



Learning Discipline and Learning Media Use on Numerical Literacy Skills

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Abstract. Today, all aspects of life require numerical abilities to make the right decisions. Therefore, numerical literacy must be taught to children from the elementary level. Learning numerical literacy needs to be improved from the basic education level, especially in the early grades. Therefore, an effort to improve students' numerical literacy skills is needed. This study aims to examine the effect of learning discipline and learning media on students' numerical literacy skills in basic arithmetic operations. This type of research is quantitative and conducted on 200 fourth graders from seven elementary schools in Gugus Kartika. Questionnaires and tests of numerical literacy skills were used to collect the data. Data were analyzed quantitatively through prerequisite tests (normality and homogeneity tests) and hypothesis tests (Two-way ANOVA test). Based on the results, learning discipline does not affect students' numerical literacy skills, while learning media effectively affects students' numerical literacy skills. There is no interaction between learning discipline and learning media. The results of this study are hoped to benefit educational practitioners in improving students' numerical literacy skills in basic arithmetic operations using learning media.

Keywords: learning discipline · numerical literacy · learning media

1 Introduction

Today, all aspects of life require numerical abilities within the family and the broader community. We must understand numerical literacy to make the right decisions [1, 2]. Numerical literacy is thinking mathematically to solve everyday problems [3]. Numerical literacy can also be interpreted as knowledge and skills in using various numbers and symbols related to basic mathematics to solve practical problems in everyday life, analyze information in various forms, and interpret analysis results to predict and make decisions [4]. In addition, numerical literacy is also a major prerequisite in acquiring knowledge and skills that can be used as lifelong learning [5]. Numerical literacy is also a prerequisite for 21st-century skills through integrated education from family, school, and society [6–8]. Therefore, everyday life is inseparable from mathematics, even in simple activities such as shopping. It aligns with [9]; specifically, numerical literacy can be said to be the thinking ability that every individual has to solve contextual problems in everyday life by using mathematical tools, procedures, facts, and concepts.

Not everyone can achieve a relatively good level of numerical literacy [10–12], so numerical literacy is critical to be taught to children from the elementary level. This statement is supported by [13] that numerical literacy will benefit life in the future, so learning numerical literacy needs to be improved from the basic education level, especially in the early grades [13]. Numerical literacy skills require knowledge of mathematics, but mathematics may not necessarily develop numerical literacy skills if not prepared beforehand [14]. Learning support tools are needed to improve students' numerical literacy skills. One effort that can be made is to use the help of learning media. In the current digital literacy era, using learning media is one of the efforts to increase numerical literacy [15]. It aligns with the opinion that appropriate learning media can provide solutions to improving numerical literacy skills [16].

The use of learning media to improve students' numerical literacy skills can be done using modern (software) or conventional (teaching aids) learning media [17]. Learning media can be used to convey learning messages [18]. The use of modern learning media is supported by electronic devices and internet networks, such as audio, audio-visual, and visual media, while conventional learning media does not need to be supported by electronic devices or internet networks [19]. In this study, researchers used Quiziz as the modern learning media and Jarimatika as the conventional learning media. Learning media is inseparable in teaching and learning to achieve learning objectives [20]. Especially in the 21st century, where everything is digital, modern media is an option for teachers to aid them in teaching and learning [21]. Just like the research by [22] related to Augmented Reality (AR) learning media using paint 3D software, [23] also developed TRACK-based learning tools and media, and [24] researched learning media with GeoGebra. Previous research shows that learning media can be developed from software [24]. Therefore, increasing numerical literacy skills can be assisted by learning media. In addition, numerical literacy skills are also related to students' learning discipline.

Learning discipline is an attitude of not procrastinating in doing school assignments so that no lesson is neglected [25, 26]. Discipline can arise by itself in oneself, but it can also be trained early or from basic education. Students are accustomed to being disciplined, so it indirectly instills the character of discipline in them. It aligns with [27] that one's discipline value will be created from the habit of discipline since childhood. Learning discipline is one of the internal factors that students must possess to complete tasks and obligations [28]. Therefore, students' learning discipline tends to be consistent in learning mathematics, so it relates to numerical literacy skills.

Based on the explanation, the researcher wants to examine whether discipline and learning media affect students' numerical literacy skills. Previous studies were carried out by [29], which showed that digital and conventional learning media significantly affected the learning outcomes of third-grade students at SDN Babat Jerawat 1 Surabaya in the mathematics subject of mixed arithmetic operations. According to [30], Modern media (YouTube) affects numerical literacy skills. It aligns with [15], who state that using videos as learning media can increase the effectiveness of students' numerical literacy skills. In previous studies, researchers have not found the effect of discipline on numerical literacy skills. Therefore, researchers are increasingly confident about researching to examine the effect of disciplined learning and media use on students' numerical literacy skills.

