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Digital Learning Innovation in Primary Science: Enhancing Student Understanding of Natural Disasters Through Quizizz Interactive Media

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Abstract

Digital learning innovation is increasingly needed to create interactive science learning that suits students' characteristics, particularly on natural disaster material in elementary school. This study aims to examine the effectiveness of Quizizz interactive media as a digital learning innovation in improving grade 5 students' understanding of natural disaster material. This research employed a quantitative approach with a pre-experimental one-group pretest-posttest design, involving 30 grade V students of SDN Sawojajar 6, Malang, East Java, Indonesia, selected through total sampling. Data were collected using a 20-item understanding test administered as a pretest before and a posttest after learning with Quizizz, then analyzed through normality testing, a paired sample t-test, and an N-Gain Score analysis. The results showed the data were normally distributed, and the paired sample t-test obtained a significance value of .000 ($p < 0.05$), indicating a significant difference between pretest and posttest scores. The N-Gain analysis produced an average score of 0.6179 or 61.79%, categorized as medium and fairly effective. These findings indicate that Quizizz interactive media is fairly effective in enhancing elementary school students' understanding of natural disaster material.

Keywords: Digital learning innovation; Quizizz; Natural disasters; Primary science.

1. Introduction

The development of digital technology has brought changes in various aspects of life, including in the implementation of education. Digital learning innovation is one of the efforts that can be made to create a learning process that is more flexible, interactive, and in accordance with the development of student needs (Bebasari, 2022). According to (Rambe et al., 2025) In research that researches technology, the use of digital technology in learning can provide a more diverse learning experience through the presentation of materials in the form of visual, audiovisual, and interactive activities. However, Adhikari & Joshi, (2024) stating that the use of technology in learning has not always been followed by the selection of media and strategies that are in accordance with the characteristics of the material and the needs of students. This condition shows that digital learning innovation is not only related to the use of technology, but also to the ability to integrate technology appropriately to support the achievement of learning goals (Gunnars, 2026).

Science learning in elementary school has an important role in helping students understand various phenomena that occur in the surrounding environment (Aisyah et al, 2024). Through science learning, students not only gain knowledge about scientific concepts, but are also directed to observe, identify, connect cause and effect, and understand various events based on the evidence found (Hayati et al., 2025). According to Rosmayanti et al., (2026) Science learning in elementary school needs to provide a learning experience that allows

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learners to relate concepts to real phenomena in everyday life. This is in line with the statement Khotimah & Zulfa, (2026) which explains that meaningful science learning needs to actively involve students in the process of acquiring and constructing knowledge. Therefore, science learning in elementary school needs to be designed not only oriented to mastery of the material, but also to provide opportunities for students to understand phenomena contextually and actively.

Elementary school students today grow up in an environment that is inseparable from the development of digital technology. The presence of digital devices and various sources of information makes students have a more diverse experience in obtaining information and interacting with learning material (Artayasa & Yuliati, 2023). According to Nadhifah & Aisyah, (2025) Characteristics of students in a digital learning environment tend to require an engaging learning experience, involve hands-on activities, and provide opportunities to obtain feedback. However Aisyah et al, (2025) stating that this condition does not mean that the use of technology automatically can improve the quality of learning, because its effectiveness is still influenced by the learning design used. Thus, the characteristics of students who are close to technology need to be balanced with the provision of a learning experience that is directed, interactive, and still in accordance with learning objectives.

However, based on preliminary observations conducted at SDN Sawojajar 6, the implementation of digital technology in science learning still needs to be optimized. The learning process has utilized digital media and technological devices, but their use is not yet consistently integrated into interactive learning activities. Science learning activities are still often focused on the delivery of material and conventional exercises, so students have limited opportunities to actively interact with learning content and receive immediate feedback. This condition indicates a gap between the availability of digital technology in the school and its utilization to create an interactive science learning experience. In addition, preliminary data obtained from 30 fifth-grade students at SDN Sawojajar 6 showed that students' understanding of natural disaster material still needs to be strengthened. The material requires students to understand not only the types and characteristics of natural disasters, but also their causes, impacts, prevention, and appropriate responses. The existing learning activities have not fully provided sufficient interactive experiences for students to explore and understand these concepts. Therefore, an interactive digital medium that can present material, questions, and immediate feedback is needed to support students in understanding natural disaster material more meaningfully.

