



## Integrating *Canva*-supported project-based learning in disaster mitigation education

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### ABSTRACT

This study aims to analyze the effectiveness of the Project Based Learning (PJBL) model supported by Canva in improving visual creativity and disaster understanding among grade XI students at Ma'arif NU Solokuro High School. The research employed a quantitative approach using a quasi-experimental design with two groups: an experimental group receiving PJBL-Canva-based instruction and a control group receiving conventional learning. Data were collected using pretest-posttest instruments to measure disaster comprehension and rubrics to assess visual creativity. The findings revealed that the experimental group experienced a highly significant improvement, indicated by a Sig. value of 0.000 on the Paired Sample t-test and a greater increase in mean scores compared to the control group. In contrast, the control group did not demonstrate significant improvement, as shown by a Sig. value of 0.755. The Independent Sample t-test also confirmed a significant difference between the groups with a Sig. value of 0.000. Furthermore, ANCOVA results indicated that the learning model significantly affected posttest outcomes ( $F = 92.363$ ;  $p < 0.05$ ), demonstrating that PJBL integrated with Canva contributed substantially to student achievement even after controlling for initial ability. Overall, this study concludes that Canva-based PJBL is highly effective in enhancing students' visual creativity and disaster-related conceptual understanding. This learning model also supports engaging, contextual, and digital-literacy-oriented instruction. Therefore, Canva-based PJBL is recommended as an innovative learning alternative, particularly for geography or subjects requiring visual creativity and deeper conceptual mastery.

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## INTRODUCTION

Globally, Project-Based Learning (PjBL) has been widely recognized as an effective instructional approach that enhances students' engagement, higher-order thinking skills, and creativity. Extensive reviews and meta-analyses indicate that PjBL outperforms conventional instructional methods by promoting active knowledge construction, collaboration, and real-world problem solving (Kokotsaki et al., 2016; Mandouit & Hattie, 2023). Recent international studies have further confirmed that PjBL contributes positively to creative thinking and conceptual understanding across various disciplines (Kwon & Lee, 2025). However, most global research focuses on general creativity outcomes and higher education contexts, with limited attention to the integration of specific digital visual design tools within PjBL environments (Yurchenko, 2025).

In the Asian context, the adoption of technology-enhanced learning has increased significantly, particularly in geography, environmental education, and disaster-related learning. Studies conducted in Asian educational settings highlight that digital media can enhance students' engagement, spatial understanding, and affective responses toward disaster issues (Satchwell et al., 2024). Nevertheless, many of these studies remain conceptual or descriptive, emphasizing pedagogical frameworks rather than empirically measuring learning outcomes or students' visual creative products through experimental designs (Nurramadhani et al., 2024b; Pramashela et al., 2023a). As a result, empirical evidence demonstrating the concrete role of digital visual tools in supporting learning within PjBL-based disaster education remains relatively limited in the Asian region.

Indonesia is one of the countries with the highest level of disaster vulnerability in the world. This is due to its geographical position at the intersection of three major tectonic plates Indo-Australian, Eurasian, and Pacific as well as its location within the Pacific Ring of Fire, which has extremely high volcanic and seismic activity (Syuryansyah & Sukendar, 2023; Husyain Rifai, 2023. Evie et al., 2022). These conditions make Indonesia highly prone to various types of disasters such as earthquakes, tsunamis, volcanic eruptions, floods, landslides, tornadoes, and droughts (Monalia & D., 2024). The high intensity of disasters requires increased awareness, mitigation skills, and disaster knowledge among communities, including students as a generation that must be prepared to face future disaster risks (Syuryansyah & Sukendar, 2023; Mahardhika & Risa Dwita Hardianti, 2025).

In Indonesia, Project-Based Learning has been widely implemented in response to curriculum demands emphasizing creativity, critical thinking, and digital literacy. Several national studies report that the integration of Canva within PjBL positively influences students' motivation, creativity, and learning outcomes in various subjects, particularly language and vocational education (Ulyani & Jayanti, 2025). In the context of disaster education, however, instructional practices still tend to prioritize cognitive understanding delivered through conventional methods, with limited use of digital visual media to support students' communication and creativity (Jalil et al., 2019). Consequently, existing Indonesian literature indicates a growing interest in PjBL and digital tools, while their application within disaster mitigation education and visual learning contexts remains an emerging area of pedagogical development.

Schools, as formal educational institutions, have a strategic role in building disaster literacy. Through disaster education, students can understand concepts of hazards, vulnerability, risk, and appropriate mitigation actions in emergency situations. Disaster education is closely related to the Sustainable Development Goal (SDG) 13, which focuses on climate action and disaster risk reduction. Implementation at the school level should be practical, experience-based, and contextual to the local environment (Suryadi et al., 2024).

Aligned with 21st-century learning paradigms, education demands integration of technology, creativity, collaboration, problem-solving, and critical thinking. The Merdeka Curriculum emphasizes student-centered, project-based learning and competency development (Aulina & Nurdiana, 2024); Hidayani 2024; Putri & Cahaya, 2024; Ulyani & Jayanti, 2025; Kwon & Lee, 2025). One of the most relevant models is Project Based Learning (PjBL), which positions students as active learners solving real problems and producing applicable products (Rahmawati & Nurlim, 2025; Husni Mubarak, 2024; Lia Januarsih et al., 2023; Putri & Cahaya, 2024).

In the context of disaster mitigation learning, PjBL provides meaningful learning experiences. Through relevant projects, students can identify disaster risks, analyze causes, and design educational products such as posters, infographics, simulation videos, or disaster education modules (Ardianto & Sumarmi, 2023). Digital technology development also supports project-based learning quality, including the use of Canva as a cloud-based visual design platform equipped with creative features that enable students to produce professional visual outputs (Oktaviani et al., 2023; Zulhandayani, 2023; Fau et al., 2025; Nasution, 2024).

