Journal of Biology Learning
Vol. 5., No. 2, September 2023, pp. 71-76
ISSN 2623-2243 (print), 2623–1476 (online)
http://journal.univetbantara.ac.id/index.php/jbl/index

Effect of PjBL Model of Diorama Project Making on Student's Creative Thinking Ability and Curiosity on The Matter of Biodiversity

Septia Muliawati [a,1,*], Daru Wahyuningsih [a,2], Annisa Nur Khasanah [a,3]

[a] Science Education Departement, Universitas Sebelas Maret, Surakarta, Indonesia
[1] septiamuliawati7@student.uns.ac.id*; [2] daruwahyuningsih@staff.uns.ac.id; [3] annisanurkhasanah@staff.uns.ac.id
* Corresponding Author

Received July 30, 2023; accepted September 27, 2023; published September 30, 2023

ABSTRACT

This research aims to see the influence of the PjBL model for making dioramas on: (1) Creative Thinking Ability; (2) Curiosity on biodiversity material. This research uses a quasi-experimental quantitative research design, using a group design posttest-only. The sample in this study was class VIIB (control) with a total of 30 students and class VIIG (experiment) with a total of 32 students at SMPN 3 Sukoharjo, Central Java, Indonesia in the 2022/2023 academic year. Data collection on creative thinking abilities was carried out using the test method esssay and for curiosity using a non-test in the form of a questionnaire. The results of the research state that: (1) students' creative thinking abilities using the PjBL model have a significant effect compared to students using the conventional model taught at school. The average score for each class was 73.20 (experimental); 63 (control); (2) curiosity (curiosity) with the PjBL model also has a significant effect compared to students who use the conventional model taught at school with an average score of 70.97 (experiment); 64.91 (control).

KEYWORDS

PjBL Model
Creative Thinking Ability
Curiosity

1. Introduction

The obstacles facing national development in the 21st century present their own complex set of challenges. To overcome these hurdles, students must prioritize skills such as critical analysis, problem solving, creativity and innovation, effective communication, cooperation, and global awareness (Hosnan, 2014). One of the factors that influence education is learning creativity (Beghetto & Kaufman, 2014; Davies et al, 2013). Educational goals can be achieved well if teachers can present learning content to students creatively and diversely, thus fostering students' creative abilities (Maslow, 1954). Education professionals are currently concentrating their efforts, especially in Indonesia, to improve teaching and learning activities in schools by involving teachers and students with various backgrounds, skills, abilities, and characteristics.

Due to these variations, learning as an educational process requires the adoption of appropriate models, methods, strategies, approaches, and procedures to ensure that students have a good and complete understanding of the subject matter (Kartika et al.2019). It cannot be denied that the discussion of the educational process is inseparable from fostering quality human resources, because fostering superior talents in education is certainly one of the goals of national education (Hamalik, 2015; Prasetyo & Hamami, 2020).

Achieving the goals of national education is done by optimizing the mastery of subjects and educational goals. An important tactic used by educators in the pedagogical process is the selection of an appropriate instructional framework. Therefore, the selection of the right learning model can serve as a powerful method to improve the overall quality of education (Tabroni, 2013). Learning is a teacher's conscious effort to educate students in order to achieve the expected learning objectives (Al-Tabany, 2014).

The learning process in schools today still tends to focus on conventional teacher-centered methods. Based on observations in several classes, several indications were found that showed low creative thinking

skills and curiosity among students' passive participation. Students tend to only receive information from the teacher without asking many questions or expressing their opinions. When given the opportunity to ask questions, most students chose to remain silent. Students' lack of initiative is also evident in learning. Students rarely propose new ideas or alternative solutions in solving problems. They prefer to wait for instructions and examples from the teacher. In practicum or project activities, students tend to just follow existing procedures without trying additional variations or experiments. This shows the lack of student exploration. Students also have low divergent thinking skills. When given open-ended questions, most students had difficulty providing diverse and original answers. Students have difficulty looking at problems from different points of view or changing approaches when facing obstacles. This condition shows the need for changes in the learning approach to stimulate students' creativity and curiosity.

Project-based learning is needed to determine its effect on creative thinking skills and curiosity. Project-based learning with dioramas has the potential to improve these skills. Project-based learning (PjBL) has been shown to be an effective approach in improving students' creative thinking skills. This method encourages divergent thinking and intrinsic motivation, which are important components in the development of creativity (Hu & Adey, 2002; Blumenfeld et al., 1991).