2 Method

This type of research was a quantitative approach. The quantitative approach is data collection in the form of quantitative data or other data types that can be quantified and processed using statistical techniques [31]. This research was conducted at SDN Gugus Kartika for four months, from September 4, 2022, to December 18, 2022. The research was conducted on fourth graders from seven elementary schools in Gugus Kartika. The sample used was 200 respondents taken by simple random sampling technique. Simple random sampling takes samples from all populations without considering strata or levels because all populations have homogeneous variances [32]. Questionnaires and tests of numerical literacy skills were used to collect the data. Data analysis used SPSS assistance [33]. Data were analyzed quantitatively through prerequisite tests and hypothesis tests. The prerequisite test tests whether the data is normally distributed using the normality test, and the homogeneity test tests whether the data has a homogeneous variance [34]. After the prerequisite test had been carried out and proven that the data met the requirements, the hypothesis test was carried out using the Two-Way ANOVA Test. A hypothesis test was carried out to answer the hypotheses in this study:

- H1: There is an effect of learning discipline on students' numerical literacy skills.
- H2: There is an effect of media use on students' numerical literacy skills.
- H3: There is an interaction between the discipline of learning and media use.

3 Results and Discussion

Based on the results of the questionnaire and the numerical literacy test given to all samples (200 respondents), it is found that there are different levels of students' learning discipline, from very good, good, average, and poor. The number of respondents from each level is shown in Table 1.

From Table 1, 18 students or 9% of all respondents, have a "Very Good" learning discipline. Students with "Good" learning discipline are 115 or 57% of all respondents, and students with "Average" learning discipline are 61 or 31%. Students with "Poor" learning discipline are six students or only 3% of all respondents. Figure 1 presents the data in a chart.

Apart from being given a questionnaire regarding discipline, the researcher also gave a questionnaire regarding modern learning media (Quizizz) and conventional learning media (Jarimatika), presented in Table 2.

Table 1. Level of Students' Learning Discipline

| Level | Number of Respondents | Percentage |
|-----------|-----------------------|------------|
| Very Good | 18 | 9% |
| Good | 115 | 57% |
| Average | 61 | 31% |
| Poor | 6 | 3% |

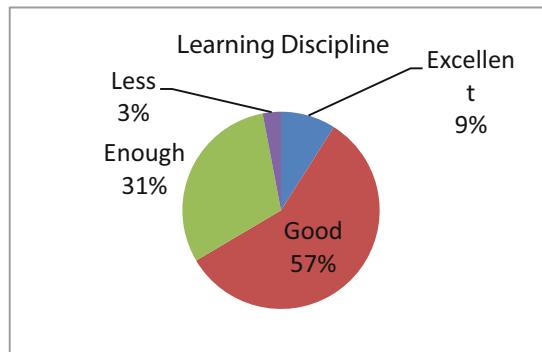


Fig. 1. The Gap in Students' Learning Discipline

Table 2. Learning Outcomes

| Learning Media | Number of Respondents | Percentage (%) |
|----------------|-----------------------|----------------|
| Quizizz | 104 | 52% |
| Jarimatika | 96 | 48% |

From Table 2, 104 students, or 52% of all respondents, chose modern learning media (Quizizz), and 96 students, or 48% of all respondents, chose conventional learning media (Jarimatika). Figure 2 presents the data in a chart.

In addition to being given disciplinary questionnaires and learning media, students were also given a numerical literacy ability test. After collecting all the data, prerequisite and hypothesis tests are carried out. The first thing to do is to test normality using Shapiro-Wilk and homogeneity using Levene as a prerequisite test, as presented in Table 3.

Based on Table 3, the Sig. value is 0.065, which is greater than 0.05. Therefore, it can be stated that all data used is normally distributed [35]. After the Shapiro-Wilk normality test, it is continued with the Levene homogeneity test presented in Table 4.

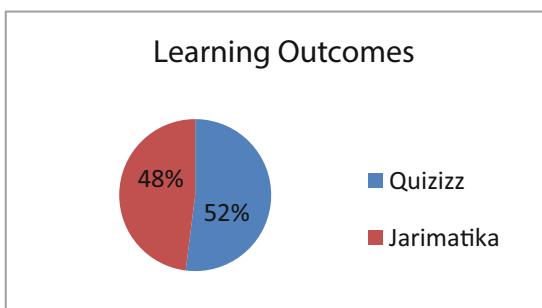


Fig. 2. Learning Outcomes

Table 3. Shapiro-Wilk Normality Test Results

| | Shapiro-Wilk | | | Criteria |
|-------------------------------------|--------------|-----|-------|----------|
| | Statistic | df | Sig. | |
| Standardized Residual for Value_KLN | 0.987 | 200 | 0.065 | Normal |

Table 4. Levene Homogeneity Test Results

| F | df1 | df2 | Sig. | Criteria |
|-------|-----|-----|-------|-------------|
| 1.466 | 7 | 192 | 0.181 | Homogeneous |

From Table 4, the value of Sig. is 0.181, so it is more than 0.05. Therefore, it can be stated that the data used has a homogeneous variance [36]. That way, all the data used meets the prerequisite tests for normality and homogeneity and can proceed to the hypothesis test with the Two Way ANOVA Test. The test results are presented in Table 5.