Visual creativity is an essential skill in modern education, involving the ability to process data, communicate messages visually, and integrate aesthetics with information. In disaster mitigation education, visual products function as communication tools to raise awareness and disseminate mitigation actions (Irfan & Jalil, 2019). Meanwhile, disaster understanding must also be strengthened through innovative learning, as conventional teaching remains theoretical and lacks experiential engagement (Nuraini et al., 2024)

However, research on the effectiveness of Canva-integrated PjBL in disaster mitigation learning is still limited, especially at the senior high school level and within religious-based schools such as Senior High School Ma'arif. Therefore, this study is essential to fill the research gap and contribute to innovative learning models that enhance visual creativity and disaster understanding.

This research aims to analyze the impact of Canva-based PjBL integration on visual creativity and disaster understanding among grade XI students at Senior High School Ma'arif. The results are expected to serve as a reference for educators in designing creative, effective, and technology-oriented instructional strategies, and to support schools in building disaster awareness culture and student involvement in school-based disaster mitigation efforts.

### **PjBL and constructivist learning theory**

Project-Based Learning (PjBL) is a learning approach that positions students as the main actors in the learning process through direct involvement in completing meaningful and authentic project tasks. This approach is rooted in constructivist learning theory, which posits that students actively construct knowledge through experience and social interaction rather than passively receiving information (Benardi, 2023). Within a constructivist learning context, PjBL stimulates students to identify real-world problems, conduct investigations, and subsequently produce products as evidence of their individual understanding of the subject matter.

PjBL has been widely recognized as effective in enhancing 21st-century skills such as critical thinking, collaboration, and creativity, as the process requires students to explore ideas and reflect on the outcomes of their own work (Voronchenko et al., 2015). Meta-analytic studies indicate that PjBL has a positive impact on students' creative thinking skills compared to conventional learning, particularly when implemented in settings that support student voice and choice (Li & Tu, 2024). The integration of digital tools within PjBL has also been reported to enrich the learning process by increasing access to resources, facilitating collaboration, and supporting the production of students' creative outputs (Voronchenko et al., 2015).

### **Visual Creativity as a Learning Outcome**

In contemporary learning, particularly in the digital era, visual creativity has become an essential competency because it influences how students communicate ideas and information effectively through visual design. Visual creativity encompasses the ability to select design elements, combine colors, and organize information in a communicative and aesthetic manner, all of which are crucial for conveying hazard mitigation messages or disaster education clearly.

Empirical studies indicate that the use of visual media in learning contexts can strengthen student engagement and support the understanding of abstract concepts. For example, digital platforms such as Canva provide opportunities for students to express ideas and concepts through visual design projects, thereby expanding possibilities in project-based learning and enhancing students' creativity in visualizing scientific or social content (Ulyani & Jayanti, 2025).

### **Technology-Based Disaster Education**

Effective disaster mitigation learning requires not only cognitive understanding of mitigation strategies but also students' capacity to communicate hazard messages visually and communicatively. Digital technology offers tools to support this process, as platforms such as Canva enable students to integrate textual content with visual graphics, thereby enhancing memory retention and individual risk communication skills.

Although many studies have examined the use of digital tools in general learning contexts, research focusing on the specific use of digital tools in disaster education remains relatively limited. Some literature emphasizes the importance of integrating technology that fosters empathy and social engagement among students in geography and disaster education contexts; however, much of this research is still confined to non-technological content development or remains largely theoretical in nature (Satchwell et al., 2024).

### **Research Gap and Novelty**

Although numerous studies have confirmed the effectiveness of Project-Based Learning (PjBL) in enhancing students' engagement, higher-order thinking skills, and creativity, the integration of PjBL with specific digital visual design tools remains underexplored, particularly within the context of disaster mitigation education. International research by (Kokotsaki et al., 2016) demonstrated that PjBL significantly improves creative thinking skills in higher education settings; however, their study focused on general creativity outcomes without incorporating digital design platforms such as Canva, nor did it address disaster-related learning contexts. As a result, the potential of digital-supported PjBL to enhance visual creativity and domain-specific understanding, such as disaster mitigation, remains insufficiently examined.

Similarly, (Satchwell et al., 2024) emphasized the importance of technology-enhanced learning environments in strengthening students' engagement and empathy in geography and disaster-related education. Nevertheless, their study primarily discussed digital systems at a conceptual and pedagogical level, without empirically measuring students' creative visual outputs or assessing learning outcomes through experimental designs. This indicates a gap in quantitative evidence regarding how digital tools concretely support students' visual communication skills and conceptual understanding in disaster education.

In the Indonesian context, research conducted by (Ulyani & Jayanti, 2025) reported that the use of Canva within a Project-Based Learning framework positively influenced students' writing skills and learning motivation. Despite these promising findings, the study was limited to language learning in vocational education and did not examine visual creativity as an explicit learning outcome, nor did it address disaster mitigation as a learning domain. Consequently, there is limited national-level empirical research that investigates the role of Canva-assisted PjBL in enhancing both creative and cognitive outcomes simultaneously, especially at the senior high school level.

Furthermore, existing disaster education studies in Indonesia tend to prioritize cognitive understanding and preparedness knowledge, often employing conventional instructional methods or descriptive approaches. Few studies have systematically integrated constructivist learning models with digital visual media to support students in transforming disaster knowledge into communicative visual products. This indicates a lack of research that positions visual creativity not merely as a supplementary skill, but as a central learning outcome in disaster mitigation education.

