THE ROLE OF BIO-ENTREPRENEURSHIP IN IMPROVING STUDENT CREATIVE THINKING

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ABSTRACT

Education is very essential, particularly in this era of globalization. Rapid advances in science and information technology have been made in many spheres of life. Each person must adjust to changing circumstances. Therefore, abilities are required to assist with this condition. Creative thinking is one competence that is possessed. This study aimed to assess the creative thinking capacity of students who employ the Bio-Entrepreneurship (BEP) learning approach. This study used a quasi-experiment with a non-equivalent control group design. The study consisted of a population of 138 class XII MIPA students at SMA Negeri 4 Parepare. Through purposive sampling, 67 students were selected as the sample, with 33 in the control group and 34 in the experimental class group. The tools used for data collection were observation sheets and creative thinking ability tests. Data analysis used descriptive and inferential analysis, which included homogeneity tests, hypothesis tests, and normality. The result showed that the experimental group had an average creative thinking ability value of 70,569, and the control group was 65,965. The calculated t-value (4.889) exceeded the critical t-value (1.998) with a significance level of $0.00 < 0.05$. So, there is a significant difference between the creative thinking abilities of students who taught with and without using the Bio-Entrepreneurship (BEP) approach in biotechnology material for class XII of SMA Negeri 4 Parepare. The implications of this study can strengthen the theory that the BEP approach can significantly improve students' creative thinking abilities and provide benefits for students, teachers, and researchers themselves in implementing and applying different learning approaches than before, especially in enhancing creative thinking abilities.

Keywords: Bio-Entrepreneurship, Biotechnology, Creative Thinking

1). INTRODUCTION

Education is crucial, especially in the era of globalization, since a nation will progress if its citizens have an excellent education. Therefore, every country always encourages its citizens to pursue education by providing supporting facilities and infrastructure. Indonesia has to support its education, as stated in Article 3 of Republic of Indonesia Law Number 20 of 2003, concerning the national education system, so the state is to educate its citizens to become more advanced. Seeking knowledge is an obligation for every human being. Through education, humans can develop all their potential and be creative for themselves and others. As a result, educators must engage with students,

particularly throughout the learning process, to ensure a comprehensive understanding of learning objectives (Parwati et al., 2021). Student involvement is necessary during the learning process because each student has uniqueness and abilities (Hidayat & Abdillah, 2019). However, at the secondary school level, student learning activities do not maximize high-level thinking skills but still emphasize the basic level (Suparman & Husen, 2015).

Rapid advances in modern science and information technology are increasingly penetrating various aspects of lives. Talented individuals who can quickly adapt to new circumstances are essential. Nowadays, learners need to have skills. The skills are called 4C, or creative thinking, critical thinking, collaboration, and communication (Nugraha & Syafi'ah, 2020).

Creative thinking and reflective thinking are two types of thinking talents. Humans are capable of creative and reflective thinking; the first, innovative thinking, is interpreted as someone being able to produce and convey something unique from the general, while the second, reflective thinking, is someone being able to sort and choose the knowledge they have in solving problems (Crow & Crow, 1984). According to the findings, students must possess the ability to think creatively, which includes understanding both creative and reflective thinking skills. It will enable them to generate diverse and innovative ideas and solutions, particularly in educational learning.

The ability to think with flexibility, originality, fluency, and elaboration are characteristics of creative thinking skills (Filsaime, 2008). The involvement of students and teachers with each other and their environment will foster innovative thinking. In the sharing process, new ideas or concepts solve problems rationally without offending or blaming other opinions. Creative thinking skills are high-level competencies as they enhance and broaden fundamental cognitive abilities. (Nia Sintia, 2022). Developing creative thinking skills using conventional learning methods, where educators are the center of learning, is no longer relevant today. Old methods can limit interaction and the use of technology-based resources as well. Conversely, unconventional learning methods promote students' creative and critical thinking abilities by encouraging them to generate conceptual frameworks that enhance their understanding of the material. This method causes more intense interaction between students, thus generating ideas from discussion activities and working in groups, which are carried out in class and outside the classroom (Nurlaela et al., 2019).

There are various learning approaches are known. Therefore, educators develop efficient learning approaches, have the knowledge and concepts to practice the method, and be understood by students. Educators lack comprehension of this condition to employ a path that does not effectively enhance student involvement in the learning process, failing to contribute substantially to student learning outcomes (Aunurrahman, 2009). Initial observations revealed that educators were more dominant in the learning process. The teachers still used conventional teaching methods (lectures), where students only became listeners. The teacher subsequently delivered the material, followed by the students summarizing the teacher's explanation. This resulted in no feedback, questions, or responses to the material discussed during the learning process. As a result, students were less enthusiastic and interested in learning. This conventional method caused students' scores to be below the KKM (minimum completion criteria) standard, which was 60. In interviews with biology teachers for class XII of SMA Negeri 4 Parepare, the average daily score of students with 138 students, only 60 (43.48%) reached the minimum learning completion value.

