



Correlation of creative thinking abilities and student learning outcomes through the application of ethnoscience-based project-based learning methods

Pramita Wally ^{1,a}, Andi Sitti Marwah ^{1,b}, Ivatul Laily Kurniawati ^{1,c,*}

¹ Education of Biology, Universitas Muhammadiyah Maluku, Ambon, Indonesia

Email: pramitawally3@gmail.com ^{1,a}, andisittimarwah08@gmail.com ^{1,b}, laily.ivatul@gmail.com ^{1,c,*}

* Corresponding author

Article Information	ABSTRACT
<p>Article History: Submitted: 2024-07-22 Revision: 2024-09-05 Accepted: 2024-09-11 Published: 2024-09-11</p> <p>Keywords: Creative thinking; ethnoscience; PjBL</p>	<p>Educators in the 21st century are challenged to be able to design and determine learning methods according to the concept of local wisdom that will be taught to improve creative thinking skills and learning outcomes. This study aims to determine the relationship between the level of creative thinking and student learning outcomes through the application of ethnoscience-based project-based learning (PjBL). This type of research is a quantitative study using a pre-experimental design with the type of one-group design. The sample in this study was the 3rd-semester biology class of the Biology Education Study Program, Muhammadiyah University of Maluku, totaling 20 students. The independent variable in this study is the ethnoscience-based project-based learning model. In contrast, the dependent variable is student learning outcomes and students' creative thinking abilities in herbal botany courses. The types of research instruments used were questionnaires and essay tests, comprising 15 items. The data found were then analyzed using the product-moment correlation test to determine the relationship with SPSS version 23 at a significance level of 0,05. The results of this study indicate that there is a positive relationship between the level of creative thinking of students and learning outcomes as shown by the results of the regression test of 5.6%. so it is suggested to lecturers or teachers to further improve creativity and student learning outcomes so that project-based learning methods based on ethnoscience can be used.</p>
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INTRODUCTION

Education is a technique that allows humans to survive consciously and playfully. It is proven that humans must adapt to the acceleration of development over time. Every human being must receive a proper education. Law Number 20 of 2003 concerning the aim of National education is to develop the potential of students to become human beings who believe and are devoted to God Almighty, capable,

creative, independent, have noble character, healthy, knowledgeable, and become democratic and responsible citizens (Maulida, 2022). Education can also help one grow one's potential intellectually and emotionally, which can make a person better. Based on this, education is essential in preparing quality human resources. The success of education in the era of the Industrial Revolution 4.0 is a challenge for teachers to produce a quality generation.

The education system needs new movements to respond to the industrial era 4.0. One of the movements launched by the government was the new literacy movement, which strengthened and even displaced the old literacy movement. The intended new literacy movement focuses on three main literacies, namely, 1) digital literacy, 2) technological literacy, and 3) human literacy. These three skills are predicted to be needed in the future or the industrial era 4.0. Digital literacy aims to improve the ability to read, analyze, and use information in the digital world (big data), technological literacy aims to understand how machines and technological applications work, and human literacy aims to improve communication skills and mastery of design science. The new literacy provided is expected to create competitive graduates by perfecting the old literacy movement, which only focused on improving reading, writing, and mathematics skills. Adapting this new literacy movement can be integrated by adjusting the curriculum and learning system to respond to the industrial era 4.0 (Yahya, 2018).

In the future, the role and presence of teachers or lecturers in the classroom will be increasingly challenging, even threatened, and require a very high level of creativity. The revolution requires students to think creatively and innovatively to compete and create jobs based on the Industrial Revolution 4.0. Of course, a teacher must first be creative and innovative to pass it on to his students. The digital era, or the current era of disruption, encourages us to increase technological literacy to support learning innovation (Suprihadi & Ma'rifah, 2022). Learning innovation must always be carried out by teachers or lecturers. This is done to provide learning that can shape students' competencies by the competencies they want to achieve. Learning that is interesting, fun, effective, creative, innovative, meaningful, challenging, etc., are forms of learning that educators hope to develop. Apart from that, it needs to be realized that developing biology learning must be integrated with the support of exciting learning media and appropriate learning strategies and models (Hutomo et al., 2021). The issue addressed in this research is the low level of creativity and student learning outcomes. Therefore, lecturers, as 21st-century educators, face the challenge of designing and selecting learning methods aligned with the concept of local wisdom. This study aims to examine the relationship between creative thinking skills and student learning outcomes through the implementation of ethnoscience-based project-based learning (PjBL).