Based on this synthesis, the key research gap lies in the absence of empirical studies that integrate Canva-supported Project-Based Learning, disaster mitigation education, and dual learning outcomes, namely disaster understanding and visual creativity, within a single quasi-experimental framework. The novelty of the present study resides in its attempt to bridge this gap by examining the effectiveness of Canva-assisted PjBL in a senior high school setting, focusing on both cognitive mastery and creative visual production. By situating digital design tools within a constructivist PjBL framework, this study contributes new empirical evidence to disaster education literature and extends the application of multimedia-enhanced learning models in secondary education.

## METHOD

This study uses a quantitative approach with a quasi-experimental design in the form of a Non-Equivalent Control Group Design model involving two groups, namely the experimental class and the control class. This design was chosen because it does not allow for perfect randomization, but it still provides an opportunity to test the causal relationship between the Canva-based Project Based Learning (PJBL) learning model and the increased visual creativity and understanding of students' disasters (Febriana, 2016; Kuo & Chuang P., 2020). Both groups received a pretest before being treated and a posttest after the learning process was completed, so that the change in ability could be analyzed comparatively.

Table 1. Quasi-experimental design

Class	Pretest	Treatment	Posstest
Experiment	O1	X	O2
Control	O1	-	O2

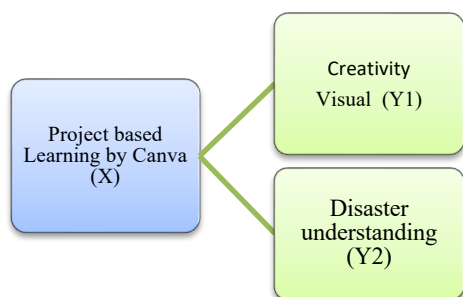
Information:

- X : Treatment (Canva-Based PJBL Learning Model)
- : Treatment (Conventional Based PJBL Learning Model)
- O1 : Pretest on experimental and control classes
- O2 : Posttest in experimental and control classes.

This research was carried out at Ma'arif NU Solokuro High School for grade XI students in Geography subjects. All grade XI students became the research population, while the sample was determined by convenience sampling technique because the class selection was adjusted to school conditions (Amin et al., 2023). The sample consisted of two classes of 30 students each, the experimental class received the treatment of the application of Canva-based PJBL, while the control class learned using conventional methods without the support of digital media.

The research variables included the independent variable, namely the Canva-based PJBL learning model, as well as two bound variables there is visual creativity and understanding of disasters. Visual creativity is measured through rubric assessments that include aspects of material suitability, design composition, visual quality, and innovation (Irfan, Jalil, 2019). Understanding of disasters is measured through objective tests and essays prepared based on competency indicators and disaster mitigation concepts set by BNPB.

Figure 1. Research variables



Data collection is carried out through tests and non-tests. Pretest and posttest tests are used to measure improved understanding of disasters before and after interventions. A non-test instrument in the form of an analytical rubric is used to evaluate the visual products that students produce during the Canva-

based learning process. In addition, documentation of activities and observations of learning implementation are also carried out as supporting data to assess student involvement during the learning process (Remmen & Frøyland, 2014).

Before use, the research instrument has been tested for validity and reliability. The validity of the question items was tested using Pearson correlation, while the reliability of the instrument was calculated using the Cronbach Alpha coefficient to ensure the internal consistency of the instrument. All research procedures are carried out in three stages, namely the preparation stage, the experimental implementation stage, and the final stage. At the implementation stage, the experiment class follows a project-based learning (PJBL) flow that includes the formulation of essential questions, project planning, investigation, creation of visual products using Canva, and presentation of results; Meanwhile, the control class followed conventional learning in the form of lectures, discussions, and exercises without digital media.

The data was analyzed using parametric statistical tests. Prerequisite tests in the form of the Kolmogorov–Smirnov normality test and the Levene homogeneity test were used to ensure the feasibility of using parametric analysis. Furthermore, the Paired Sample t-test was used to test the improvement of learning outcomes in each group, the Independent Sample t-test to compare differences between groups, and the Covariance Analysis (ANCOVA) to see the effectiveness of the learning model by controlling for the influence of early ability. Descriptive analysis is also used to provide an overview of the quality of visual products and students' responses to the use of Canva media (Zulhandayani, 2023). The selection of this analysis technique is in line with educational research standards that integrate PJBL models and digital technology (Nuraini et al., 2024a).

Prior to hypothesis testing, data were analyzed using prerequisite tests, including the Kolmogorov–Smirnov normality test and Levene's homogeneity test. Inferential analyses included paired-sample t-tests to examine within-group improvements, independent-sample t-tests to compare posttest differences between groups, and Analysis of Covariance (ANCOVA) to control for pretest scores. In addition to statistical significance testing, effect sizes were calculated to determine the magnitude of the instructional impact. Cohen's *d* was used to assess the effect size of group differences, while partial eta squared ( $\eta^2$ ) was reported for the ANCOVA results. These effect size measures provide meaningful interpretation of the practical significance of the Canva-supported PjBL intervention beyond p-values (Valentine et al., 2019). This study was conducted in accordance with ethical research principles. Permission to conduct the research was obtained from the school authorities. Students participated voluntarily, and informed consent was obtained prior to data collection. Participants' identities were kept confidential, and the data were used solely for research purposes.

## RESULT AND DISCUSSION

### RESULTS

The data collected between the experimental class and the control class of results before and after the test were analyzed using a parametric statistical approach to determine the integration of the Canva-based Project Based Learning (PJBL) learning model in disaster mitigation learning: its impact on visual activity and disaster understanding of grade XI students at SMA Ma'arif NU. A prerequisite for performing parametric statistical tests is that the data is normally distributed and the data variance is homogeneous.

