The Effect of Interactive Learning Media on Students' Understanding of Basic Mathematical Concepts in SDN 1 Tebaban

Siti Rabiatul Adawiyah[1], Donna Boedi Maritasari[2*], Muh Yazid[3]

[1,2*,3] Elementary School Teacher Education, Faculty of Education, Hamzanwadi University.

*Corresponding Author Email: dewiy@student.hamzanwadi.ac.id

Abstract: This study aims to determine the effect of the use of interactive learning media *(wordwall)* on the understanding of basic mathematical concepts of grade IV students at SDN 1 Tebaban. This type of research is a quantitative research of experimental methods with a *quasi-experimental design of pretest-posttest control group design*. The population of this study is class IV A and IV B which totals 35 students. The sample of this study uses a saturated sampling technique. The data collection technique in this study uses observation sheets, questionnaire sheets and *pretest* and *posttest test sheets*. The data analysis techniques in this study include observation and questionnaire data analysis, descriptive analysis, normality test, variance homogeneity test and *independent samples test*. The results of the observation sheet showed that the students' understanding of basic mathematical concepts in the experimental class reached 75% ('Very Good'), higher than the control class which only reached 62.99% ('Good'). Based on the results of the questionnaire, the use of wordwall interactive media was proven to be more effective in improving students' understanding than *mind mapping* learning media and teaching aids in the control class, with 91% of students in the experimental class supporting the use of *wordwalls*, compared to 80% in the control class. The t-test showed a value of Sig. (2-tailed) 0.02, so that the alternative hypothesis was accepted, indicating a significant influence of interactive learning media on the understanding of mathematical concepts of grade IV students at SDN 1 Tebaban.

Introduction

Mathematics is a discipline that is given high priority in schools, therefore success in understanding mathematics learning is very important for students. one of the main focuses in mathematics learning is for students to have adequate skills in solving each given problem (Schoenfeld in Faturohman et al., 2022: 86). Achievement in mathematics education can be observed through students' ability to complete mathematical tasks and apply mathematical concepts in daily life and make mathematics relevant in their lives (Putra & Millennia, 2021: 30).

Based on a study conducted by the Ministry of Education and Culture (Kemendikbud) through the INAP (Indonesia National Assessment Program) AKSI (Indonesian Student Competency Assessment) program in 2016, it was found that around 77.13% of elementary school students throughout Indonesia have a very low level of mathematical competence (lack) while only 20.58% of students have mathematical proficiency that is considered sufficient and only 2.29% of students are included in the good category. This means that the majority of students have inadequate mathematical skills, indicating significant problems in mathematics learning at the elementary level in Indonesia. Therefore, based on these data, the ability of Indonesian students to learn mathematics and their interest in learning mathematics is still considered low. This shows that students have difficulty understanding mathematical concepts which is an important aspect of mathematics learning.

Based on the observations that have been made at SDN 1 Tebaban in grade IV, several problems were found such as, students have difficulty understanding complex mathematical concepts because learning is done more verbally without the use of interactive learning media, lack of facilities and infrastructure that support the use of interactive learning media, such as technology devices, internet access, or educational software so that the learning process becomes Monotonous. In addition, students are less actively involved in the learning process due to the lack of use of interactive learning media and tend to only use conventional methods in the learning process which causes students to be less interested, quickly feel bored and lose interest in learning mathematics.

One of the factors that causes students' low ability in mathematics is their lack of understanding of basic mathematical concepts related to the topic being studied (Wahyudin in E. I. F. Hidayat et al., 2020: 107). This lack of understanding can hinder students' ability to follow lessons well, resulting in difficulties in solving math problems, and reducing their confidence in learning the subject. Therefore, it is important to use interactive learning media that can help students in understanding basic concepts better and improve their abilities in math lessons.

In order to increase the interaction between teachers and students, the use of learning media is very important and can also avoid all kinds of distractions that make communication ineffective (Daryanto in Nursidiq & Coal, 2022: 1320). Learning media has an important role in improving the quality of learning because technological developments in the field of education demand efficiency and effectiveness in the learning process. To achieve the optimal level of efficiency and effectiveness, the steps that need to be taken are to reduce or even eliminate the dominance of verbalistic lesson delivery systems by using interactive learning media.

