

Analysis of Students' Creative Thinking Abilities Through Project-Based Learning in Environmental Knowledge Courses

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Abstract: The competency of creative thinking for students is very important in the era of global competition because of the level of complexity. This is because creative thinking skills are included in the six competencies that must be possessed in competition in the 21st century. This is because creative thinking skills are included in the six competencies that must be possessed in facing competition in the 21st century. Project-based learning is one method that can be used to train and improve students' creative thinking skills. This research aims to analyze students' critical thinking abilities through a project-based learning model in environmental knowledge courses. The method used in this research is descriptive. The research subjects consisted of 38 participants. The instrument used in this research is an essay test, and four indicators of creative thinking skills are considered: fluency thinking, flexible thinking, original thinking, and elaboration ability. The data analysis technique used is descriptive. The research results show that students' creative thinking abilities in environmental knowledge courses are in the high (creative) category, with a total score for all indicators is 74,75. It indicates that project-based learning is an effective strategy adapted to train and improve students' creative thinking abilities. Project-based learning is an innovative student-centered learning method where students can work autonomously to construct their learning. This is thought to cause students' creative thinking ability scores in environmental knowledge courses to be in the high category.

Keywords: Creative Thinking Ability; Project-Based Learning

Introduction

Preparing human resources who master 21st-century skills will be effective if pursued through education. Education becomes a chief tool for individual and societal development, enabling access to broader knowledge and opportunities. The 21st century emphasizes more meaningful learning when students do not just focus on completing the material but train to have skills [1]. Education is a learning and teaching process that aims to transfer knowledge, skills, values, and social norms from one generation to the next [2] and is a means by which students are assembled to become capable, independent, strong-minded subjects, creative thinking, innovation, and professionalism [3]. It is hoped that 21st-century learning emphasizes the development of 6 skills known as the 6Cs, namely critical thinking, creativity, culture, collaboration, communication, and connectivity [4], which can train students to be used to communicate well and have cohesiveness in working together, critical in facing problems, creative and innovative in all fields [5].

Environmental knowledge is a mandatory subject for students in teaching and science faculties. After programming this course, students are expected to understand concepts related to the environment, be competent in identifying problems that occur in the environment, find appropriate solutions to solve problems and become human beings who are aware of the importance of protecting the environment. To be able to achieve this,

students are expected to be able to develop their creative thinking abilities. Creative thinking skills have a crucial role in developing students' self-development, especially in science learning, to solve problems faced in the future [6].

Creative thinking is a person's skill in analyzing new knowledge, as well as combining unique ideas or concepts to solve a problem [7] through developing a solution [8], which can stimulate students to develop high-level thinking skills [9]. Results of the Global Creativity Index in 2015 show that creative thinking skills in Indonesia are still low, occupying 115th place out of 139 countries (Dewi et al., 2019). Creative thinking skills include four indicators: (1) Fluency thinking, namely the achievement of this indicator, students can find ideas for answers to solve problems; (2) Flexible thinking, the achievement of this indicator means students can provide varied solutions (from all angles); (3) original thinking, this indicator is achieved when students can produce unique answers (using their language or words that are easy to understand); and (4) elaboration ability, the achievement of this indicator is that students can expand an idea or explain in detail an answer [11].

Project-based learning is one approach that can be used to train and improve students' creative thinking skills. This is because the syntax of the project-based learning (PjBL) model directs PjBL to have the potential to empower social skills and creative thinking [12]. Through project-based learning, it is hoped that students will be able to train and develop creative thinking skills to face increasingly complex future challenges. Environmental knowledge is a

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course that discusses various issues related to problems in the surrounding environment. By implementing project-based learning, students are better trained to hone their creative thinking skills because they are faced directly with real experiences in the projects given. Project-based learning is an innovative learning strategy that aims to help students build solid and meaningful knowledge and skills through authentic assignments and work and building knowledge through real-world experience [13].

This research aims to describe students' creative thinking abilities through project-based learning implementation in environmental knowledge courses. The lack of articles discussing the application of project-based learning in environmental knowledge courses is also why this research is crucial to complete.