Table 5 shows that if the Sig. value is more than 0.05 ($\text{Sig.} > 0.05$), then H_0 is accepted, and there is no significant effect. However, if the Sig. value is less than 0.05 ($\text{Sig.} < 0.05$), then H_0 is rejected, and there is a significant effect.

This study examines the effect of learning discipline and media on students' numerical literacy skills. The effect is seen from the hypothesis test results of the effect of learning discipline and modern and conventional learning media on students' numerical literacy skills in multiplication and the interaction between learning discipline and learning media. This section will explain the hypothesis of this study.

Table 5. Two-Way ANOVA Test Results

| Source | Type III Sum of Square | Df | Mean Square | F | Sig. | Conclusion | Information |
|--------------------------------------|------------------------|-----|-------------|-----------|-------|----------------|---------------|
| Corrected Model | 282.144 | 7 | 40.306 | 2.827 | 0.008 | H_0 Rejected | Significant |
| Intercept | 423217.327 | 1 | 423217.327 | 29681.981 | 0.000 | H_0 Rejected | Significant |
| Level of_Discipline | 20.003 | 3 | 6.668 | 0.468 | 0.705 | H_0 Accepted | Insignificant |
| Media_Learning | 67.040 | 1 | 67.040 | 4.702 | 0.031 | H_0 Rejected | Significant |
| Level of_Discipline * Media_Learning | 10.879 | 3 | 3.626 | 0.254 | 0.858 | H_0 Accepted | Insignificant |
| Error | 2737.611 | 192 | 14.258 | | | | |
| Total | 1387967.000 | 200 | | | | | |
| Corrected Total | 3019.755 | 199 | | | | | |

Hypothesis 1 (H1) looks at the effect of learning discipline on students' numerical literacy skills in mathematical arithmetic operations. Based on Table 5, the Sig. value of learning discipline level is 0.705 or greater than 0.05 (>0.05). Therefore, the null hypothesis is accepted, and H1 is rejected, so there is no significant effect. Therefore, it can be concluded that learning discipline does not effectively affect students' numerical literacy skills in basic arithmetic operations.

Hypothesis 2 (H2) looks at the effect of learning media on students' numerical literacy skills in mathematical arithmetic operations. Based on Table 5, the Sig. value of learning discipline level is 0.031 or less than 0.05 (<0.05). Therefore, the null hypothesis is rejected, and H1 is accepted, so there is a significant effect. Therefore, it can be concluded that learning media effectively affect students' numerical literacy skills in basic arithmetic operations.

Hipotesis 3 (H3) menguji apakah terdapat interaksi antara kedisiplinan belajar dengan media pembelajaran terhadap kemampuan literasi numerasi siswa. Based on Table 5, the Sig. value of learning discipline level is 0.858 or greater than 0.05 (>0.05). Therefore, the null hypothesis is accepted, and H1 is rejected, so there is no significant effect. Therefore, it can be concluded that there is no interaction between learning discipline and media in affecting students' numerical literacy skills in basic arithmetic operations.

After testing the three hypotheses, it was found that learning media affected students' numerical literacy abilities, but learning discipline did not. Therefore, the authors recommend increasing students' literacy skills by developing modern learning media (Quizizz) and conventional learning media (Jarimatika). Providing variations in learning media will create learning that is not monotonous. It is expected to improve students' numerical literacy skills, especially in basic arithmetic operations.

The researchers are increasingly convinced that learning media can significantly affect students' numerical literacy skills because it is supported by previous studies that state that Quizizz learning media is very effective for learning in lower and higher grades, especially in students' mathematical literacy learning [37]. It aligns with [38] that Quizizz learning media can improve numerical literacy skills. Besides improving numerical literacy skills, Quizizz also improves students' focus, cognitive abilities, and creative thinking [39, 40]. In addition, [41] found that using video animation learning media properly supported students' numerical literacy skills. That way, the researchers contribute to improving numerical literacy skills using modern and conventional learning media.

Learning media can be further developed to be more effective in improving students' numerical literacy skills. This research only involved subjects in elementary schools. Future research can be carried out on different subjects, such as junior high schools, high schools, to universities, so that the scope of the impact of instructional media in influencing numerical literacy skills is broader. The results of this study are hoped to benefit educational practitioners in improving students' numerical literacy skills using learning media. The results of this study can also assist teachers in developing learning media so that they are even more varied.

4 Conclusion

This study aims to examine the effect of learning discipline and learning media on students' numerical literacy skills in basic arithmetic operations. Based on the Two-Way ANOVA test, learning discipline does not affect students' numerical literacy skills, while learning media effectively affects students' numerical literacy skills. There is no interaction between learning discipline and learning media. The results of this study are hoped to benefit educational practitioners in improving students' numerical literacy skills in basic arithmetic operations using learning media.

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