Learning media is an intermediary tool in conveying messages that can stimulate students' thoughts, attention, feelings and interests in following the learning process (Surahmawan et al., in Sukma & Handayani, 2022: 1021). In the use of learning media, teaching staff need to carefully choose the media to be used. Meticulousness and accuracy in the selection of media will support the effectiveness of learning activities. In addition, the use of learning media also makes learning activities interesting which can increase student motivation to learn and make students' attention more focused on the topic being discussed (Hasan et al., 2021: 13).

Wordwall is a learning platform where teachers can create a variety of learning templates designed in the form of games. The main advantage of this platform is the presence of various quiz templates presented in a game format. This can increase students' interest in learning, make the learning process more interactive and deepen their understanding. Quiz templates available on wordwall Covering various types such as the form of multiple choice questions (quiz), cross mystery (Crossword), sorting cards, or matching pictures (matching pairs), etc. (Nadia et al., 2022: 35). Wordwall is a web-based digital application that can support teachers in planning interesting and interactive learning for students (Nenohai et al., in Sukma & Handayani, 2022: 1022). Media usage Wordwall can liven up the classroom atmosphere and increase students' enthusiasm in learning and create a fun learning atmosphere (Sinaga & Soesanto, 2022: 1847).

Based on the above problems, in this study, the researcher was moved to use the wordwall platform to encourage students to be more active and easier to understand the material being taught. Therefore, the researcher is interested in conducting research on the influence of interactive learning media on the understanding of basic concepts of mathematics in grade IV at SDN 1 Tebaban.

Research Method

This study uses a quantitative approach with an experimental method, which aims to explore the influence of independent variables on dependent variables through measurable data collection and statistical analysis (Sidik Priadana & Denok Sunarsi in Maisaroh et al., 2023: 3264). The design used in this study is Quasi Experimental with the type pretest-posttest control group design. In this study, the experimental group received the treatment and the control group did not. In this study pretest and posttest to measure changes in outcomes after treatment. Population is the conceptualization of the totality of relevant elements in a study, which includes both the object observed and the subject that is the focus of the research, which is characterized by a defined number of traits and characteristics (Amin et al., 2023: 18).

The population in this study is grade IV at SDN 1 Tebaban. The sampling technique used is a saturated sampling technique because the number of students is relatively small, namely 16 students. The data collection instruments in this research include observation, questionnaire, and pretest-posttest tests, which are analyzed using descriptive and statistical analysis with the SPSS application. The normality test data used the shapiro-wilk test and homogeneity with the levene test. The hypothesis test was carried out using an independent sample test with a decision-making basis at a significance of 0.05. The hypothesis tested is whether there is an effect of the use of interactive learning media on the understanding of basic mathematical concepts of grade IV students at SDN 1 Tebaban.

Result and Discussion
Result

The results of this study presented the findings obtained based on data analysis from the pretest and posttest tests as well as the results of supporting instruments in the form of observations and questionnaires in the experimental and control groups, the data that had been collected was then analyzed to identify changes in students' understanding after being given

treatment, and evaluate the effectiveness of the use of interactive learning media (wordwall) in improving the understanding of basic mathematical concepts. The following is a summary of the results of the research that has been prepared.

Table 1. Observation results

Score	Information	Experimental Classes	Control Classes
4	Excellent	27,78%	15,69 %
3	Good	34,72%	23,53%
2	Enough	12,04%	21,07%
1	Less	0,46%	2,70%
	Total	**75,00%**	**62,99%**

Based on the results of these observations, the level of understanding of basic mathematical concepts of students in fractional materials in the experimental class was higher than that of the control class. The percentage of students with a score of 'Excellent' in the experimental class reached 27,78%, while in the control class it was only 15,69%. The number of students with 'Good' understanding in the experimental class was also higher (34,72%) than in the control class (23,53%). In contrast, the percentage of students with 'Enough' and 'Less' comprehension was lower in the experimental class. Overall, the level of understanding in the experimental class reached 75,00% (Excellent), while in the control class it was 62.99% ('Good'). This shows that the use of interactive learning media (wordwall) in the experimental class is more effective in improving the understanding of basic mathematical concepts than the mind mapping learning media and teaching aids used in the control class.