One of the lecturers' efforts to increase students' creative thinking power is using innovative learning models. One of the newest learning models in the campus world that can enliven the learning atmosphere is the project-based learning (PjBL) learning model. Choosing a project-based learning model is appropriate when combined with proper learning materials. According to Marshella et al., (2022), the project-based learning model is an innovative, student-centered learning model while the lecturer is a facilitator and motivator. The application of projects in learning allows students to build their learning. The project-based learning model is a learning model that involves a project in the learning process. This learning model can direct students to build their creativity based on experience, thereby increasing their learning activities (Cahyani, 2021; Hastuti et al., 2023). This project-based learning model comprises problem-solving activities, decision-making, investigation, and project-creation skills. In this way, students can be actively involved in every learning process to build knowledge in the context of their own experiences (Hikmawati, 2022).

Knowledge in the learning process that is built can be integrated with culture according to the learner's concept. Knowledge in the built learning process can be integrated with culture according to the ethnoscience-based learning concept. Ethnoscience (ethnos) comes from Greek, which means nation, and scientia comes from Latin, which means knowledge. Based on this description, ethnoscience can be interpreted as the knowledge of a nation, tribe, or social group in the form of local wisdom. Learning in the 4.0 era by touching on ethnoscience can encourage lecturers and educational practitioners to teach science based on cultural values, local wisdom, and problems that exist in society. In this way, students can apply the science they learn in class and then creatively apply it to solve problems they encounter in everyday life to have meaningful learning (Nuralita, 2020). Based on the explanation of this concept, the project-based learning model based on ethnoscience on endemic Maluku plants, packaged in herbal botany learning, can increase creative thinking and student learning outcomes.

The existing literature highlights the importance of innovation in education, especially in the context of the 4.0 era. However, there is a clear gap in practical strategies and empirical research on how to integrate ethnoscience-based PjBL to improve creativity and learning outcomes, particularly in regions with rich cultural knowledge like Maluku. The proposed research aims to fill this gap by examining the relationship between creative thinking and learning outcomes through the application of ethnoscience-based PjBL. The research aims to determine the relationship between the level of creative thinking and student learning outcomes by applying ethnoscience-based project based learning (PjBL).

RESEARCH METHODS

This type of quantitative research uses a pre-experimental design with a one-group pretest-posttest design. The sample in this study was determined using a random sampling technique where samples were taken based on classes, not individuals. The sample in this study was 20 students in 3rd-semester biology education students. The independent variable in this research is the ethnoscience-based project-based learning model. In contrast, the dependent variable is the relationship between student learning outcomes and students' creative thinking abilities in herbal botany courses. Two types of research instruments were used: questionnaires and tests. Questionnaire via questionnaire to see the implementation of the PjBL model, which contains 15 statement items that refer to 4 indicators of creative thinking, namely fluency of thinking, flexibility of thinking (flexibility), elaboration (elaboration), and originality (originality). This questionnaire instrument measures students' creative thinking abilities after implementing the ethnoscience-based project-based learning model regarding the use of Maluku endemic plants. Meanwhile, to see student learning outcomes, an essay test is used to ensure a comprehensive understanding of learning concepts.

The research results were analyzed in stages, namely, data description in the form of implementing the learning model on learning outcomes and hypothesis testing based on product moment correlation and regression to see the relationship using the SPSS program. Meanwhile, to find the implementation of the PjBL learning model on student learning outcomes, use a presentation formula by paying attention to the criteria (Mirawati & Yuwono, 2020), which can be seen in Table 1.

Table 1. Learning Model Implementation Criteria

Score	Model Implementability	Category
85-100	75-100%	Very Good
70-84.99	49.98-74.98%	Good
50-69.99	24.98-49.97%	Pretty good
< 49.99	< 24.97%	Not good

FINDING AND DISCUSSION

This research was conducted on 20 students in 3rd-semester biology education students at the Muhammadiyah University of Maluku in the herbal botany course. The research analyzed learning outcomes and students' creative thinking abilities after implementing the ethnoscience-based PjBL model. Lecturers carried out the integrated ethnoscience learning in this research to highlight the potential of the nutmeg plant as a typical plant endemic to Maluku to become an herbal medicinal product, which was packaged as student learning material in the form of an online module. This teaching material is a source of ethnoscience for students to gain knowledge according to cultural values, local wisdom, and real problems that exist in society. The student learning outcomes after implementing the ethnoscience-based project-based learning model can be seen in [Table 2](#).