Meanwhile, 78 students (56.52%) were below the average score of 60. One factor that caused some students not to achieve the minimum competency criteria (KKM) score was a lack of maximizing students' creative thinking skills.

It is known that creative thinking skills are important in improving students' learning outcomes. One function of creative thinking is to increase enthusiasm for learning, stimulate the learning process so that better results are received, and help them place themselves in the right conditions and situations (Salsabila & Ramdhini, 2020). This was also confirmed by the biology teacher of class XII SMA Negeri 4 Parepare, who said that their students find it challenging to express new ideas or concepts, which is one of the essential aspects of creative thinking skills. Based on the initial study, showed that 54 students (39.13%) had creative thinking skills, while other students (60.87%) had low creative thinking skills. In addition, teachers only assess students' cognitive abilities. Creative thinking skills have not been optimally empowered, so some students have low creative thinking skills.

In response to these conditions, a teacher can take bold steps and think imaginatively in determining an approach to carrying out learning tasks for students so that learning objectives are achieved and fulfilled. One of them is applying the Bio-Entrepreneurship Learning Approach or BEP not just for better understanding but also for students' daily lives.

The BEP learning approach is perceived as a pedagogical method that incorporates entrepreneurship principles. It will produce new and innovative ideas or works that have sales value by utilizing living things or their components in implementing them. This BEP learning approach is expected to improve students' creative thinking skills and be able to apply them in their daily lives, especially in biology and biotechnology materials. This study aimed to assess the creative thinking capacity of students who employ the Bio-Entrepreneurship (BEP) learning approach.

2) METHODS

This study used a quasi-experimental research type with a Non-Equivalent Control Group Design research design. The population in this study was 138 students of class XII MIPA SMA Negeri 4 Parepare, with 34 people in the experimental class (XII MIPA 4) and 33 people in the control class (XII MIPA 3). The research instruments used to collect this data were observation sheets and creative thinking ability tests. The analysis techniques in this study were descriptive analysis and inferential analysis.

3) RESULTS AND DISCUSSION

Based on the analysis, it was found that the class XII MIPA 3 pretest score, which was used as a control group to determine whether to use the Bio-Entrepreneurship (BEP) learning approach or direct instruction with conventional learning methods, resulted in an average posttest score of 65.965 and an average creative thinking ability of 62.768. There were no students who obtained very high scores on the pretest and posttest, with students in the medium category (5 students) and high category (28) on the posttest (table 1.).

Table 1. Creative Thinking Ability Category in Control Class

Total Score Range (%)	**Frequency**		**Percentage**		**Category**
	Pretest	*Posttest*	*Pretest*	*Posttest*	
81 – 100	0	0	0	0	Very High
61 – 80	31	28	93,93	84,85	High
41 – 60	2	5	6,061	15,15	Medium
21 – 40	0	0	0	0	Low
0 – 20	0	0	0	0	Very Low

Table 1. shows that the average score on the pretest was 62.768, while the average score on the posttest was 65.965. Although there has been an increase in the average score for creative thinking abilities, both scores are still in the high range. Even if the teaching approach is still conventional, it is clear pupils have the potential to think creatively. This is consistent with the claim made by Hartati et al. (2022) that children possess creative thinking abilities from a young age and have a habit of constantly thinking about what they have just heard or seen. It is in line with Tekeng (2016) that creativity is a trait that everyone has, although the level of creativity of each person is different. Everyone has the potential to be creative, but not everyone uses it. It can happen because they do not get the opportunity or do not have the desire to develop their creative potential. It takes a high effort to build creative thinking abilities. According to Ni'mah and Sukartono (2022), teachers must have a particular strategy for improving creative thinking skills in students. That is why, in this study, although it did not use any approach, it was seen that there was creative thinking ability in students in the medium and high categories.

In class XII MIPA 4, an experimental class taught with the Bio-Entrepreneurship (BEP) learning approach, the average value of creative thinking ability in the pretest was 62.216, and the posttest value was 70.569. In the pretest, none were in the very high category, but in the posttest, five students were in the very high category.

Table 2 Creative Thinking Ability Category in Experimental Class

Total Score Range (%)	**Frequency**		**Percentage**		**Category**
	Pretest	*Posttest*	*Pretest*	*Posttest*	
81 – 100	0	5	0	14,71	Very High
61 – 80	25	28	73,53	82,35	High
41 – 60	9	1	26,47	2,941	Medium
21 – 40	0	0	0	0	Low
0 – 20	0	0	0	0	Very Low

Table 2 shows that the Bio-entrepreneurship (BEP) learning approach average value is increased. The average pretest value was 62.216, which increased to an average posttest value of 70.569. Both values were in the high category. The application of the learning approach increased creative thinking skills. This is because the stages in Bio-Entrepreneurship (BEP) stimulate the student's creative

thinking skills. During the learning process, students showed high enthusiasm for this BEP approach. According to Abdullah (2017), with effective learning, students are expected to understand and master material that is relevant to real life.