The collaboration and exchange of ideas that occur in group projects facilitate synergies that can trigger creative thinking (Bell, 2010). PBL also creates an environment that supports experimentation and intellectual risk-taking, important aspects in the development of creativity (Doppelt, 2003). Furthermore, the integration of cross-disciplinary knowledge in projects encourages students to think creatively in connecting different concepts (Barak & Dori, 2005). This approach also enhances metacognitive skills, allowing students to reflect on and control their own creative processes (Sart, 2014). Last but not least, PBL engages students in activities that require analysis, synthesis, and evaluation, which are essential components of higher-order creative thinking.

One of the projects that can be done by students to be more optimal in improving creative thinking skills and curiosity is a diorama project. Learning by using diorama has shown various advantages in improving students' creative thinking skills and curiosity. Dioramas help students visualize abstract concepts, stimulate their imagination, and encourage creative thinking in representing ideas (Ainsworth, 2008). The process of making diorama involves students actively in learning, increasing their motivation and curiosity to explore the topic more deeply (Kolb, 1984). When conducted in groups, diorama projects facilitate collaborative learning, encouraging the exchange of ideas and perspectives that stimulate creative thinking and curiosity through social interaction (Johnson & Johnson, 2009). Finally, active engagement in diorama making helps students remember information better, encouraging curiosity to deepen their understanding (Mayer, 2009).

This research focuses on the implementation of PjBL with diorama project and its effect on students' creative thinking skills and curiosity. The implementation of PjBL was carried out on biodiversity material. Diversity material is very suitable with diorama project. The urgency of this research is its potential to revolutionize the way biodiversity concepts are taught to students. So far, biodiversity is often seen as an abstract and difficult to understand topic. However, by integrating the Project-Based Learning (PjBL) model through the creation of dioramas, this research opens new avenues to transform abstract concepts into concrete and meaningful learning experiences. More than just improving understanding, this research aims to develop two crucial skills needed in the 21st century: creative thinking and curiosity. In a fast-moving and uncertain world, the ability to think outside the box and be curious are essential assets for students to face future challenges.

2. Method

The method used in this study was a quasi-experimental design, specifically adopting a posttest-only control group design. The participants in this study were students of SMP Negeri 3 Sukoharjo. The sample consisted of two classes, namely class 7B as the control group, and class 7G as the experimental group that applied the PjBL learning model. Evaluation of creative thinking skills was carried out through

the use of creativity observation sheets and non-test methods such as curiosity questionnaires for data collection. To test the hypothesis, independent sample t-test was used. Statistical analysis was conducted using SPSS 23.0 software used for the computational process. If the p value <0.05, the research conclusion is considered significant.

3. Results and Discussion

The research was conducted at SMP Negeri 3 Sukoharjo involving two classes, namely classes 7B and 7G. Class 7B consisted of 30 students who became the control class and followed learning with conventional methods. Meanwhile, class 7G consisted of 32 students who became the experimental class and followed the learning using the (PjBL) model. This research was conducted in 4 meetings (8 JP) both in the experimental and control classes. The results of the descriptive statistical test of creative thinking ability can be seen in Table 1.

Table 1: Descriptive Statistical Test Results of Creative Thinking Ability

Description	*Class*	
	Experiment	*control*
Average	73,20	63
Standard Deviation	20,22	18,60
Varian	408,96	346,29
(N_{min})	25	15
(N_{max})	100	97
Range	75	85

The data in Table 1 shows that the average creative thinking test score of the experimental group is 73.203 compared to the control group of 63. This leads to the conclusion that the average creative thinking test score of the experimental group is higher than the control group. The results of the curiosity descriptive statistical Test can be seen in table 2

Table 2: Curiosity Descriptive Statistical Test Results

Description	*Class*	
	Experiment	*control*
Average	70,97	64,91
Standard Deviation	10,99	12,36
Varian	120,941	152,902
(N_{min})	52,5	42,5
(N_{max})	92,5	85
Range	40	42,5

The data in Table 2 shows that the experimental class has an average result of 70.97, compared to the control class (conventional) which obtained an average of 64.91. This means that there was an increase of 6.06 between the two classes. When looking at the standard deviation, a lower value is considered ideal as it shows a more accurate variance. Overall, both classes can be considered to have accurate values. Data on creative thinking skills and curiosity were then tested for normality (Table 3).

