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Enhancing Creative Thinking Skills Through Digital Literacy-Based PjBL Model Assessment: A Quasi-Experimental Study

Eliaumra[*1], Dewi Purwasih Samaela[2], Indri Novayanti Gala[3], Shelvy Ferawati Rurua[4], Karmila Akib[5]

[1,2,3,4]Biologi Education Study Program, Sintuwu Maroso, University Poso, Indonesia

[5]Public Administration Study Program, Sintuwu Maroso University, Poso, Indonesia

***Correspondence Aouthr:**

Email ID: eliaumra81@gmail.com

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ABSTRACT

Creative thinking skills can be improved through a variety of assessment models in learning. The purpose of this study is to determine the effect of the application of digital literacy-based PjBL model assessment on improving students' creative thinking skills in biology learning in high school.This study was a quasi-experimental study with a nonequivalent pretest-posttest control-group design. The research sample consisted of 150 people, and each experimental and control class consisted of 75 students. Data were collected using creative thinking skills test questions. Data analysis was carried out statistically using the t-test formula. The findings of the research showed that there was an increase in creative thinking skills before and after treatment and there was a significant difference in the average creative thinking skills of students. The improvement of creative thinking skills in the experimental class was 60.5% and, in the control, class was 26.12%. The results of the t-test calculation obtained a sig value of 0.000. Thus, it was concluded that there was an effect of the application of the digital literacy-based PjBL model assessment on improving students' creative thinking skills in high school biology learning.

Keywords: *creative thinking, digital literacy, Project-Based Learning, assessment, quasi-experiment*

1. INTRODUCTION

Creative thinking is essential to prepare students for change and flexibility. Creative thinking is the skills possessed by students to produce new ideas that are original and positive (Kuo et al., 2022). Creative thinking can turn obscure information into new information with a specific purpose (Pastén, 2021). Creative thinking includes finding gaps, paradoxes, opportunities, challenges, or things of concern which then seek new meaningful relationships by generating various possibilities (from different perspectives or other views), unusual or original possibilities, and details (Syafrial et al., 2022). Creative thinking includes divergent thinking that leads to more than one solution to a problem (Putri et al., 2023). Creative thinking is related to complex convergent and divergent thinking in solving problems (Zabelina & Silvia, 2020). Developing new concepts or information and trying to use them to solve problems is a characteristic of creative thinking. Five characteristics define creativity: fluency, flexibility, elaboration, originality, and evaluation (Jumadi et al., 2021). Improving creative thinking skills can be done through innovative learning approaches, including utilizing digital technology.

Digital literacy-based education has become a relevant approach to developing digital literacy skills. Digital literacy is the skills to use and interact with digital technology. Literacy in learning can prepare technologically literate graduates (Reddy et al., 2023). Digital literacy is not just about technical skills, but also about the skills to think critically, collaborate, and create innovative solutions in the context of digital technology (Tinmaz et al., 2022; Waemusa & Jongwattanapaiboon, 2023). Digital literacy is a set of knowledge that involves at least three forms of literacy that have been practiced previously, namely media literacy, information literacy, and computer/information technology communication (Pangrazio et al., 2020; Suwarto et al., 2022; Yıldız, 2020).

This digital skill is the skill to explore technology for writing and reading to adapt to the world of the digital era (Park et al., 2021). Digital literacy competencies include the ability to utilize, understand, access, manage, collect, and evaluate information based on information and communication technology (ICT) (Rusydiyah et al., 2020; Fadillah et al., 2024) . The research result of Núñez-Pacheco et. al. (2023) found that the use of digital technology as a resource that can be used in the teaching and learning process correlates with digital competency knowledge and the possibility of application as part of a teaching strategy so that students have a positive perception of digital skills.

Digital skills will develop well if teachers can facilitate and encourage students' digital literacy potential. Internet access is increasingly widespread in various parts of the world, including in Indonesia, and has opened up opportunities for the world of education to access information, communicate, and participate in the digital world. The importance of digital literacy has launched initiatives to strengthen student skills. Improving the quality of education that focuses on the development of digital literacy curriculum, teacher training, and learning support resources. Through digital learning, it can expand knowledge and facilitate lifelong learning for students (Getenet et al., 2024; Liu et al., 2020; Rod et al., 2024). Improving students' digital literacy skills in learning can be done through the Project-Based Learning model.