Research Methods

The method used in this research is descriptive. This study was held from 15 July until 15 August 2023 at Buton Muslim University. The research subjects consisted of 38 participants. The instrument used in this research is an essay test and load indicators of creative thinking skills. The data analysis technique used is descriptive. The formula for determining the percentage of students' creative thinking scores adapted from [14] :

$$\text{Creative thinking} = \frac{\text{Score obtained}}{\text{Maximum score}} \times 100$$

The categories for assessing students' creative thinking abilities [14] are noticeable in the following table.

Table 1. Creative Thinking Skill Category

Range Of Total score	Category
81 – 100	Very High
61 – 80	High
41 – 60	Medium
21 – 40	Low
0 – 20	Very Low

Results and Discussion

Creative thinking is one of the 21st-century skills that one must have in order to meet the challenges of the future. Creative thinking is a high-level theory ability to create innovative thinking to solve an issue [15]. Creativity plays a great role for each student's overall growth and personality [16]. Therefore, every individual must have it. The results of student's creative thinking skills in environmental knowledge courses by applying the project-based learning model are presented in the following table.

Table 2. Results of Student Critical Thinking Skills

Indicator	Score	Kategori
Fluency thinking	75	High
Flexible thinking	73	High
Original thinking	73	High
Elaboration ability	78	High
Total	74.75	High

Table 2 shows that students' creative thinking skills for the fluid thinking indicator have an average score of 75, including in the high (creative) category. Students can write relevant and correct answers according to the flexible question requirements. The thinking indicator has an average value of 73 and is included in the high (creative) category. That is probably because the students may be capable of giving the correct answer in one phase of the process, but the responses are not variative. The original thinking indicator has an average value of 73, which puts it in the high (creative) category. That is probably because the students could answer questions in a language they had prepared correctly according to the actual concept, and the elaboration ability indicator has an average value of 78, which is also considered. In the high (creative) category, this is probably because the students were able to answer questions in detail and correctly from different perspectives using language they had put together they selves. These results align with [17] research: students' ability on the elaboration indicator is in the good category because students can understand problem information and describe the solution to the problem correctly and detail it in detail so they can make the right conclusions. The overall score of students' creative thinking skills is 74.75, included in the high category.

That indicates that students' creative thinking skills in environmental knowledge courses are considered good (creative) through the project-based learning model, as the scores obtained range from 73 to 78. Hasil ini sejalan dengan penelitian yang dilakukan oleh [18] kemampuan berpikir kreatif siswa meningkat dari 72 menjadi 94 melalui pembelajaran berbasis proyek. Implementing project-based learning in the environmental knowledge course was delivered theoretically and through direct practices in making a work. This was expected to stimulate students to think creatively and work together to complete the project. Students' creative thinking skills can be complemented through classroom learning activities, discussions, projects, and problem-solving [19]. That is consistent with research findings [20] that application project-based learning can improve students' creative thinking skills because students are more active in constructing knowledge [21].

These results show that project-based learning is a strategy capable of training students' creative thinking skills through a series of learning activities. Project-based learning corresponds to the ideal learning components for students because students' competitive spirit is accelerated through a group system, learning projects are remembered longer because the information students receive is based on direct experience, and students are helped through discussions. Tutors are afforded incentives in the form of media - concrete media provided by teachers and students leads to social interactions that support them to be actively involved in learning [22]. Project-based learning is a positive and efficient way to improve learning performance, retention, and functionality [23].

Based on research has been holding on, it shown that project-based learning can improve students' thinking abilities [24] and can increase spatial thinking abilities, which are part of creativity because (1) students are challenged to solve real problems, (2) students are increasingly active in learning, (3) students' performance during project implementation is more regular, (4) students

have freedom in completing projects, and (5) students are enthusiastic about competing to produce the best project [25].

The results of research on the effectiveness of implementing project-based learning have been widely carried out and proven to not only be able to increase creative thinking ability, but it can also increase student competence in various aspects at every level of education, from elementary to higher education. It is relevant to research results [26] that project-based learning can increase creativity and learning outcomes [27] as well as the critical reasoning abilities of elementary school students [28], able to increase understanding of concepts, motivation, and interest of junior high school students [29] and can improve the critical thinking skills of high school students [30].

Conclusion

Based on the research and discussion results, it is concluded that project-based learning is very effective in improving students' critical thinking skills in environmental knowledge courses, with a total score for all indicators of students' creative thinking abilities of 74.75, and is included in the high category.

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