	Minimum Value	60
3	Average	86,21
4	DSK (%)	80,13%

d. Formative Test Results 4

Formative test 4 was carried out after learning cycle IV ended to evaluate literacy skills on mathematical thinking material using digital games. The recap of formative test 4 results can be seen in Table 7.

Table 7. Formative Test Results 4

No.	Category	Value
1	Maximum Value	100
2	Minimum Value	65
3	Average	90,01
4	DSK (%)	89,50%

The formative test results from Table 7 can be recapitulated in Table 8.

Table 8. Recapitulation of Formative Test Results 1 to 4

Test Formative	Average Mark	DSK (%)
1	76,77	67,65
2	78,70	69,75
3	86,21	80,13
4	90,01	89,50

Based on the recapitulation of the results of formative tests 1-4 above, it can be seen that each cycle has increased so that the use of digital games media can be used in learning students' mathematical thinking to improve literacy.

Literacy is a person's ability to write and read. In this study, the meaning of literacy is the ability to understand mathematical problems through reading questions which are then determined by the core problems that must be solved and the right solution is sought in making decisions to solve them so that the results of these thoughts are rewritten in the form of problem-solving [3].

Literacy skills in each cycle have increased because the use of digital games media is unique where students learn without pressure and are free to use Internet facilities in the learning process so that the use of this learning media can be used online or offline or referred to as blended learning [8].

The use of questionnaires in this study was carried out to obtain information about student responses to the use of digital games media in mathematical thinking courses which are presented in Table 9.

Table 9. Results of Student Questionnaire Analysis

No.	Rated Aspect	Student Scores	Interpretation
1	Student responses to mathematical thinking courses	3,5	positive
2	Student responses to learning Mathematics using digital games	3,4	positive
3	Student responses to literacy questions	3,5	positive
4	Student responses to other lecturers/students during learning	3,2	positive
	Average Score	3,4	positive

Based on the results of the 3.4 questionnaires, which were positive, the students gave a good response to the use of digital games in the mathematical thinking course. Apart from student observation questionnaires in this study were used to observe student activities during Mathematics learning activities using digital games media in mathematical thinking courses. The student activity observation sheet is filled out by the observer. The observer only puts a checklist in the appropriate activity score column in the observation sheet provided by the researcher. The results of observations on student activities during the learning process were analyzed in tabular form. Data analysis of observations on student activities for 4 cycles is shown in table 10.

Table 10. Data Analysis of Observation Results on Student Activities

No.	Observation Aspect	Cycle (%)				Average (%)
		I	II	III	IV	
1.	Listening activities	60	75	80	84	74,75
2.	Writing activities	70	75	81	85	77,75
3.	Reading activities	70	75	75	93	78,25
4.	Application activities	70	75	90	95	82,05
5.	Communicating and problem-solving activities	75	75	81	100	82,75
Average/Cycle Percentage		69	75	81,4	91,4	79,02

Based on the results of Summative 1-4, the results of the questionnaire and the results of observations of the use of digital media in this mathematical thinking course have increased both learning outcomes, learning process processes, and high motivation through activities that increase every cycle, however, lecturers in learning must be extra in guiding their learning independently and creatively. The use of digital game media can create student characters to be able to think critically in solving mathematical problems. This is in line with Marlina's research in 2018 and 2019 that in learning Mathematics, students must be led to think critically and have high mathematical thinking skills according to their intelligence [9] [10].

4. Conclusion

The use of digital games media is unique in the Mathematics' learning process, one of which is at the university level in Mathematical thinking courses, because through the design of digital games students are active, innovative, and creative in applying Internet-assisted learning which is currently being improved by the government in development through digital literacy programs. This literacy ability is used in writing and reading information so that it can also be used in learning Mathematics. The results of the study based on the description above, it can be concluded that the use of digital games media in learning Mathematical thinking courses can improve literacy skills seen from the summative results of cycles 1-4 increasing each cycle and the results of the questionnaire also getting positive values and the results of observing student activities also increasing every year. cycle, so based on the results of this study, it is recommended that digital media be reused in other mathematics courses.

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