Table 3: *One-Sample Kolmogorov-Smirvnov Test*

Class	*Sig*		*Conclusion*
	Creative Thinking	*Curiosity*	
Experiment	0,200	0,200	normal
Control	0,200	0,200	normal

Based on Table 3, it is known that the significance results of the experimental class data group on creative thinking ability are 0.200 and curiosity is 0.200, while in the control class creative thinking ability is 0.200 and curiosity is 0.200. Both classes have a significance value> 0.005, based on the results

of the analysis and in accordance with the applicable provisions, it can be interpreted that the residual value has a normal distribution.

Levene's Test was used to test the homogeneity of data in this study with the help of the Statistical Product and Service Solutions (SPSS) version 23 application. Data homogeneity testing is carried out to strengthen or prove statistically the equality in the initial conditions of the two subject groups. The significance value of the data which is> 0.05 can be said to be homogeneous. Table 4 describes the results of the homogeneity test in the experimental and control groups.

Table 4: Results of t-test of Creative Thinking Ability

Class	*Average*	*t-test*	*Sig (2-tailed)*	*Conclusion*
Experiment	73,20	2,063	0,043	H_o rejected
Control	63			

Based on the group statistics table 4, the experimental class average is 73.20 while the control class average is 63. From the independent samples test table, the t value obtained is 2.063 with a significance value of 0.043. Based on the sig. (2-tailed) value which is <0.05, it can be concluded that the null hypothesis (Ho) is rejected or in other words there is a significant difference in creative thinking skills between students using the PjBL model and conventional techniques. Thus, it can be concluded that students who receive PjBL model learning have an average level of creative thinking that is 10.2 higher than students who use conventional techniques. The t-test results on curiosity can be seen in Table 5.

Table 5. Curiosity t-test Results

Class	*Average*	*T-test*	*Sig (2-tailed)*	*Conclusion*
Experimen	70,97	2,042	0,046	H_o rejected
Control	64,91			

Based on the data in the table 5, it was found that the average level of "curiosity" in the experimental class was 70.97, while in the control class it was 64.91. The results of the "independent samples test" analysis show that the t value is 2.042 with a significant value of 0.046. Since the significant value is less than 0.05, it can be concluded that the null hypothesis (Ho) is rejected. That is, there is a significant difference in the level of "curiosity" between students taught using the PjBL model and conventional methods. Thus, it can be concluded that students who learn using the PjBL model have a higher level of curiosity than students who follow conventional teaching techniques, with an average difference of 6.06.

The Project-Based Learning (PjBL) model has been proven effective in improving students' conceptual understanding and science process skills. According to research conducted by Krajcik & Blumenfeld (2006), PjBL allows students to engage in authentic inquiry that promotes deep learning and the development of 21st century skills. Another important aspect developed through this approach is curiosity. Engel (2011) emphasizes the central role of curiosity in science education, and how project-based activities can foster it. Making biodiversity dioramas provides a hands-on experience that stimulates students' curiosity, encouraging them to explore more about biodiversity.

Çil (2014) showed that the use of models and visual representations such as dioramas can significantly improve students' understanding of ecology and biodiversity concepts. These visualizations help students understand complex concepts in a more concrete and memorable way. Furthermore, the biodiversity diorama project integrates various disciplines, including biology, art, and design. Although it has many benefits, the implementation of PjBL with diorama making also faces challenges. Bradley-Levine & Mosier (2014) identified several challenges in PjBL implementation, including time management and effective assessment. The PjBL model with the creation of biodiversity dioramas has great potential to improve students' creative thinking skills and curiosity. This approach not only improves conceptual understanding of biodiversity, but also develops important skills such as creativity, problem solving, and environmental awareness. However, effective implementation requires careful

planning and consideration of potential challenges. Further research is needed to measure the long-term impact of this approach and optimize its implementation in various educational contexts.