The Project-Based Learning (PjBL) model has been recognized as a learning method that can stimulate students' creative thinking skills. PjBL allows students to learn through projects or assignments that are relevant to the real world, which require critical thinking, problem-solving, collaboration, and creativity. PjBL offers opportunities for students to develop into active learners who are required to seek knowledge to solve problems that may arise in their projects, and not become passive learners who absorb secondhand knowledge from their teachers. Through PjBL students can interact and exchange knowledge with each other, encouraging them to have creative thinking skills, which are needed for 21st-century learners (Alemneh & Gebrie, 2024; Almulla, 2020; Chaijum & Hiranyachattada, 2020). However, there is still a lack of literature on how the implementation of digital literacy-based PjBL model assessments affects students' creative thinking skills. Facts in the field also found that the implementation of digital literacy-based project-based learning (PjBL) models has not been carried out, most teachers only apply the PjBL model and have not combined it with digital literacy. The assessment model used so far only measures the cognitive level C1-C3, which should have used assessments at the cognitive level C4-C5 by the demands of the Merdeka curriculum as one form of 21st-century learning strategy.

Previous research has explored the impact of project-based learning (PjBL) on students' academic performance and creative thinking skills. There is little research that specifically examines the integration of digital literacy in the PjBL assessment process, especially in the context of biology learning in Senior High School. Most of the existing research focuses on PjBL or digital literacy independently (Burks, 2022)(Ling et al., 2024)(Prajoko et al., 2023)(Burks, 2022; Ling et al., 2024; Prajoko et al., 2023), but the combination of both in assessment for science has not yet been done. Other research conducted by Guo et al. (2020) shows that PjBl can improve learning in higher education. Research results Audrin & Audrin (2022) also explained that there is an impact of digital literacy in the world of education.

In this research, the integration of PjBL and digital literacy in assessment to measure and improve creative thinking skills has not been widely explored. Thus, further investigation is needed to understand how digital literacy-based assessment in PjBL can influence the development of student's creative thinking skills in learning Biology in Senior High School. The implementation of the digital literacy-based PjBL model assessment is believed to be able to encourage active student participation in the learning process. They do not only receive passive information, but are also involved in designing, running, and evaluating their projects, promoting a deeper understanding that can be used to provide constructive feedback to students, and motivate them to improve their performance. The digital literacy-based PjBL model assessment will provide an opportunity to evaluate student understanding holistically. Students will be actively involved in the learning process, from designing to evaluating their projects, so that the assessment becomes more interactive. This study is very relevant in filling the knowledge gap in educational literature, as well as providing additional insights into how digital literacy-based education and PjBL can work together to advance students' creative thinking skills.

The research is important because it will evaluate students' understanding holistically, involve students actively in learning, and improve creative thinking skills and digital literacy skills. The implementation of this innovation will be carried out by integrating digital technology into the PjBL assessment. Students will work on projects that are relevant to the real world and use digital technology in the process of research, collaboration, and delivery of results. Evaluation of students' creative thinking skills will be carried out based on indicators of fluency, flexibility, originality, elaboration, and evaluation that they show in their projects. It is expected to gain a deeper understanding of how digital literacy-based assessments in PjBL affect students' creative thinking skills from this study. This study will also provide practical guidance for teachers in developing more effective and relevant learning methods to the needs of the 21st century (Ritter et al., 2020). In addition, the results of the study can help improve the quality of education through the integration of digital literacy in innovative learning models, as well as prepare students to face future challenges with strong creative skills and digital literacy. The purpose of this study was to explore the impact of implementing a project-based learning model assessment based on digital literacy on improving students' creative thinking skills in biology learning at Senior High School.

2. METHODS

This was quasi-experimental research. The selection was based on the external factors that affected the study's results, which could not be fully controlled (Fadillah et al., 2025). The research design used was a nonequivalent pretest-posttest control-group design Creswell & Guetterman (2018), as presented in Table 1.