The normality test of this study is used as a prerequisite for the t-test. In this study, the data must be distributed normally, if it is not distributed normally, the t-test cannot be continued. The data can be said to be normally distributed if the significance level is  $> 0.05$ , then the data is said to be not normally distributed if the significance level is  $< 0.05$ . To perform the normality test obtained using the Kolmogorof Smirnov test with the help of SPSS 25, the results of the normality test can be seen from the following table:

**Table 2.** Normality test results with *Kolmogorov-Smirnov*

Class	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	Df	Sig.	Statistics	Df	Sig.
Pretest A (Control)	.138	30	.150	.942	30	.104
Posttest A (Control)	.147	30	.097	.939	30	.084
Pretest B (Experiment)	.153	30	.072	.939	30	.085
Posttest B (Experiment)	.155	30	.064	.958	30	.271

Based on the results of normality testing using two statistical approaches, namely Kolmogorov-Smirnov and Shapiro-Wilk, it was found that all research data groups, including pretest and posttest values in both the control and experimental classes, showed a significance value (Sig.)  $< 0.05$ . This condition indicates that there is no significant difference between the distribution of empirical data and the theoretical normal distribution, so it can be concluded that all variables in this study are normally distributed.

**Table 3.** Homogeneity Test Results

Living Statistic	df1	df2	Sig.	
Based on Mean	1.732	3	116	.164
Based on Median	1.620	3	116	.189
Based on Median and with adjusted df	1.620	3	114.021	.189
Based on trimmed mean	1.747	3	116	.161

Based on the results of Levene's Test on four calculation approaches (mean, median, median with df adjustment, and trimmed mean), the overall significance value was above 0.05. These findings show that there was no significant difference in variance between the data groups. Thus, the variance of the whole group can be declared homogeneous, so that the homogeneity assumption is fulfilled and parametric statistical analysis can be followed appropriately.

**Table 4.** Paired Sample t-test results (*Control Class*)

	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig (2 tailed)
				Lower	Upper			
Pair 1 Pretest - Posttest	.667	11.577	2.114	-3.656	4.990	.135	29	.755

Based on the results of the Paired Sample t-test on the pretest and posttest values in the control class, the value of Sig. (2-tailed) = 0.755  $> 0.05$  was obtained. Thus, there was no significant difference between the pretest and posttest scores in the control class.

**Table 5.** Paired Sample t-test results (*Experimental Class*)

	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig (2 tailed)
				Lower	Upper			
Pair 1 Pretest - Posttest	-16.667	6.989	1.276	-19.277	-14.057	-13.061	29	.000

Based on the results of the Paired Sample t-test between the pretest and posttest values in the experimental class, a Sig. (2-tailed) value of 0.000  $< 0.05$  was obtained, so it can be concluded that there is a very significant difference between the pretest and posttest values in the experimental class.

Thus, it can be concluded that the learning treatment applied to the experimental class had a noticeable positive impact, while the conventional learning in the control class did not provide a significant improvement.

**Table 6.** Independent Sample t-test results

Value	F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	2.726	.104	-9.127	58	.000	-19.333	2.118	-23.573	-15.093
Equal variances not assumed			-9.127	54.627	.000	-19.333	2.118	-23.579	-15.088

Based on the results of the Independent Sample t-test, the value of Sig. (2-tailed) = 0.000 < 0.05 and the value of t = -9.127 were obtained which showed that there was a significant difference. Thus, H0 was rejected and H1 was accepted, so it can be concluded that the learning method applied to the experimental class was more effective than the control class.

**Table 7.** ANCOVA Test Results

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	6345.076a	2	3172.538	57.137	.000
Intercept	3063.128	1	3063.128	55.167	.000
Pretest	738.409	1	738.409	13.299	.001
Class	5128.447	1	5128.447	92.363	.000
Error	3164.924	57	55.525		
Total	28695.000	60			
Corrected Total	9510.000	59			

Based on the results of the ANCOVA test, it was found that the class variable had a significant influence on the posttest score after controlling the pretest score, with a value of F = 92,363 and p = 0.000 < 0.05. This shows that the learning method in the experimental class is significantly more effective than the control class in improving student learning outcomes. In addition, the pretest covariate also had a significant effect on the posttest with a value of F = 13,299 and p = 0.001 < 0.05, which means that students' initial ability also affects the final learning outcome.

## DISCUSSION

The results of this study show that the integration of the Project-Based Learning (PJBL) model using Canva in disaster mitigation learning has a great influence on increasing visual creativity and understanding of disasters in grade XI students of SMA Ma'arif NU Solokuro. The results of the pretest test showed that the basic abilities of students in the experimental class and the control class were almost the same. This is evident from the normality and homogeneity tests which show a significance value above 0.05, meaning that the data is normally distributed and the variance of the two groups is the same. This condition shows that the two classes have equal initial abilities, making it worth comparing in this study.

Beyond statistical significance, the magnitude of the effect observed in this study provides strong evidence of the educational value of Canva-based Project-Based Learning (PJBL). The ANCOVA results indicate an R<sup>2</sup> value of 0.667, meaning that 66.7% of the variance in students' posttest scores is explained by the learning model after controlling for initial ability. In educational research, this proportion represents a large effect size, suggesting that the intervention does not merely produce marginal gains but leads to substantial learning improvements. Such a large explanatory power reinforces that the observed differences are educationally meaningful and not only statistically detectable. From a pedagogical perspective, a large effect size implies that Canva-based PJBL meaningfully transforms the learning experience. Students do not only score higher on tests but also demonstrate deeper understanding and improved visual creativity. This finding strengthens the

argument that integrating digital visual tools into project-based learning environments can significantly enhance conceptual comprehension, particularly in abstract and contextual topics such as disaster mitigation.