The use of digital technology in science learning provides opportunities to present learning materials and activities through various forms that are more interactive. Science materials related to real-world phenomena, such as natural disasters, can be presented through images, videos, interactive questions, simple simulations, and evaluation activities that allow learners to be directly involved in the learning process (Juneda dkk, 2025). According to Askar dkk, (2025) The use of interactive digital media in science learning can help students obtain a more concrete and interesting learning experience. This is in line with the statement (Hayati et al., 2025) that students' interest in learning can increase when learning activities provide opportunities to interact, try, and obtain feedback directly. Therefore, the use of interactive digital media is one of the alternatives that can be used to support science learning so that the material is not only delivered verbally, but also experienced through more interesting activities (Hidalgo dkk, 2026).

Technological advances are opportunities for educators to be more innovative in learning, without being dependent on textbooks and conventional media. Educators may take advantage of the availability of various digital platforms to facilitate the collection and presentation of materials, practice exercises, assessments, and evaluations in a more interactive manner (Hayati et al., 2025). Digital media provides a good opportunity for educators to create a more interactive learning environment that can give more room for students' involvement. Some of the various digital platforms available to facilitate the learning process are Quizizz which provides a quiz activity consisting of interactive features and feedback so that assessment activities can be more interesting and engaging (Yenisa & Putri, 2025). With the utilization of this potential, technology can be more than just a medium for delivering information; moreover, it can be a driving force in involving students in the learning process.

Based on the opportunities presented by the utilization of interactive media, the use of Quizizz can be directed to support science learning, especially in natural disaster materials that are relevant to students' lives. Disaster materials require an explanation that is not only focused on the characteristics of the disaster but also include the causes and consequences of the disaster and strategies to respond to and overcome the disaster. The use of interactive media is expected to be able to facilitate an engaging activity that enables the students to understand the information provided. Therefore, the utilization of Quizizz as an interactive media is one of the digital learning innovations that can be applied to support elementary school students' understanding of natural disasters. Based on the description above, the following article will discuss digital learning innovations in elementary school science through Quizizz interactive media to improve students' understanding of natural disasters.

2. Method

This research is a quantitative research through a pre-experimental approach by applying a one-group pretest-posttest design. This design was used to determine changes in students' understanding of natural disasters before and after learning using Quizizz interactive media. The study involved one group of students without a control group, with measurements taken before and after treatment. The population as well as the sample in this study is grade 5 students of SDN Sawojajar 6 which totals 30 students. The sampling technique uses total sampling because all members of the population are involved as research respondents. The research was carried out at SDN Sawojajar 6 in June 2026 with learning materials about natural disasters.

This study employed a quantitative research approach using a pre-experimental method with a one-group pretest-posttest design. The design consisted of three stages: pretest (O_1), treatment (X), and posttest (O_2). The treatment involved learning natural disaster materials using Quizizz interactive media. The study was conducted at SDN Sawojajar 6, Malang, in June 2026. The population and sample consisted of 30 fifth-grade students, selected using total sampling because all members of the population participated in the study. The research instrument was a test measuring students' understanding of natural disaster materials, consisting of 20 questions developed according to the learning objectives and material indicators. The test was administered twice, before and after the treatment. The research procedure began with a pretest to identify students' initial understanding, followed by learning activities using Quizizz interactive media containing natural disaster materials and interactive

questions. After the learning activities were completed, students took the posttest to measure their understanding after the treatment.