Table 1. Research Design

Groups	Pretest	Treatment	Posttest
Experiment	P1	X1	P3
Control	P2	X2	P4

P1 : Pretest Experiment class, P2 : Pretest Control class, P3 ; Posttest Experiment class, P4 : Posttest control class

The study began by giving a pretest to the experimental class (P1) and the control class (P2). The experimental class used a digital literacy-based PjBL learning model (X1) while the control class used conventional learning (X2). The study ended by giving a posttest to the experimental class (P3) and the control class (P4). The sample of this study was 150 high school students in class XI IPA SMAN 1 Lage, SMAN 1 Pamona Utara dan SMAN 2 Pamona Selatan in Poso Regency, taken using a purposive sampling technique, consisting of 75 people in the control class and 75 people in the experimental class.

The instrument used was a creative thinking skills test. The test questions were given in the form of open essays. Brookhart & Nitko (2011) explained that open questions were chosen because they can encourage effective and efficient thinking in directing high-level thinking skills. All question items were analyzed for validity and reliability. The validity of the questions used product moment with the criteria of calculated r value > r table and sig value < 0.05. The reliability of the questions used Cronbach Alpha. The criteria for testing the reliability of the test is if the Cronbach-Alpha value > 0.61 (Djudin, 2023; Sugiyono, 2017). Indicators of creative thinking skills test questions are presented in Table 2.

Table 2. Indicators of Creative Thinking Skills

No.	Learning indicators	Question indicators	Cognitive domain	Indicators of creative thinking
1.	Analyze the relationship between the roles of organ systems in the process of transporting and exchanging substances in the human body.	Comparing the differences in enzymes that play a role in the absorption process of nutrients in the mouth, stomach, and small intestine	Evaluation (C5)	Flexibility
2.	Analyze the relationship between the roles of organ systems in the process of transporting and exchanging substances in the human body.	Examining the role of the kidneys in the disposal of metabolic waste	Creation (C6)	Originality
3.	Analyze the relationship between the roles of organ systems in the process of transporting and exchanging substances in the human body.	Analyzing the stages of urine formation in the kidneys	Analysis (C4)	Fluency
4.	Investigating phenomena related to the process of transport and exchange of substances in the human body and its abnormalities	Detailing the process of substance exchange in the lungs	Analysis (C4)	Elaboration
5.	Investigating phenomena related to the process of transport and exchange of substances in the human body and its abnormalities	Evaluate the important role of the circulatory system in the transport and exchange of substances in the human body.	Evaluation (C5)	Evaluation

A T-test was conducted using the SPSS ver.26 application to find out the impact of implementing the digital literacy-based PjBL model assessment. The prerequisite analysis test carried out was the normality and homogeneity test. The criteria for testing normality and homogeneity are if the sig value>0.05. The calculation of the learning outcome test score was carried out using a modified percentage formula from Sugiyono (Sugiyono, 2017) as follows:

% CTS: students' total score x 100%

total scores

The categories of creative thinking skills (CTS) have been modified with the following criteria:

Table 3. The categories of creative thinking skills

No.	Interval	Categories
1.	81%-100%	Very Creative
2.	61%-80%	Creative
3.	41%-60%	Quite Creative
4.	21%-40%	Less Creative
5.	0%-20%	Not Creative

The hypothesis in this study is i) H_1 = there is no impact of implementing digital literacy-based PjBL model assessment on improving students' creative thinking skills; and ii) H_2 = there is an impact of implementing digital literacy-based PjBL model assessment on improving students' creative thinking skills. The acceptance and rejection criteria for hypotheses H_1 and H_2 are accepted if the Sig value <0.05.

3. RESULTS AND DISCUSSION

Validity dan Reliability

The results of the validity test for the creative thinking skills test questions are presented in Table 4.

Table 4. Validity values of creative thinking skills test questions

Question No.	Creative thinking skills	r Count	Sig.
1.	Flexibility	0.741	0.000
2.	Originality	0.800	0.000
3.	Fluency	0.826	0.000
4.	Elaboration	0.760	0.000
5.	Evaluation	0.778	0.000

Based on Table 4, it showed that all questions were declared valid because the calculated r value was greater than the r table value of 0.212. Thus, it could be stated that the questions were suitable for use in the research. The questions used to measure creative thinking skills assessed the aspects of fluency, flexibility, originality, elaboration, and evaluation. The results showed that the questions had been declared valid because the significance value was < 0.05, indicating that the measurement results or data obtained were reliable and could be used to assess students' creative thinking skills.