In the class that followed conventional learning, the results of the Paired Sample t-test showed no significant improvement between the initial test score and the final test, with a significance value of 0.755. These findings suggest that teaching methods that use only lectures and simple assignments are less effective in improving students' understanding of how to reduce the impact of disasters. Conventional learning makes students more passive, only receiving information without actively participating, so they have difficulty understanding abstract concepts and relating them to the everyday conditions around them. These findings are in line with the opinion (Upi Supriatna, 2023) Explanations that low participation and lack of hands-on experience are the main causes of limited learning outcomes improvements in traditional learning methods. In addition, education about disasters in schools is still only theoretical and does not use visual media, so it is difficult for students to understand mitigation measures as a whole (N. Nuraini et al., 2025).

In the experimental class that received Canva-based PJBL learning, there was a very significant increase in posttest results. From the Paired Sample t-test, a Sig. value of 0.000 was obtained and an average score increase of 16,667 points. This improvement shows that Canva-based PJBL learning is able to provide a more meaningful, interactive, and contextual learning experience. This PJBL model allows students to be directly involved in completing projects, from compiling key questions, conducting research, to creating visual products such as posters, infographics, and videos about disaster mitigation. This active engagement helps students understand the material through real-life experiences and teamwork. (Benardi, 2023a) He said that project-based learning (PJBL) is effective in improving critical thinking skills and concept understanding because it focuses on independent investigation and problem-solving activities.

Canva's integration in learning plays an important role in enhancing students' visual creativity. Canva as a digital design platform helps students turn information into visuals that are engaging, informative, and easy to understand. Students can choose from a variety of appropriate templates, icons, colors, and fonts to convey the message more effectively. By visualizing information, students not only learn the material, but also turn it into designs they create themselves, thus strengthening their understanding (Hazarika, 2025; Zulhandayani, 2023). Similar research explains that Canva can help improve digital capabilities and design creativity because its interface is easy to use and allows users to explore visual ideas freely and creatively (Yurchenko, 2025).

The significant difference between the experimental class and the control class became more pronounced after being tested with the Independent Sample t-test. The results showed a Sig. value of 0.000 and a difference in the average score of 19.333 points. This means that students in the experimental class understand the material better than students in the control class after going through the learning process. These findings are in line with research (Fau et al., 2025) which explains that learning using creative digital media can improve the ability to remember information, enthusiasm for learning, and understanding of the material better than the usual learning methods used previously.

By analyzing more deeply using the ANCOVA test, it can be seen that the learning model has a significant influence on student learning outcomes, even though the pretest scores have been controlled. The class variable showed a value of  $F = 92.363$  with  $p = 0.000$ , which means that the type of learning used is the main factor that causes an increase in student learning outcomes. From the  $R^2$  value of 0.667, it can be concluded that 66.7% of the change in posttest scores was influenced by the learning model, which is a very large number in the context of educational research. These findings are in line with opinion (Nuraini et al., 2024a) which states that contextual learning that uses digital technology can have a significant impact in improving students' abilities.

In addition to improving academic skills, project-based learning with Canva also has a big impact on students' visual creativity. They can create works with neater designs, attractive color choices, and clearer mitigation messages. The use of posters, infographics, and videos helps improve students' ability to communicate visually. As explained by (Irfan, Jalil, 2019) that good visual media is able to simplify complex messages and help people more easily understand how to reduce the impact of disasters. In addition, the process of making this visual project also helps develop twenty-first century

skills such as cooperation, creativity, communication, and the ability to use digital technology, which is in accordance with the needs of the Independent Curriculum (Aulina & Nurdiana, 2024a).

In general, the results of this study show that the use of the Canva-based PJBL model is an effective, relevant, and appropriate way of learning in accordance with current educational needs. This model not only improves students' understanding of the concept of disasters in real life, but also encourages their creativity in conveying mitigation information in an engaging and easy-to-understand way. Therefore, the Canva-based PJBL model is highly recommended to be used in learning geography or other subjects that require increased digital literacy, creativity, and context-based understanding. The findings of this study are strongly aligned with constructivist learning theory, which emphasizes that knowledge is actively constructed by learners through interaction with their environment, rather than passively received. Canva-based PJBL allows students to engage directly with disaster mitigation concepts by designing visual products, collaborating with peers, and connecting learning materials to real-life disaster contexts. This process supports meaningful learning, as students actively interpret, reorganize, and represent information based on their prior knowledge and experiences (Ulfi Andrian Sari et al., 2024; Susilawati & Fahrozi, 2020).

Furthermore, the integration of multimedia elements through Canva supports Mayer's multimedia learning theory, which posits that learners understand information more effectively when it is presented through a combination of verbal and visual representations. By transforming textual disaster information into infographics, posters, and videos, students process information through multiple cognitive channels, leading to stronger memory retention and conceptual clarity. This explains why students in the experimental class demonstrated significantly higher posttest scores compared to those in conventional learning settings.

The improvement in students' learning outcomes can also be explained through the lens of cognitive load theory. Disaster mitigation concepts often involve complex processes, abstract risks, and multi-step procedures, which may overwhelm students when delivered solely through lectures. Canva-based visual learning helps reduce extraneous cognitive load by organizing information into structured, visually coherent formats. Well-designed visuals guide students' attention to essential information, allowing them to focus on understanding rather than decoding dense textual explanations.

At the same time, PJBL increases germane cognitive load by encouraging students to actively process information, make design decisions, and reflect on how best to communicate mitigation messages. This balance between reducing unnecessary cognitive burden and promoting productive mental effort contributes to deeper learning. Thus, the use of visual projects not only enhances creativity but also supports efficient cognitive processing in disaster education.