Table 2. Questionnaire results

Score	Information	Experimental Classes	Control Classes
4	Strongly Agree	69%	46%
3	Agree	20%	26%
2	Disagree	2%	7%
1	Tend to Disagree	0%	1%
	Total	**91%**	**80%**

The results of the questionnaire showed significant differences between the two classes. In the experimental class, 69% of students 'strongly agreed' with the use of Wordwall's interactive learning media, while in the control class only 46% gave similar responses. A total of 20% of students in the experimental class 'Agreed,' slightly lower compared to 26% in the control class. Only 2% of the students in the experimental class were 'Disapproving,' compared to 7% in the control class, and none of the students in the experimental class were 'Disapproving,' whereas in the control class there were 1% of the students who disagreed. The total approval in the experimental class reached 91%, higher than the control class which was

only 80%. This shows that interactive learning media (wordwall) received stronger support from students than mind mapping learning media and teaching aids in the control class.

Table 3. Results of descriptive analysis

Descriptive Statistics

	N	Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance
	Statistics	Statistics	Statistics	Statistics	Statistics	Statistics	Std. Error	Statistics	Statistics
Pretest Experiment	18	35	15	50	610	33,89	2,51	10,64	113,39
Posttest Experiment	18	55	40	95	1175	65,28	3,32	14,08	198,44
Pretest Control	17	70	0	70	510	30,00	4,49	18,54	343,75
Posttest Control	17	75	20	95	870	51,18	5,11	21,10	445,40
Valid N (listwise)	17								

The descriptive statistics presented describe the comparison of pretest and posttest results between two groups, namely the experimental group and the control group. The experimental group consisted of 18 participants who in the pretest had an average score of 33,89 with a standard deviation of 10,64 and a variant of 113,39. After being given treatment in the form of using interactive learning media (wordwall), the average score of participants in the posttest increased to 65,28, with a standard deviation of 14,08 and a variant of 198,44. This shows a significant improvement in the understanding of basic mathematical concepts in the experimental group after being given treatment. Meanwhile, the control group consisted of 17 participants who in the pretest obtained an average score of 30,00 with a standard deviation of 18.54 and a variant of 343,75.

In the posttest, the average score of the control group increased to 51,18, with a standard deviation of 21,10 and a variant of 445,40. This increase occurred even though the control group was not given treatment in the form of using interactive learning media (wordwall), but used conventional learning methods. From these results, it can be concluded that both the experimental group and the control group experienced an increase in the average score from pretest to posttest. However, the increase that occurred in the experimental group was higher than in the control group. This indicates that the use of interactive learning media (wordwall) has a greater impact on improving the understanding of basic mathematical concepts compared to the mind mapig learning media and teaching aids applied to the control group.

Table 4. Normality test results

Class		Shapiro-Wilk		
		Statistics	Df	Sig.
Understanding Basic Concepts of Mathematics	Pretest Experiment	0,93	18	0,22
	posttest experiment	0,96	18	0,72
	Pretest Control	0,94	17	0,41
	Posttest Control	0,95	17	0,46

Table 2 displays the results of normality tests using shapiro-wilk on the pretest and posttest data of the experimental group and control group related to the understanding of basic mathematical concepts. In the experimental group, the results of the shapiro-wilk test showed that the pretest data had a significance value of 0,22, while for the posttest, the significance value was 0,72. Both values are greater than 0,05, which means that the data in the pretest and posttest of the experimental group are normally distributed. Meanwhile, the results of the normality test in the pretest for the control group showed a significance value of 0,41, and in the posttest the significance value was 0,46. Just like the experimental group, this significance value was also greater than 0,05, so it can be concluded that the pretest and posttest data in the control group were also normally distributed.