Based on these results, it can be concluded that the questions used in the application of the digital literacy-based PjBl model assessment have good validity, which means that the questions are significantly able to measure students' creative thinking skills in biology learning. Reeves & Marbach-Ad (2016) explain that assessment validation is an iterative process where the test developer builds an evidence-based case for the intended score interpretations in a specific population. A validity

argument, for example, might claim that test items reflect the domain being assessed (e.g., body of knowledge/skills). This argument-based approach supports claims with relevant evidence. The goal of validation is to compile comprehensive evidence over time to confirm that scores reflect the developer's intended meaning within the target population. Ahmed & Ishtiaq (2021) further explained that validity measurement can be done based on the results of statistical analysis or expert assessment. The reliability skills values are presented in Table 5.

Table 5. Reliability Test Results

Reliability Statistics	
Cronbach's Alpha	N of Items
.837	5

Based on Table 5, shows that the questions were stated as reliable which was greater than 0.60. Thus, it can be concluded that this question of creative thinking skills can be used as a measurement instrument with consistent results in the application of the digital literacy-based PjBL model assessment.

Reliability is related to the issue of trustworthiness. A test is said to have a high level of trustworthiness if it provides consistent results. Reliability serves as an index indicating the extent to which a measuring instrument can be relied upon. Reliability is widely recognized as one of the most important psychometric characteristics of a test. However, a given test may not measure all individuals equally. Some individuals' test results may contain significantly more errors than others (Geschwind et al., 2024; Hu et al., 2016; Torné et al., 2021).

Normality and Homogeneity Test

The normality test was conducted to test the normality of the data obtained from the pre-test and post-test values in the control and experimental classes. The results of the data normality test are presented in Table 6.

Table 6. Normality Test Result

	Pretest of control class	**Posttest of control class**	**Pretest of experiment class**	**Posttest of experiment class**
P-value	0.075	0.141	0.108	0.182

Based on the data obtained in Table 6, it can be concluded that the data from the experimental class and the control class are sig > 0.05. This means that the research data is normally distributed. Based on these results, parametric statistical tests can be carried out, namely the Paired Sample T-Test. The next assumption test is a homogeneity test. A homogeneity test is conducted to test two groups of data from the experimental class and the control class whether they have the same or similar data distribution. The test results through the SPSS ver.26 application obtained data as presented in Table 7.

Table 7. Homogeneity Test Result

	Pretest of creative thinking	**Posttests of creative thinking**
P-value	0.057	0.105

Based on Table 6, a significance value (Sig.) > 0.05 was obtained, from the learning results of creative thinking skills between the experimental and control groups were homogeneous, so that statistical analysis assuming the similarity of variance could be used and continued for the parametric statistical test, namely the Independent Sample t-Test.

Hypothesis Test

The hypothesis test used in this study is using the paired sample T-test. This test is a parametric test used on both groups of paired data. The results of the paired sample t-test are presented in Table 8.

Table 8. Result of paired sample t-test

Count Result	Control Class	Experiment Class
Mean	26.187	60.747
Standard deviation	15.635	15.849
Standard error mean	2.66998	1.83552
t	14.505	33.199
Sig	0.000	0.000

Based on Table 7, the Sig. (2-tailed) value is 0.000 <0.05, so it can be concluded that there is a difference in the learning outcomes of the experimental class and the control class. Thus, there is an impact of the use of digital literacy-based PJBL model assessments or conventional methods on the results of students' creative thinking skills tests in the experimental class and the control class. This study also uses the independent sample t-test. This test is a parametric test used on both groups of unpaired data. The prerequisite for this test is that the data is normally distributed and homogeneous. The following results of the independent sample t-test are presented in Table 9.