Table 2. Student Learning Outcomes Results

Component	Average (%)	Description
<i>Pre-test</i>	54.75	Lack of understanding
<i>Post-test</i>	87.87	Very understanding

[Table 2](#) shows that the average student learning outcomes after implementing the ethnoscience-based project-based learning model in the Maluku endemic plants course increased by 33.12%. These results show that students' mastery of the material concept can be understood. Furthermore, to measure the implementation of the learning model based on student learning outcomes, it is presented in [Table 3](#).

Table 3. Implementation of the Learning Model

Range of Learning Outcome	Scores Presentation	Range of Category Model Implementation
85-100	75-100%	Very Good
70-84.99	45-74.99%	Good
50-69.99	25-49.99%	Pretty good
< 49.99	< 24.99%	Not good

[Table 3](#) shows 9 students achieved the implementation of the learning model in the very good category (75-100%) because they had a learning outcome score of 85-100, while the other 6 students only had the implementation of the model in the good category (49.98-74.99) with a score range between 70-84.99. The high achievement of student learning outcomes is due to students' direct activity in learning. Students can directly collaborate and discuss with other students to solve problems and complete projects as best as possible. These results prove that implementing the project-based learning method received a positive response from students. This methodology is exciting for students studying project learning because it is a new way of learning from the 21st century in herbal botany courses. Compared to learning using conventional models, they feel challenged and energized by this treatment ([Andini & Rusmini, 2022](#)).

The results of the analysis of the achievement of students' level of creative thinking obtained from the results of the questionnaire analysis after the lecturer implemented an ethnoscience-based project learning model in the herbal botany course showed a presentation of each indicator of students' creative thinking abilities which included fluency of thinking of 19.78%, skills flexible thinking (flexibility) of 19.68%, detailing skills or (elaboration) of 26.70% and original thinking skills (Originality) of 33.82%. It can be seen in [Figure 1](#).

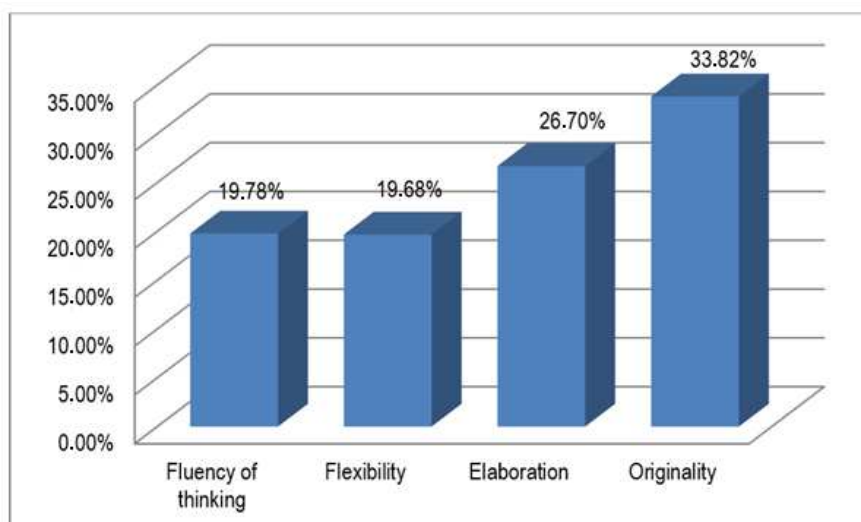


Figure 1. The results of the analysis of the achievement of students' level of creative thinking

The diagram above shows that biology education students have creative abilities in participating in learning in herbal botany courses. This is proven by the fulfillment of 4 indicators of creative thinking, which include fluency, flexibility, elaboration, and originality. This result can be achieved because appropriate learning methods prove that project-based learning can foster student learning activities and improve learning outcomes (Astuti et al., 2022). Apart from that, Susilo et al. (2018) stated that project-based learning emphasizes that students work independently in their learning and accumulate it in the form of natural products. By learning ethnosience-based project-based learning, students get used to solving real problems. Students will also learn to carry out investigations and complete projects. The role of the lecturer is to present problems, design questions, facilitate investigations, and provide guidance during the implementation of project assignments. The hope is that giving project assignments can increase student creativity.