The effectiveness of Canva-based PJBL in this study is also influenced by cultural and local contextual factors. Disaster mitigation learning in Indonesia is highly relevant, as students often live in disaster-prone areas and are familiar with floods, earthquakes, or other natural hazards. By incorporating local disaster contexts into visual projects, learning becomes more authentic and personally meaningful. Students are not merely learning abstract concepts but are visualizing mitigation strategies that are directly applicable to their own environments.

Additionally, the collaborative nature of PJBL aligns well with collectivist cultural values commonly found in Indonesian educational settings, where cooperation and group responsibility are emphasized. Working together on visual projects fosters social interaction, shared responsibility, and peer learning, which further strengthens students' engagement and understanding. This cultural compatibility may partly explain the strong impact of the learning model observed in this study.

The novelty of this study becomes clearer when compared with previous international and national research on Project-Based Learning and digital media integration. Although numerous studies have confirmed the effectiveness of Project-Based Learning (PjBL) in enhancing students' engagement, higher-order thinking skills, and creativity, the integration of PjBL with specific digital visual design tools remains underexplored, particularly within the context of disaster mitigation education. For instance, (Winaryati et al., 2025) demonstrated that PjBL significantly improves creative thinking skills in higher education settings; however, their study focused on general creativity outcomes and did not incorporate digital design platforms such as Canva. Moreover, disaster mitigation was not

used as a domain-specific learning context, leaving the potential of digital-supported PjBL for visual creativity and contextual disaster understanding insufficiently examined.

In addition, (Satchwell et al., 2024) emphasized the importance of technology-enhanced learning environments in geography and disaster-related education, particularly in fostering student engagement and empathy. Nevertheless, their research was largely conceptual and pedagogical in nature, without employing experimental designs or quantitatively measuring students' learning outcomes. Importantly, their study did not assess students' creative visual products or evaluate how digital tools concretely support visual communication skills in disaster mitigation learning. This highlights a gap in empirical evidence regarding the measurable impact of digital visual tools within project-based disaster education.

From a national perspective, research by (Ulyani & Jayanti, 2025) reported positive effects of Canva-assisted PjBL on students' writing skills and learning motivation in vocational education. While these findings support the pedagogical value of Canva within project-based learning, the study was limited to language learning contexts and did not explicitly examine visual creativity as a learning outcome. Furthermore, disaster mitigation was not addressed as a learning domain, and the study did not involve senior high school students. As a result, empirical evidence on the effectiveness of Canva-supported PjBL for enhancing both creative and cognitive outcomes in disaster education at the secondary school level remains limited in the Indonesian context.

Unlike previous studies, the present research integrates Canva-supported Project-Based Learning within disaster mitigation education and simultaneously examines dual learning outcomes, namely disaster understanding and visual creativity, using a quasi-experimental design. This study not only extends prior findings by situating digital design tools within a constructivist PjBL framework but also provides quantitative evidence of their effectiveness, as indicated by the large effect size obtained after controlling for students' initial abilities. By positioning visual creativity as a central learning outcome rather than a supplementary skill, this study contributes new empirical insights to disaster education literature and strengthens the application of multimedia-enhanced, constructivist learning models in senior high school education.

Despite its strong findings, this study has several limitations that should be acknowledged. First, the sample size was limited to two classes within a single school, which may restrict the generalizability of the results to broader educational contexts. Differences in school facilities, teacher competencies, and student digital literacy levels could influence the effectiveness of Canva-based PJBL in other settings. Second, the study focused on short-term learning outcomes measured through pretest and posttest scores. Long-term retention of disaster mitigation knowledge and sustained development of visual creativity were not examined. Future research is encouraged to involve larger and more diverse samples, as well as longitudinal designs, to explore the long-term impact and broader applicability of this learning model.

## CONCLUSION

This study demonstrates that the integration of Canva-based Project-Based Learning (PJBL) in disaster mitigation learning is highly effective in enhancing both visual creativity and disaster understanding among grade XI students at SMA Ma'arif NU Solokuro. Students who participated in Canva-assisted PJBL showed substantial improvements in learning outcomes compared to those who experienced conventional instructional methods. In contrast, the control class, which relied primarily on lectures and routine assignments, did not show meaningful improvement, indicating that traditional approaches are less effective in fostering deep understanding and active engagement in disaster mitigation education. Beyond its empirical findings, this study offers an important theoretical contribution to the field of educational research, particularly in constructivist and multimedia learning perspectives. By integrating a digital visual design platform within a Project-Based Learning framework, this research extends constructivist learning theory by demonstrating how students actively construct disaster-related knowledge through visual representation and collaborative project work. Furthermore, the findings support multimedia learning and cognitive load theories by showing

that visual-based project outputs help students organize complex disaster information more effectively, thereby enhancing conceptual understanding and creative expression. This study positions visual creativity not merely as a supplementary skill, but as a core learning outcome in disaster education.

In terms of educational policy implications, the results of this study suggest that disaster mitigation education should move beyond theoretical instruction toward more interactive, technology-supported learning models. The integration of Canva-based PJBL aligns with the goals of the Indonesian curriculum that emphasize digital literacy, creativity, and contextual learning. Therefore, policymakers and curriculum developers are encouraged to incorporate project-based digital learning strategies into disaster education programs, particularly at the secondary school level. Such an approach can strengthen students' disaster literacy, improve their ability to communicate mitigation messages effectively, and better prepare them to respond to real disaster situations within their local environments. Despite its contributions, this study has several limitations that open opportunities for future research. The sample size was limited to a single school, which may restrict the generalizability of the findings. Future studies are recommended to involve larger and more diverse samples across different regions and school types. In addition, longitudinal research designs could be employed to examine the long-term retention of disaster mitigation knowledge and the sustainability of students' visual creativity skills. Further research may also explore the integration of other digital design tools or compare different multimedia platforms to identify the most effective strategies for enhancing disaster education outcomes.