Table 9. Result of Independent Sampel t-test

Equal variances assumed	Count Result
F	18.067
T	15.503
Df	148
Mean difference	-32.53333
Standard error differences	1.88929
Sig.	0.000

Based on Table 9, the Sig. (2-tailed) value is 0.000 <0.05, it can be concluded that there is a real difference in the average creative thinking skills of students using the digital literacy-based PjBL model assessment and the conventional learning model. The difference in the average (mean) of students' creative thinking skills in the experimental class and the control class can be seen in Figure 1. Thus, it was decided to accept H2 and reject H1 that there is an impact of implementing the digital literacy-based PjBL model assessment on students' creative thinking skills. The average difference in creative thinking skills in the control and experimental classes is presented in Figure 1.

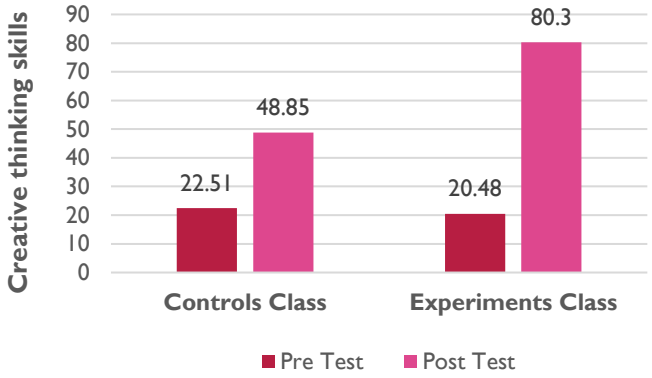

Figure 1. Difference in average relative thinking skills of the class Controls and experiments

Based on Figure 1, the difference in average values between the control class and the experimental class is obtained. The lowest value in the pretest of the experimental class and the highest in the posttest of the experimental class. The skills to think creatively in the control class were obtained with a score of 48.85% in the category of quite creative and in the experimental class of 80.3% in the very creative category. The results obtained in this study indicated that the application of the digital literacy-based PjBL model assessment affected the improvement of students' creative thinking skills, as shown by the increased learning activities and outcomes before and after the implementation. During the learning process, students were more enthusiastic and active in exploring lesson information from various digital-based sources. This challenged students because, up until that point, the learning process had been one-way. Through the application of the digital literacy-based PjBL model assessment, students gained new learning experiences, discovered relevant information, became more creative in generating original ideas, and improved their digital literacy skills.

As a result of this study, teachers gain knowledge on how to combine the PjBL model with digital literacy and can help to be able to implement the assessment of the project-based learning model (PjBL) based on digital literacy. This is in line with Yu's (2024) opinion that Project-Based Learning (PjBL) can improve creative thinking in learning. The alignment of PjBL with cognitive processes can increase student creativity. Almulla (Almulla, 2020) also explained that PjBL can increase student involvement in learning by enabling the sharing of knowledge information and discussions. Furthermore, Chaijum & Hiranyachattada (Chaijum & Hiranyachattada, 2020) stated that PjBL can correlate knowledge and skills to generate new knowledge in the form of projects. Furthermore, the ability to think creatively based on indicators in the control and experimental classes can be seen in Figure 2.