Based on the results of this normality test, it can be concluded that the assumption of normality is met for all data in both the experimental group and the control group. This allows the use of parametric statistical tests in subsequent analyses to test research hypotheses.

Table 5. Variance homogeneity test results

		Levene Statistic	df1	DF2	Sig.
Understanding Basic Concepts of Mathematics	Based on Mean	3,01	1	33	0,09
	Based on Median	2,75	1	33	0,10
	Based on Median and with adjusted df	2,75	1	30,34	0,10
	Based on trimmed mean	2,87	1	33	0,09

Table 3 shows the results of the variance homogeneity test using the levene test. This test is based on several approaches, including mean, median, median with adjusted df, and trimmed mean. Based on the results of the levene test, the significance value for all approaches is above 0,05, which is 0,09 for the mean, 0,10 for the median, 0,10 for the median with adjusted df, and 0,09 for the trimmed mean. A significance value greater than 0,05 indicates that the variance between the experimental group and the control group is homogeneous, or in other words, there is no significant difference in variance between the two groups. Thus, the assumption of variance homogeneity is fulfilled, which is an important condition for continuing parametric statistical analysis, namely the t-test to compare the averages of the two groups.

Table 4. Homogeneity test results
Independent Samples Tests

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
| | | F | Sig. | t | Df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
									Lower	Upper
Understanding Basic Concepts of Mathematics	Equal variances assumed	3,01	0,09	2,33	33	0,02	14,10	6,03	1,82	26,37
	Equal variances not assumed			2,31	27,68	0,02	14,10	6,10	1,59	26,60

The results of the Independent Samples Test for variables in understanding basic mathematical concepts were displayed with two assumptions, namely with variances that are considered equal (Equal variances assumed) and variances that are not considered equal (Equal variances not assumed). Based on the Levene test, a significance value of 0,09 indicates that the variance between the experimental and control groups is homogeneous (there is no significant difference in variance). Therefore, the results of the t-test assuming the same variance can be used. In the t-test assuming the same variance, the t-value was 2,33 with a degree of freedom (df) of 33 and a significance value (2-tailed) of 0,02. Since this significance value is less than 0,05, it can be concluded that there is a significant mean difference between the experimental and control groups in understanding the basic concepts of mathematics. The mean difference between the two groups was 14,10 with a standard error of 6,03. The 95% confidence interval for this difference is between 1,82 and 26,37.

Thus, these results show that the use of interactive learning media has a significant impact on improving the understanding of basic mathematical concepts in students in the experimental group compared to the control group.

Discussion
Descriptive analysis showed that there was a significant increase in the posttest score of the experimental class, with an average of 65.28, compared to the control class which only reached 51.18. This indicates that the use of media Wordwall more effective in improving overall mathematical comprehension compared to mind mapping media and teaching aids in the control class. Research by Arina et al., (2020) supports these findings, stating that wordwall effective in improving mathematics learning outcomes.

Prerequisite tests, such as normality and variance homogeneity tests, show that the data meet the assumptions for parametric analysis. Test results t independent with a significant value (p = 0,02) confirming that there is a significant difference between the average understanding of the experimental and control classes. These findings are also in line with Levie & Lentz's study in Kustandi & Darmawan (2020: 16), which states that visual media supports cognitive function

in improving understanding and memory of information. In this context, wordwall using visual elements such as images, colors, and graphics that attract attention and facilitate understanding of concepts, thereby increasing student engagement in the learning process.

Overall, this study shows that interactive learning media such as wordwalls are more effective in improving the understanding of basic mathematical concepts compared to mind mapping media and teaching aids. These findings are consistent with previous theories and research that suggests that interactive media that combines visual and game elements can improve students' motivation to learn and comprehension. Thus, the alternative hypothesis in this study proved to be correct, showing that the use of interactive learning media had a significant impact on the mathematics understanding of grade IV students at SDN 1 Tebaban.