Table 3 Hypothesis Test Results

Variable		**Levene's Test for Equality of Variances**		**t-test for Equality of Means**		
		F	Sig.	t	df	Sig. (2-tailed)
Creative Thinking Skills of Students	Equal variances assumed	0,006	0,936	4,889	65	0,000
	Equal variances not assumed			4,885	64,636	0,000

In Table 3, the independent sample t-test analysis test has a sign value of 0.000, or the sign value is less than 0.05 (0.000 <0.05). This means that there is a significant influence of the Bio-Entrepreneurship (BEP) learning approach towards the creative thinking skills of class XII students of SMA Negeri 4 Parepare. The Bio-Entrepreneurship (BEP) learning approach is a learning approach that is applied in the experimental class by applying entrepreneurship concepts in the learning process that will also produce various ideas or works that are new and innovative and have sales value by utilizing living things and/or their components in implementing them. The Bio-Entrepreneurship (BEP) learning approach has stages that can improve the abilities of students in this study, namely creative thinking skills, namely the preliminary stage, the concept formation stage, the concept application stage, the concept consolidation stage, and the evaluation stage. In the preliminary stage, an initial introduction to the teaching material is conducted, then forming groups by discussing what products are in the biotechnology material. This stage has an aspect of creative thinking, namely flexible thinking, where students build concepts, ideas, hypotheses, or problem formulations for the innovative products they will create. This is also stated by Fitri and Septifiana (2013): students' ability to find various ideas and ways to solve problems is one activity that shows the students' creative thinking ability.

The concept formation stage involves looking for ideas for biotechnology innovation products by searching for product ideas in non-print sources (the internet), then discussing how the product is developed and deciding together on the product made in the group. This activity will train students to

express various ideas, concepts, and suggestions regarding something they observe that is included in the aspect of creative thinking, namely fluent thinking. Siswono (2005) has the same opinion as this, where expressing various ideas from this information becomes one activity that leads to the development of creative thinking skills. Nailufari et al. (2024) also stated that collaboration with groups will stimulate the exchange of ideas so that there is an increase in students' creativity.

The concept application stage is where each group will execute their innovation product so that it can be seen how they realize the product they discussed and imagined in their previous imagination. Here, it will be seen how their ability to create their products and add various ideas and innovations from the discussions they discussed previously makes the product results better. At this stage, students enrich or develop previously existing ideas and detail various previously existing ideas and concepts so that, at this stage, the creative thinking aspect, especially students' elaboration thinking, develops. Wijaya (2020) has a similar opinion that this ability to think is achieved by taking and using an idea and perfecting it again.

In this concept consolidation stage, students design product packaging that can attract consumer interest. All forms of packaging and design innovations certainly come from the results of thinking and deliberation in each of their respective groups. The form and design of this packaging come from the results of their imaginative thinking, and then they combine each idea in their respective groups so that a unique and creative packaging innovation is set. This stage has one aspect of novelty (originality), where students find something different from what existed before, like an idea, concept, or work. This statement is in line with Wijaya (2020) that the ability to think innovatively is the ability to produce unique thoughts from usual, whether it be ideas, responses, solutions, or products that are uncommon in solving a problem.

The final stage is the evaluation stage, where students analyze the economics of the products they have made. Together, they calculate the cost of the products they make. They create a table detailing the costs for raw materials, production, and marketing and estimate the ideal selling price to get the appropriate profit. This activity will be increasingly challenging and encourage them to produce quality products that are economical and efficient, such as choosing product production materials using the best quality but at a price that suits economic needs and making product packaging that attracts customers with quality materials and the right price. This condition causes students to determine how they present excellent quality products for buyers with an efficient budget. Students' ability to

determine various alternative ideas in this much-needed situation as fluency thinking. Wijaya (2020) said that the ability to think fluently is the ability to produce various ideas and alternative solutions in very important conditions and situations.

Everyone has this creative thinking ability, but it can be realized if they encourage the potential for creative thinking to develop and realize their abilities. This creative thinking ability can increase if there is active and creative interaction between students and their educators in developing creativity, and its application requires the right learning media (Mustami, 2007). Thus, the BEP learning approach in the learning process can encourage and improve students' creative thinking and learn about real-life situations.

4) CONCLUSION

Bio-Entrepreneurship (BEP) learning approach can improve students' creative thinking skills. Based on this study, the creative thinking skills of students in the control class are in the medium and high categories. Meanwhile, in the experimental class, the students are in the high and very high categories. The average value of the control class is 65.965, and the experimental is 70.569. The hypothesis test shows a considerable influence of the BEP learning approach on students' creative thinking skills, with a significant value smaller than 0.05 (0.000 <0.05).

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