The collected data were analyzed using quantitative descriptive and inferential analyses. Descriptive analysis was used to calculate the mean, minimum score, maximum score, and percentage of students' test results for both the pretest and posttest. The improvement in students' understanding was determined using the N-Gain score, calculated from the pretest and posttest results. A normality test was also conducted as a prerequisite for determining the appropriate inferential statistical test. The difference between students' pretest and posttest scores was analyzed using a paired-sample t-test when the data met the normality assumption. If the data were not normally distributed, the Wilcoxon Signed-Rank Test was used as a non-parametric alternative. The analysis was conducted to determine whether there was a significant difference in students' understanding of natural disaster materials before and after learning using Quizizz interactive media.

3. Results and Discussion

3.1 Results

This research was conducted at SDN 6 Sawojajar, Malang, involving Grade V students, on March 14, 2026. The study examined the effectiveness of Quizizz interactive media as a digital learning innovation in primary science, specifically to enhance students' understanding of natural disaster material. Data were collected through a pretest administered before the intervention and a posttest administered after students engaged with the Quizizz-based learning activity. The pretest and posttest scores were then analyzed using a normality test, a paired sample t-test, and an N-Gain Score analysis to determine the effectiveness of the treatment. Before conducting the difference test, a normality test was performed to determine whether the pretest and posttest data were normally distributed. The results of the Shapiro-Wilk normality test are presented in Table 1.

Table 1. Normality Test of Pretest and Posttest Scores

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PRETEST	.118	30	.200*	.946	30	.128
POSTTEST	.121	30	.200*	.951	30	.181

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 1 shows that the significance value of the Shapiro-Wilk test for both the pretest (Sig. = .128) and the posttest (Sig. = .181) is greater than 0.05. This indicates that both data sets are normally distributed. Because the data are normally distributed, the subsequent analysis was carried out using a parametric statistical test, namely the paired sample t-test. The paired sample t-test was used to examine whether there was a significant difference between students' pretest and posttest scores after the implementation of Quizizz interactive media. The results are presented in Table 2.

Table 2. Paired Sample T-Test of Pretest and Posttest Scores

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PRETEST - POSTTEST	-13.16667	.74664	.13632	-13.44547	-12.88787	-96.588	29	.000

Based on Table 2, the significance value (Sig. 2-tailed) obtained is .000, which is smaller than α = 0.05. This means there is a significant difference between students' pretest and posttest scores, with the posttest scores being higher than the pretest scores. In other words, the use of Quizizz interactive media had a significant effect on improving students' understanding of natural disaster material.

To determine the extent to which Quizizz interactive media was effective in improving students' understanding, an N-Gain Score analysis was conducted using the pretest and posttest data. The N-Gain Score is used to measure the increase in student learning outcomes after treatment while taking into account the initial (pretest) score, and its result is then interpreted based on established categorization criteria. The category of N-Gain score used in this study refers to Melzer (in Syahfitri, 2008:33), as presented in Table 3, while the category of N-Gain effectiveness interpretation refers to Hake (1999), as presented in Table 4.

Table 3. Category of N-Gain Score

N-Gain Score	Category
g > 0,7	High
0,3 ≤ g ≤ 0,7	Medium
g < 0,3	Low

Source: Melzer, in Syahfitri, 2008:33

Table 4. Category of N-Gain Effectiveness Interpretation

Percentage (%)	Interpretation
< 40	Ineffective
40 – 55	Less Effectiva
56 – 75	Fairly Effective
> 76	Effective

Source: Hake, R.R., 1999

Based on these two categorization tables, the N-Gain Score obtained from the pretest and posttest data can be classified both in terms of its numeric gain category and its effectiveness percentage. The descriptive statistics of the N-Gain Score results are presented in Table 5.

Table 5. Descriptive Statistics of N-Gain Score

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Ngain_score	30	.50	.72	.6179	.05860
Ngain_Persen	30	50.00	72.22	61.7934	5.85965

Valid N (listwise)	30				

Based on the results of the N-Gain Score analysis presented in Table 5, the average (mean) N-Gain obtained was 0.6179, with a minimum value of 0.50 and a maximum value of 0.72 from 30 students. Referring to the N-Gain Score category in Table 3, the mean value of 0.6179 falls within the range of $0.3 \leq g \leq 0.7$, and is therefore classified in the medium category. Furthermore, the N-Gain value was converted into a percentage form, resulting in an average of 61.79%. Referring to the N-Gain effectiveness interpretation category in Table 4, a percentage of 61.79% falls within the range of 56–75%, and is therefore classified as fairly effective. These findings indicate that the use of Quizizz interactive media as a digital learning innovation is fairly effective in enhancing Grade V students' understanding of natural disaster material at SDN 6 Sawojajar.