4. Conclusion

Based on the results of the research and discussion, it can be concluded, the research conducted shows that the use of project-based learning models (PjBL) is superior to students who use conventional models in terms of creative thinking. This is shown in the results of the independent sample t-test, obtained a t value of 2.063 with sig (2-tailed) 0.043. Based on the sig (2-tailed) value <0.05, this means reject H_o or can mean that there is a significant difference in the creative thinking ability of students taught using the PjBL model and the conventional model. On the effect of the use of PjBL model of diorama making on curiosity. This is indicated by the independent sample t-test of PjBL learning model on curiosity obtained by 0.046. If the 2-tailed t-test value shows a number less than 0.005 (<0.05, H_o is rejected), it means that the data has a significant effect.

Based on the research that has been carried out, it is hoped that future studies can be carried out in applying the PjBL model further regarding the influence of internal factors and other variables on creative thinking, especially project production skills. Schools should do more to incentivize educators to adopt diverse and meaningful ways of learning, so that all potential skills that students have can be developed to best achieve learning objectives.

References

Ainsworth, S. (2008). The educational value of multiple-representations when learning complex scientific concepts. In *Visualization: Theory and practice in science education* (pp. 191-208). Dordrecht: Springer Netherlands.

Al-Tabany, B. I. T. (2017). *Mendesain Model Pembelajaran Inovatif, Progresif, dan Kontekstual*. Jakarta: Prenada Media.

Barak, M., & Dori, Y. J. (2005). Enhancing undergraduate students' chemistry understanding through project-based learning in an IT environment. *Science education*, *89*(1), 117-139.

Bradley-Levine, J., & Mosier, G. (2014). Literature review on project-based learning. *University of Indianapolis Center of Excellence in Leadership of Learning*

Beghetto, R. A., & Kaufman, J. C. (2014). Classroom contexts for creativity. *High ability studies*, *25*(1), 53-69.

Bell, S. (2010). Project-based learning for the 21st century: Skills for the future. *The clearing house*, *83*(2), 39-43.

Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational psychologist*, *26*(3-4), 369-398.

Çil, E. (2014). Teaching nature of science through conceptual change approach: conceptual change texts and concept cartoons. *Journal of Baltic Science Education*, *13*(3), 339-350.

Davies, D., Jindal-Snape, D., Collier, C., Digby, R., Hay, P., & Howe, A. (2013). Creative learning environments in education—A systematic literature review. *Thinking skills and creativity*, *8*, 80-91.

Doppelt, Y. (2003). Implementation and assessment of project-based learning in a flexible environment. *International journal of technology and design education*, *13*, 255-272.

Engel, S. (2011). Children's need to know: Curiosity in schools. *Harvard educational review*, *81*(4), 625-645.

Hamalik, O. (2015). *Kurikulum dan Pembelajaran*. Jakarta : Bumi Aksara.

Hosnan. (2014). *Pendekatan Saintifik dan Kontekstual dalam Pembelajaran Abad 21*. Bogor: Ghalia Indonesia.

Hu, W., & Adey, P. (2002). A scientific creativity test for secondary school students. *International Journal of Science Education*, *24*(4), 389-403.

Johnson, D. W., & Johnson, R. T. (2009). An educational psychology success story: Social interdependence theory and cooperative learning. *Educational researcher*, *38*(5), 365-379.

Kartika, Y. K., Pujiastuti, E., & Soedjoko, E. (2019). The effectiveness of project based learning with creative mind-map tasks for improving mathematical connection ability and student curiosity. *Unnes Journal of Mathematics Education*, *8*(2), 145–151.

Krajcik, J. S., & Blumenfeld, P. C. (2006). *Project-based learning* (pp. 317-34). na.

Kolb, D. A. (2014). *Experiential learning: Experience as the source of learning and development*. FT press.

Maslow, A. (1954). *Motivation and Personality*. New York: Harper & Row.

Mayer, R. E. (2002). Multimedia learning. In *Psychology of learning and motivation* (Vol. 41, pp. 85-139). Academic Press.

Prasetyo, A. R., & Hamami, T. (2020). Prinsip-prinsip dalam pengembangan kurikulum. *Palapa*, *8*(1), 42-55.

Sart, G. (2014). The effects of the development of metacognition on project-based learning. *Procedia-Social and Behavioral Sciences*, *152*, 131-136.

Tabroni, T. (2015). Upaya Menyiapkan Pendidikan Yang Berkualitas. *Al-Fikrah: Jurnal Kependidikan Islam IAIN Sulthan Thaha Saifuddin*, *6*(5), 56–66.