Students need to have creative thinking skills because it is one of their abilities to face the demands of the 21st century (Putri et al., 2022). By developing ethnosience-based creative thinking skills in biology education study program students, students will form beneficial thinking habits to solve various real problems based on their local wisdom (Usmaldi & Amini, 2022). Likewise, Ariyatun (2021) revealed that the ethnosience approach in the classroom can improve students' creative thinking abilities because it can connect the knowledge learned with concepts and technology in everyday life. The results of the correlation between the level of creative thinking and student learning outcomes can be seen in Table 4.

Table 4. Relationship between Levels of Creative Thinking and Student Learning Outcomes

Variables		Creative Thinking	Learning outcomes
Creative Thinking	Pearson Correlation	1	.238
	Sig. (2-tailed)		.394
	N	15	15
Learning outcomes	Pearson Correlation	.238	1
	Sig. (2-tailed)	.394	
	N	15	15

Based on Table 4 shows that the calculated r is (0.238) > r table, meaning that there is a relationship between the level of student's creative thinking and student learning outcomes. This correlation is in the medium category (Manaf et al., 2022). Thus, it can be interpreted that if student

creativity is high, their learning outcomes will increase. These results are from research conducted by (Laelasari & Sholehah, 2021), which shows a reasonably strong correlation between creativity and student learning outcomes. Creativity can be created by applying appropriate learning, namely the ethnoscience-based project-based learning method. This method can make students actively involved in recognizing objects, symptoms, and problems that occur, analyzing them, drawing conclusions, and creating projects according to the scientific principles they have obtained. Simple linear regression test results can be seen in Table 5.

Table 5. Simple Linear Regression Test Results

Model	R	R Square	Adjust R Square	Std. Error of the Estimate
1	.238 ^a	.056	-.016	5.26097

The regression test results in Table 5 show that the R square value shows a positive relationship of 5.6% between the level of creative thinking and student learning outcomes. Therefore, creativity must be integrated into the tertiary-level education system for lecturers to develop their learning media and for students in their learning. In learning, student learning activities and activeness greatly determine the success of student learning outcomes. Thus, using an ethnoscience-based project-based learning model is the proper method to help students become more creative in learning (Warju et al., 2020). Learning outcomes can also improve and help students understand the material independently. Djamarah in (Marshella et al., 2022) stated that learning while doing activities brings more results for students because the impression that will be obtained is more long-lasting and stored in the minds of each student. Students are also involved in solving problems and making decisions through various activities to facilitate the process of storing cognitive memory more permanently (Amsikan, 2022).

The student activity in this research concerns the Maluku endemic herbal planting project, which the lecturer is responsible for completing. This project-based learning focuses on questions or problems that encourage the implementation of concepts and principles expected to produce a product in project work that has been carried out based on facts. Mayangsari (2017) states that project-based learning focuses on problems that require concepts and principles to be solved. Projects encourage students to gain significant learning experience. Projects prioritize autonomy, choice, work time that is not complicated, and student responsibility so that the project can be completed properly (Syukriah et al., 2020). Apart from that, in the project-based learning assessment process, it can be seen that students become more active, confident, and responsible in completing their projects (Fadillah et al., 2021). Apart from that, in the project-based learning assessment process, it can be seen that students become more active, confident, and responsible in completing their projects (Widiana et al., 2021). Therefore, the ethnoscience-based project-based learning method can improve creative thinking abilities and student learning outcomes in the 4.0 era.

CONCLUSION

The data found were then analyzed using the product-moment correlation test to determine the relationship with SPSS version 23 at a significance level of 0,05. The results of this study indicate that there is a positive relationship between the level of creative thinking of students and learning outcomes as shown by the results of the regression test of 5.6%. So it is suggested to lecturers or teachers to further improve creativity and student learning outcomes so that project-based learning methods based on ethnoscience can be used. This study explores the correlation between students' creative thinking skills

and their learning outcomes through the application of the ethnoscience-based project-based learning (PjBL) method. Ethnoscience, which integrates local cultural knowledge into science education, serves as the basis for the project-based learning approach. This study aims to determine whether encouraging creative thinking through culturally relevant projects can improve students' academic performance. The findings indicate that this method fosters critical and creative thinking skills, leading to improved student learning outcomes. This approach highlights the importance of integrating local wisdom with educational strategies to optimize student engagement and achievement.

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