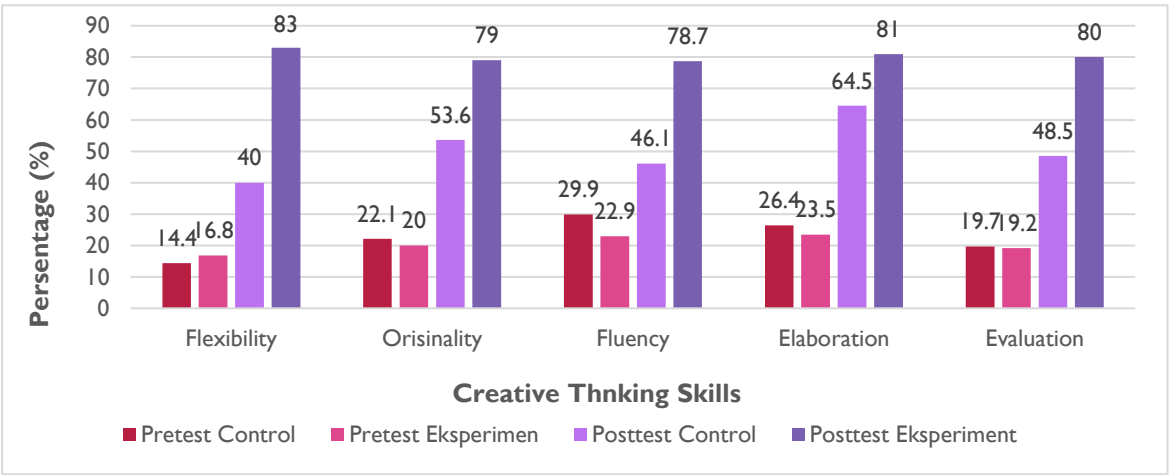

Figure 2. Creative thinking skills based on indicators in dick classes and experiments

Based on Figure 2, it shows that there is a significant difference in creative thinking ability between the experimental class and the control class. The high ability to think creatively in all indicators in the experimental class is because, through the use of wider learning resources through this digital-based project task, students have good knowledge and understanding of

the concept of a problem, topic, or material. Learning experiences, such as group discussions and problem-solving together provide students with the opportunity to develop their creative thinking skills. Through this digital literacy-based PjBL model, students are encouraged to seek information, choose the best strategy, and make decisions based on data and facts. Access to technology and learning media allows students to explore a variety of information sources and practice their thinking skills by comparing, analyzing, and validating data.

The PjBL approach is more effective in developing creative thinking skills through group work, students can improve creativity, problem-solving skills, and collaboration. This learning allows students to find solutions in a fun way while developing their skills through exploration, and find different solutions to the same problem (Habibi et al., 2020; Suradika et al., 2023). Project-based learning can improve career-related thinking skills (Lee & Lee, 2024). Creative thinking can be developed by using the right materials and approaches (Atun & Latupeirisa, 2021). The improvement of creative thinking skills based on indicators is presented in Figure 3.

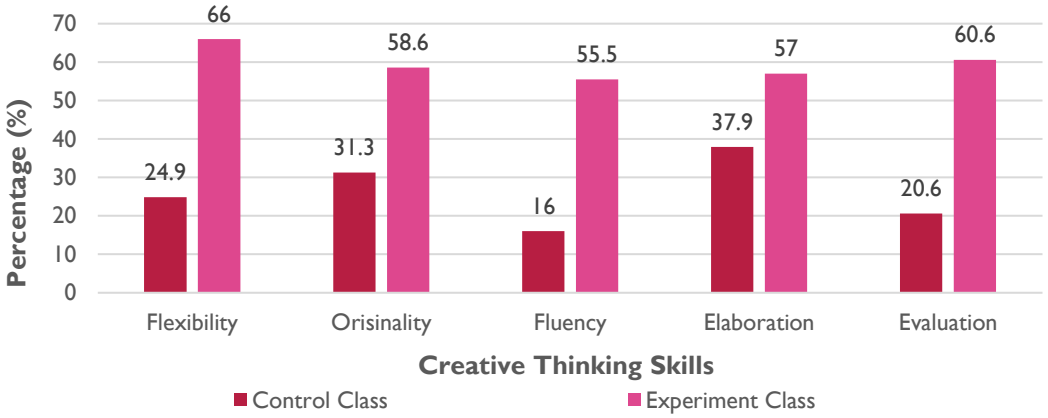

Figure 3. Improvement of creative thinking skills based on indicators in the control and experiment classes

Based on Figure 3, it shows that the percentage of improvement in thinking ability ranges from 55.5% - 66%. Improving creative thinking skills in PjBL was achieved through the implementation of a digital literacy-based PjBL assessment. Students' creative thinking skills developed through activities such as self-discovery of subject matter, where they were encouraged to ask questions, seek information, and find their solutions, fostering creative thinking. The production of digital content, such as videos, PowerPoint presentations, and learning posters, allowed students to express their creative ideas. The application of original ideas in technology was evident as students applied their creative concepts through digital tools like Canva, CapCut, TikTok, and other digital applications. This is what was found by Zhang and Ma (2023) project-based learning provides a more significant effect on student learning in subjects that utilize technology. It is further explained that project-based learning is more suitable for small group teaching, where the group size is 4-5 people so that students can exchange ideas with each other.