Conclusion

Based on the results of the analysis and discussion, this study concludes that the use of interactive learning media (wordwall) significantly improves the understanding of basic mathematical concepts in grade IV students at SDN 1 Tebaban. This was evidenced by a greater increase in the average posttest score of the experimental group compared to the control group, where the experimental group obtained an average score of 65.28, while the control group only reached 51.18. The results of the normality and homogeneity test showed that the data were normally distributed and variance between homogeneous groups, so the parametric analysis used was valid. In addition, the independent t-test sample showed a significant difference between the two groups ($p = 0.02$), confirming that interactive learning media (wordwall) was more effective in improving mathematical understanding than mind mapping learning media and teaching aids.

These findings reinforce the view that interactive learning media that combines visual, game, and interaction elements can increase student engagement and make it easier to understand concepts. Thus, this study supports the use of wordwall as a learning media that can be applied effectively to improve mathematics learning outcomes at the elementary level.

References

Amin, N. F., Garancang, S., & Abunawas, K. (2023). Konsep Umum Populasi dan Sampel dalam Penelitian. *Jurnal Pilar*, *14*(1), 15–31.

Arina, A., Irfan, M., & Hermuttaqien, B. P. F. (2020). Efektivitas Media Pembelajaran Wordwall Untuk Meningkatkan Hasil Belajar Matematika Siswa Kelas IV. *Pinisi Journal Pendidikan Guru Sekolah Dasar*, *1*(1), 1–9.

Faturohman, I., Iswara, E., & Gozali, S. M. (2022). Self-Confidence Matematika Siswa dalam Penerapan Pembelajaran Online Mosharafa : Jurnal Pendidikan Matematika Self-Confidence Self- Self-Confidence Mosharafa : Jurnal Pendidikan Matematika. *Mosharafa: Jurnal Pendidikan Matematika*, *11*(1), 85–94.

Hasan, M., Milawati, Darodjat, Harahap, T. K., Tahrim, T., Anwari, A. M., Rahmat, A., Masdiana, & P, I. M. I. (2021). Media Pembelajaran. In *Tahta Media Group*.

Hidayat, E. I. F., Yandhari, I. A. V., & Alamsyah, T. P. (2020). Efektivitas Pendekatan Realistic Mathematics Education (RME) Untuk Meningkatkan Kemampuan Pemahaman Konsep

Matematika Siswa Kelas V. *Jurnal Ilmiah Sekolah Dasar*, *4*(1), 106–113.

Kustandi, C., & Darmawan, D. D. (2020). *Pengembangan Media Pembelajaran: Konsep & Aplikasi Pengembangan Media Pembelajaran bagi Pendidik di Sekolah dan Masyrakat*. Prenada Media. https://books.google.co.id/books?id=cCTyDwAAQBAJ

Maisaroh, S. W., Maritasari, D. B., & Ibrahim, D. S. M. (2023). No Title. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, *8*(2), 3261–3272.

Nadia, A. I., Afiani, K. D. A., Naila, I., & Muhammadiyah, U. (2022). Penggunaan Aplikasi Wordwall untuk Meningkatkan Hasil Belajar Matematika selama Pandemi Covid-19. *Jurnal Teknologi Pembelajaran Indonesia*, *12*(1), 33–43.

Nursidiq, A. P., & Batubara, H. H. (2022). Pengalaman Guru Sekolah Dasar dalam Menggunakan Media Pembelajaran. *Primary: Jurnal Pendidikan Guru Sekolah Dasar*, *11*(5), 1319–1334.

Putra, A., & Milenia, I. F. (2021). Systematic Literature Review : Media Komik dalam Pembelajaran Matematika. *Mathema*, *3*(1), 30–43.

Sinaga, Y. M., & Soesanto, R. H. (2022). Upaya Membangun Kedisiplinan melalui Media Pembelajaran Wordwall dalam Pembelajaran Daring pada Siswa Sekolah Dasar. *Jurnal Basicedu*, *6*(2), 1845–1857. https://journal.uii.ac.id/ajie/article/view/971

Sukma, K. I., & Handayani, T. (2022). Pengaruh Penggunaan Media Interaktif berbasis Wordwall Quiz terhadap Hasil Belajar IPA di Sekolah Dasar. *Jurnal Cakrawala Pendas*, *8*(4), 1020–1028.