3.2 Discussion

The results of the study on 30 grade V students of SDN Sawojajar 6 showed a change in students' understanding after participating in learning using Quizizz interactive media. The results of the Shapiro-Wilk normality test showed a pretest significance value of 0.128 and a posttest of 0.181, both of which were greater than 0.05 so that the data was declared to be normally distributed. The results of the paired sample t-test obtained a significance value of 0.000 ($p < 0.05$) with the difference in the average pretest and posttest scores showing that the posttest score was higher than the pretest score. The range of 95% confidence interval for score differences was -13.44547 to -12.88787, so the change in scores obtained showed a consistent pattern in the study group. The findings show that after learning using Quizizz, students' understanding of natural disaster material has increased statistically.

The magnitude of the increase in student understanding was further seen through the N-Gain analysis which produced an average score of 0.6179 with a standard deviation of 0.05860. The lowest N-Gain value is 0.50, while the highest value reaches 0.72, so all values obtained are in the medium category range based on the criteria used in the study. When converted into percentages, the N-Gain is in the range of 50.00% to 72.22%, with an average value of 61.79%. Based on the effectiveness criteria used, the average of 61.79% is in the range of 56–75% and belongs to the category of quite effective. The results show that Quizizz's interactive media provides a fairly effective increase in understanding, although the rate of improvement has not yet reached the high category.

The increase can be attributed to the characteristics of science learning that require student involvement in understanding phenomena that are close to daily life. Natural disaster material not only requires students to recognize the types of disasters, but also to understand information about the causes, impacts, and ways to deal with disasters, so it is necessary to present material that allows students to interact with this information. The use of Quizizz provides a space for students to engage in learning activities through the digital presentation of materials and questions, then obtain responses to the answers provided. This condition is in line with the preliminary research that places interactive digital media as an alternative to make science learning more active and contextual, especially in materials related to real phenomena such as natural disasters. Thus, an average increase in N-Gain of 0.6179 or 61.79% can be seen as an indication that learning that combines science material with interactive activities can help students understand the material better.

The results of this study also agree with previous research that has been done, which states that interactive digital media can provide a more engaging learning experience and encourage students to participate actively in the learning process. Based on the N-Gain value of 61.79%, which falls under the category of quite effective, it can be concluded that the digital media application called Quizizz has the potential to enhance science learning. However, the learning outcomes of each student who was given the science material using quizizz still have different levels of effectiveness, because the N-Gain value of each student was between 50.00%-72.22%. This shows that the use of digital media must be supported by management of learning that is appropriate to the needs and characteristics of students, the subject matter, and learning objectives. According to Suganda, it is not enough if education and learning activities are accelerated through the use of technology, but the success and effectiveness of learning also depend on the appropriate media and strategies. Therefore, it can be concluded with confidence that quizizz can be used as one form of digital learning innovation applied to elementary school students to improve their understanding of natural disaster materials, with an average level of effectiveness of 61.79%.

4. Conclusion

Based on the results of the study, the use of Quizizz interactive media in science learning showed an increase in the understanding of grade V students of SDN Sawojajar 6 to natural disaster materials. The results of the paired sample t-test showed a significance value of 0.000 ($p < 0.05$), which indicates a significant difference between the pretest and posttest results after learning using Quizizz. The increase was strengthened by the results of the N-Gain analysis with an average value of 0.6179 or 61.79% which is included in the medium and quite effective category. These findings show that Quizizz can be one of the alternative digital learning innovations that support science learning more interactively and help students understand natural disaster materials. However, because the study used a one-group pretest-posttest design without a control group, the improvements obtained cannot be fully used to ensure that the change in students' understanding is solely due to the use of Quizizz.

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