The abilities shown by students in creative thinking are flexibility, originality, fluency, elaboration, and evaluation (Gunawan et al., 2022). The highest improvement in creative thinking skills shown in Figure 3 is flexibility, which means that students have been able to find various solutions to the given problems. Learning that focuses on higher-order thinking skills encourages students to analyze, evaluate, and create innovative new solutions, thereby increasing flexibility in thinking. The existence of a supportive learning environment such as good facilities and access to technology can help students to try new ideas to increase their flexibility in thinking.

Students as users of technology need to have adequate knowledge and skills to be able to use them effectively in the learning process (Farias-Gaytan et al., 2022). Through technology students can find new, creative solutions to project challenges, using digital tools and platforms that may not be available in traditional learning methods through mastery of digital literacy skills. According to Anisimova (2020) and Weninger (2023), digital literacy involves the knowledge, skills, and understanding necessary for the appropriate, safe, and effective use of digital technology in learning. Digital literacy is the knowledge and functional skills to use codes and modes to participate online. The use of digital technology has real implications for learning practices so that students can develop their skills in digital literacy such as operational skills including basic technical skills to use the Internet, such as operating a browser. Formal skills related to hyperlink navigation and orientation on websites. Information skills include searching, selecting, and evaluating online information. Communication skills related to online interaction and collaboration. Content creation skills include creating and sharing quality digital content. Finally, strategic skills include utilizing the Internet to achieve goals and make the right decisions.

In this study, a type of quasi-experiment was used that compared the improvement of creative thinking skills in the control class and experiments before and after the implementation of the digital literacy-based PjBL model assessment. The distribution of creative thinking skills in the control class and experiments after applying the digital literacy-based PjBL model assessment can be seen in Figure 4.

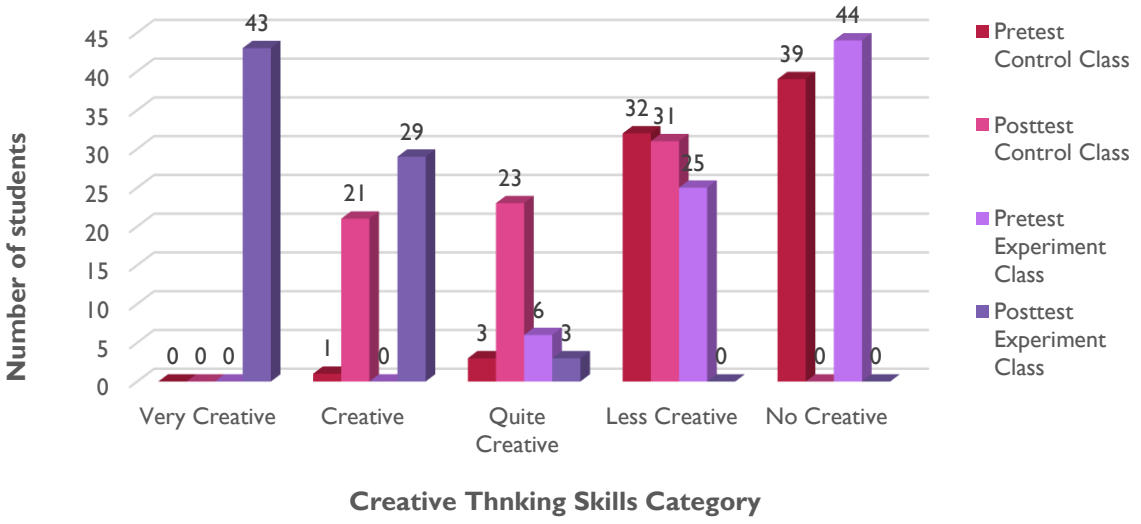

Figure 4. Distribution of creative thinking skills in the control class before and after the implementation of the digital literacy-based PjBL model assessment model

Based on Figure 4, shows that after the implementation of the assessment, there is an increase in the number of students who are categorized as very creative and creative, while students who are categorized as less creative and uncreative experience a decrease in the number. Students with a very creative category are only in the experimental class of 43 students. Students with creative categories in the experimental class were more in the experimental class, namely 29 students while in the control class, there were 21 students. In the less creative category, only 31 students were obtained in the control class. This shows that the application of the digital literacy-based pjBl model assessment can affect and improve creative thinking skills. Overall, the improvement of creative thinking skills before and after the implementation of the digital literacy-based PjBL model assessment calculated using the N-Gain formula can be seen in Figure 5.