## REFERENCES

- Amin, N. F., Garancang, S., Abunawas, K., Makassar, M., Negeri, I., & Makassar, A. (2023). KONSEP UMUM POPULASI DAN SAMPEL DALAM PENELITIAN. *JURNAL PILAR: Jurnal Kajian Islam Kontemporer*, 14(1), 15–31.
- Ardianto, R., & Sumarmi, M. (2023). The effectiveness of the Project Based Learning model with outdoor learning in improving students' environmental care attitudes on natural disaster mitigation materials. *Journal of Innovative Integration and Harmony of the Social Sciences*, 3(5), 452–460. <https://doi.org/10.17977/um063v3i52023p452-460>
- Aulina, C. N., & Nurdiana, A. A. (2024a). Penerapan Project Based Learning dalam Implementasi Kurikulum Merdeka di Taman Kanak-Kanak. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 8(5), 1137–1150. <https://doi.org/10.31004/obsesi.v8i5.6058>
- Aulina, C. N., & Nurdiana, A. A. (2024b). The Implementation of Project Based Learning in the Implementation of the Independent Curriculum in Kindergarten. *Journal of Obsession: Journal of Early Childhood Education*, 8(5), 1137–1150. <https://doi.org/10.31004/obsesi.v8i5.6058>
- Benardi, A. R. S. A. I. (2023a). Efektivitas model project based learning dengan pembelajaran outdoor dalam meningkatkan sikap peduli lingkungan peserta didik pada materi mitigasi bencana alam. *Jurnal Integrasi Dan Harmoni Inovatif Ilmu-Ilmu Sosial*, 3(7), 717–725. <https://doi.org/10.17977/um063v3i72023p717-725>
- Benardi, A. R. S. A. I. (2023b). The effectiveness of the project-based learning model with outdoor learning in improving students' attitude of environmental care on natural disaster mitigation materials. *Journal of Innovative Integration and Harmony of the Social Sciences*, 3(7), 717–725. <https://doi.org/10.17977/um063v3i72023p717-725>
- Dinda Oktaviani, Sukardi, Nursaptini, M. (2023). Pengaruh Model Project Based Learning Berbantuan Media Canva Terhadap Kemampuan Berpikir Kreatif siswa SMA Pada Mata Pelajaran Sosiologi. *JURNAL EDUCATIVE: Journal of Educational Studies Pengaruh*.

- Evie, S., Hasni, H., Azwar, A., & Saman, S. (2022). Pendidikan Kebencanaan dan Simulasi Bencana Gempa Bumi sebagai Upaya Mengurangi Dampak Bencana Gempa Bumi. *Poltekita: Jurnal Pengabdian Masyarakat*, 3(4), 947–954. <https://doi.org/10.33860/pjpm.v3i4.1175>
- Fau, A., Indra, D., Hts, G., & Hondro, R. K. (2025). Optimalisasi Canva sebagai Media Kreatif untuk Siswa SMA. *Jurnal Pengabdian Kepada Masyarakat*, 01(05), 326–331.
- Febriana, A. A. (2016). *Perbedaan antara model pembelajaran STAD (student teams achievement divisions) dan jigsaw terhadap hasil belajar mata pelajaran ipa siswa kelas 5 SD gugus kopi kecamatan kandang kabupaten temanggung skripsi.*
- Hazarika, H. J. (2025). Implementing digital storytelling to enhance library engagement: an experience. *Library Hi Tech News*, 42(6), 11–16. <https://doi.org/10.1108/LHTN-03-2025-0051>
- Hidayani, E. (2024). Canva for Education Project Based Learning Model for Presenting Fiction Stories. *Jurnal Pendidikan Profesi Guru*, 2(1), 33–45. <https://doi.org/10.22373/jppg.v2i1.4356>
- Husni Mubarak. (2024). Implementasi Project Based Learning (PjBL) Menggunakan Canva untuk Meningkatkan Keterampilan Desain Grafis dan Motivasi Belajar Siswa Jurusan TKJ di SMK. *Jurnal MediaTIK*, 98–102. <https://doi.org/10.59562/mediatik.v7i3.4592>
- Husyain Rifai, M. (2023). The Effectiveness Of Problem-Based Learning (PBL) And Project-Based Learning (PJBL) Learning Models On Disaster Mitigation Materials On Learning Motivation Of Xi Social Studies Class. *International Journal of Educational Research & Social Sciences*, 4(5), 923–928. <https://doi.org/10.51601/ijersc.v4i5.727>
- Irfan, Jalil, S. (2019). Kreativitas Visual Pada Desain Poster Iklan Komersial Karya Mahasiswa. *Jurnal Pakarena*, 4, 28–36.
- Irfan, & Jalil, S. (2019). Visual Creativity in Student Commercial Advertising Poster Design. *Journal of Psychology*, 4, 28–36.
- Kokotsaki, D., Menzies, V., & Wiggins, A. (2016). Project-based learning: A review of the literature. *Improving Schools*, 19(3), 267–277.
- Kuo & Chuang P., Y. (2020). Effects of multimedia learning on student creativity. *Computers & Education*.
- Kwon, H., & Lee, Y. (2025). A meta-analysis of STEM project-based learning on creativity. *STEM Education*, 5(2), 275–290. <https://doi.org/10.3934/steme.2025014>
- Lia Januarsih, Dhorika Hasna, Yohanes Elfanius, & Fahrudin. (2023). Implementation of Project Instruments to Measure Creativity in History Learning Using Canva Platform for Grade X and XI at SMAN 4 Yogyakarta. *Santhet (Jurnal Sejarah Pendidikan Dan Humaniora)*, 8(1), 35–43. <https://doi.org/10.36526/santhet.v8i1.2877>
- Mahardhika, L., & Risa Dwita Hardianti. (2025). Implementation of PJBL-STEM on Disaster Mitigation Sub-Matter to Improve Students' Problem Solving Ability. *Journal of Environmental and Science Education*, 5(2), 45–51. <https://doi.org/10.15294/jese.v5i2.12555>
- Mandouit, L., & Hattie, J. (2023). Revisiting “The Power of Feedback” from the perspective of the learner. *Learning and Instruction*, 84, 101718.
- Maya Ulyani, & Widuri Indah Dwi Jayanti. (2025). The Utilization of Canva in Project Based Learning (PjBL) to Enhance the Students' Writing Skills. *Sintaksis: Publikasi Para Ahli Bahasa Dan Sastra Inggris*, 3(1), 242–252. <https://doi.org/10.61132/sintaksis.v3i1.1412>
- Monalia, I., & D., E. (2024). Public knowledge about preparedness in dealing with volcanic disaster eruptions. *Indonesian Journal of Public Health*, 2(4), 790–807.
- Najma Nur Aini, Kayla Salsabila Naqiyya, Kinanthi Hayyu Siwi, N. (2024). Inovasi pembelajaran kebencanaan untuk meningkatkan kesadaran risiko di sekolah tingkat dasar. *Jurnal Eksplorasi Pendidikan*, 7, 9–16.

- Nuraini, E., Saktiari, L. I., & Kristiono, N. (2024a). *Implementasi Project Based Learning Berbantuan Canva dalam Meningkatkan Aktivitas Belajar dan Hasil Belajar Kognitif*. 607–620.
- Nuraini, E., Saktiari, L. I., & Kristiono, N. (2024b). *Implementation of Canva-Assisted PjBL in Improving Learning Activities and Outcomes*. 607–620.
- Nurramadhani, A., Riandi, Permanasari, A., & Suwarma, I. R. (2024). STEM based Project Learning: How It Affects Preservice Science Teacher's Creativity Before, During, and After Pandemic Covid-19? *EduMatSains: Jurnal Pendidikan, Matematika Dan Sains*, 9(1), 29–39. <https://doi.org/10.33541/edumatsains.v9i1.5980>
- Oktaviani, D., Sukardi, & Nursaptini, M. (2023). The Influence of Canva's Media-Assisted Project Based Learning Model on High School Students' Creative Thinking Skills in Sociology Subjects. *Jurnal Educative: Journal of Educational Studies*.
- Pramashela, A. D., Suwono, H., Sulisetijono, S., & Wulanningsih, U. A. (2023). The Influence of Project-based Learning Integrated STEAM on the Creative Thinking Skills. *BIOEDUKASI*, 21(2), 138. <https://doi.org/10.19184/bioedu.v21i2.39737>
- Putri, E. S., & Cahaya, M. A. (2024). Pengaruh Project Based Learning Menggunakan Canva Terhadap Kemampuan Berpikir Kreatif Siswa Pada Materi Ekosistem. *BIODIK*, 10(4), 703–713. <https://doi.org/10.22437/biodik.v10i4.35610>
- Rahmawati, F. A., & Nurlim, R. (2025). Effectiveness of STEM-Based PjBL on Problem Solving Ability. *Journal of Nusantara Research*, 1, 132–139.
- Remmen, K. B., & Frøyland, M. (2014). Implementation of guidelines for effective fieldwork designs: Exploring learning activities, learning processes, and student engagement in the classroom and the field. *International Research in Geographical and Environmental Education*, 23(2), 103–125.
- Suryadi, Y., Lukitawati, L., & U., H. (2024). Disaster Education to Build Elementary School Preparedness. *Basic Journal*, 8(1), 633–642.
- Susilawati, E., & Fahrozi, S. (2020). Utilization of rumah belajar in schools affected by earthquake disasters. *Jurnal Pendidikan Dan Kebudayaan*, 5(1), 99–114. <https://doi.org/10.24832/jpnk.v5i1.1504>
- Syuryansyah, & Sukendar, D. A. (2023). The Role of BNPB in Disaster Management in Tanjung Lesung. *Asian Journal of State Administration Sciences*, 11(1), 69–79.
- Ulfi Andrian Sari, Ni'matuz Zuhroh, & Marga Cindy Elisa. (2024). EFFECTS OF DISASTER MITIGATION LEARNING USING PROJECT-BASED LEARNING MODEL ON DISASTER LITERACY SKILLS. *Proceedings of the International Conference on Social Studies Education (ICoSSE)*, 1(1), 220–228. <https://doi.org/10.20414/icosse.v1i1.24>
- Upi Supriatna, S. E. Y. (2023). PEMBELAJARAN GEOGRAFI MENGGUNAKAN MODEL PROJECT BASED LEARNING (PjBL) DALAM MENINGKATKAN MINAT BELAJAR SISWA KELAS XI DI SMA YUMIK BANJARAN KABUPATEN BANDUNG. *Jurnal Geoarea*, 6(2), 79–89.
- Valentine, K. D., Buchanan, E. M., Scofield, J. E., & Beauchamp, M. T. (2019). Beyond p values: Utilizing multiple methods to evaluate evidence. *Behaviormetrika*, 46(1), 121–144.
- Yurchenko, A. (2025). Integration of Project-Based Learning and Digital Visualization for Developing Soft Skills of Future STEM Teachers. *Open Science Initiative-Monographs*, 135–184.

Zulhandayani, F. (2023). Canva sebagai media peningkatan kreativitas mendesain iklan slogan dan poster pada model project-based learning. *Jurnal Pendidikan, Sejarah, Dan Ilmu-Ilmu Sosial*, 7(1), 126–131.