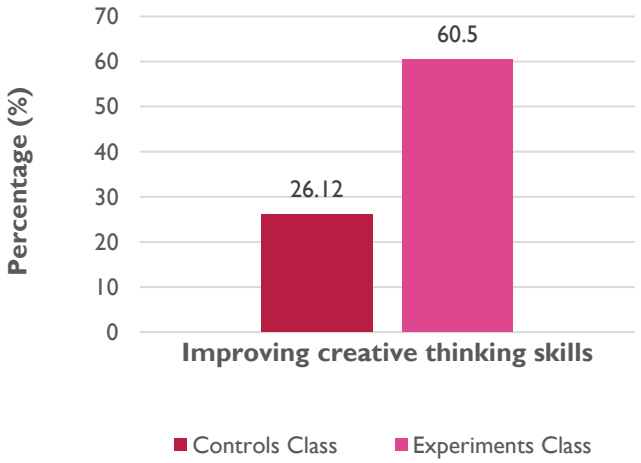

Figure 5. Differences in improving creative thinking skills in Control and Experiment Classes

The results obtained in Figure 5 show that the increase in creative thinking skills is greater in the experimental class, which is 60.5% than in the control class, which is only 26.12%. This indicates that the application of the digital literacy-based PJBL model assessment can stimulate and improve students' creative thinking skills. This increase in skills is due to the PjBL being a student-centered learning method, where they learn through active involvement in relevant and meaningful projects. PjBL encourages students to explore, collaborate, and produce a final product that represents learning outcomes. When PjBL is integrated with digital literacy, students are encouraged to use digital technology in their learning process, such as conducting online research, utilizing digital collaboration platforms, and producing technology-based products (e.g., videos, multimedia presentations, and blogs). From acquiring new viable technology skills to becoming proficient communicators and advanced problem solvers, students benefit from this learning approach. This digital literacy also has a positive influence on motivation in learning which will ultimately affect learning outcomes (Maor et al., 2023; Sumarni & Kadarwati, 2020; Zheng et al., 2024).

Digital literacy refers to the skills to understand, evaluate, and utilize information through digital media. The concept of digital literacy can be multidimensional, encompassing basic knowledge of computers and the Internet, as well as the skills and capacities needed to use digital devices and the Internet as tools for learning, production, communication, and recreation (S. Guo et al., 2024; Lazonder et al., 2020; Park et al., 2021). The application of digital literacy in PjBL in this study can improve students' creative thinking skills, because of wide exploration of information with digital literacy allows students to access a variety of digital resources, giving them more opportunities to explore new and innovative ideas. In line with the opinion of Desmayani, et.al (2024) and Zhang & Ma (Zhang & Ma, 2023) that digital literacy produces the skills to understand, obtain, and use information through facilities such as computers connected to the internet so that the information received can be broader and deeper.

Digital collaboration in the application of the digital literacy-based PJBL model assessment, enables broader social collaboration through online platforms, where students can work together, share ideas, and get real-time feedback, which can trigger the occurrence of creative ideas. This is in line with what Wei (2023) stated that digital literacy includes mastery of professional digital technology skills ("hard skills") as well as emotional literacy, attitudes, and values ("soft skills") to adapt to social life. This includes critical thinking, analytical, problem-solving, innovative thinking, self-management, self-motivation, adaptive skills, and active learning.

4. CONCLUSION

There is an effect of the application of the digital literacy-based PjBL model assessment on improving students' creative thinking skills in high school biology learning with a value of sig. 0.000. The implementation of digital literacy-based PjBL assessment has great potential to improve students' creative thinking skills. The use of digital technology not only provides access to wider information resources but also facilitates collaboration and innovation in project completion. The results of this study can be used as a reference in the development of learning models to improve creative thinking skills as well as digital literacy skills.

5. ACKNOWLEDGMENT

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