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Dr. Rizhal Hendi Ristanto, S.Pd., M.Pd

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Address:

Department of Biology Education, Universitas Negeri Jakarta, Indonesia

Hasjim Asjarie Building 5Th Floor

Jl. Rawamangun Muka, East Jakarta, Indonesia,

Email: rizhalhendi@unj.ac.id

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Students' entrepreneurship interest and cognitive learning outcomes: Effectiveness of biodiversipreneurship

Nur Hayati*, Lina Arifah Fitriyah

Natural Science Education Department, Faculty of Education, University of Hasyim Asy'ari Tebuireng Jombang, Indonesia

*Corresponding author: nurhay.ht@gmail.com

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ABSTRACT

In addition to hard skills, students also need to be equipped with soft skills such as entrepreneurship. Entrepreneurship is one of the 21st-century skills. It can be trained to students through entrepreneurship-based learning. This study aimed to determine the effectiveness of the biodiversipreneurship learning method on students' entrepreneurship interest and cognitive learning outcomes. This study used a quantitative-qualitative method with a pre-experimental design, a model of one group pretest-posttest design. This research was applied to the Biotechnology course with the sample consisting of 15 students of the Natural Science Education department of Universitas Hasyim Asy'ari Jombang in the fifth semester of 2018 class. The research instrument included entrepreneurship interest questionnaires and cognitive learning outcome tests. Data analysis was carried out quantitatively using an independent sample t-test, and the result was then described. The t-test analysis on entrepreneurship interest and cognitive learning outcomes data shows a significant value of 0.000 or ≤ 0.05. Thus, it can be concluded that the biodiversipreneurship learning method effectively increases students' entrepreneurship interest and cognitive learning outcomes.

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INTRODUCTION

O'Leary & El-Gohary (2011) state that science and technology learning is only slightly related to entrepreneurship. In contrast, the implementation of learning by linking the elements of entrepreneurship based on several studies is essential to develop students' skills. Entrepreneurship is a 21st-century skill (Obschonka et al., 2017) and must be possessed by students (Deveci & Cepni, 2017). Afriadi & Yuni (2018) also argue that university graduates must have hard skills and soft skills, one of which is the soul of entrepreneurship. Entrepreneurial skill is the ability to combine academic knowledge and creativity to create something innovative (Adinugraha, 2017). Every graduate is expected as a job seeker and a job creator with an entrepreneurial spirit (Hasni, 2018).

The lack of the implementation of entrepreneurship elements is feared to affect the quality of graduates, which in turn impacts increasing the unemployment rate (Afriadi & Yuni, 2018). According to Isrososiawan (2013), Okorie et al. (2014), & Suyahman (2017), the implementation of entrepreneurial character and values can be done through education in schools. The government has also made efforts to include entrepreneurship education in the Indonesian education curriculum at the primary and secondary levels (Mulyani, 2011) and higher education levels (Hasni, 2018). Budiati et al. (2012) argue higher education to equip students with entrepreneurship education to create entrepreneurs. Universities are also responsible for preparing graduates to choose entrepreneurship professionally (Okorie et al., 2014). The entrepreneurial spirit that continues to grow among students is expected to increase students' orientation in entrepreneurship (Mopangga, 2015).

Entrepreneurship education can be applied to natural science learning, especially Biology, in the form of bio entrepreneurship (Fitri et al., 2014; Khotimah et al., 2016; Aqil et al., 2019). Wardhani et al. (2020) explain that bio entrepreneurship can be interpreted as utilizing living things to be processed into marketable business products to create a productive economy. One application of bio entrepreneurship is the use of local biodiversity and, in the future, biodiversipreneurship. In this study, biodiversipreneurship is defined as a combination of biotechnology, biodiversity, and entrepreneurship, and it is the entrepreneurial activity through biotechnology products based on local biodiversity.

The use of the local potential around the students has an essential role in biology learning, leading to contextual learning that can provide direct experience to the students (Mumpuni, 2013). Learning resources through local potential are learning tools that help students relate the materials studied to the actual situation and encouraged them to connect their knowledge and application in life (Mumpuni, 2013). In addition, the integration of endemic plants as teaching materials is the step of extensive conservation (Mumpuni et al., 2014). Apriana (2012) states that contextual learning by integrating the concept of bio conservation in biology learning acts to grow students' environmental literacy and awareness. Contextual learning is also supported by the research result of Ramadoss & Moli (2011) that the application of learning local biodiversity and conservation for sustainable development has a long-term influence on students' attitudes towards local biodiversity.

Mumpuni et al. (2014) state that Indonesia's biodiversity has not been fully utilized, even though local biodiversity in the form of endemic plants can be used as a source of learning biology. Jombang Regency is one of the areas having relatively high biodiversity. Based on the Ministry of Environment and Forestry (Kementerian Lingkungan Hidup dan Kehutanan, 2015), in Jombang Regency, there is a Biodiversity Park located in Sumber Rejo Village, Wonosalam District. Wonosalam District produces fresh cow's milk, which can be used as raw material for yogurt. Meanwhile, other sub-districts such as Kabuh produce glutinous rice and beans as raw materials for fermented glutinous rice and tempeh. Megaluh and Tembelang sub-districts produce watermelon and cantaloupe which can be used for making nata.

The Biodiversipreneurship learning method in this study is a solution to facilitate entrepreneurship education and local potential-based education. This learning method equips students with knowledge and skills in creating biotechnology products and is introduced to the local potential of the region. Various studies related to the integration of entrepreneurship education in learning have been carried out. The research results show that the application of bio entrepreneurship can improve students' learning outcomes and entrepreneurial interest (Khotimah et al., 2016; Hayati & Fitriyah, 2021). Besides that, the application of bio entrepreneurship in learning can improve students' learning motivation (Mujab et al., 2019), Entrepreneurial Intelligence (EI), and students' creativity (Putri et al., 2018). The results of other studies show that entrepreneurship-based science learning tools can strengthen students' entrepreneurial skills (Kristanti et al., 2012; Winarti, 2014; Adinugraha, 2017), students' activities, and learning achievement (Kristanti et al., 2012).

Study-related to the effectiveness of biodiversipreneurship learning method is important to be carried out because it can support the vision of Universitas Hasyim Asy'ari Jombang (UNHASY) as a center for the development of knowledge-based on Islamic boarding schools and entrepreneurship. The difference between this study and the previous studies is the implementation of the biodiversipreneurship learning method in the natural science education department, which is in an Islamic boarding school-based university. In addition, this research utilizes Jombang's local biodiversity raw materials in conventional biotechnology practicum.

METHODS

Research Design

This study aimed to determine the effectiveness of implementing the biodiversipreneurship learning method on the increase of students' entrepreneurship interest and cognitive learning outcomes. Cognitive learning outcomes in this study are conceptual understanding. This research is applied to the Biotechnology course with the topic of conventional biotechnology. This research method was a quantitative-qualitative method with a pre-experimental research design, one group pretest-posttest design model (Sugiyono, 2019), which gives a pretest before treatment and a posttest after treatment in the form of biodiversipreneurship learning method.

Population and Samples

The sampling technique in this research was a probability sampling technique, with a simple random sampling technique in which members of the population are taken at random and are considered homogeneous (Riduwan, 2018). The samples of this study were the natural science department students of UNHASY in the class of 2018, who was in the fifth semester. This research sample is small because the class only consisted of 15 students.

Instrument

The instruments of this research were questionnaires of entrepreneurship interest and cognitive learning outcomes test. The number of entrepreneurship interest questionnaires was 16 statements and had been empirically validated by the Entrepreneurship lecturer of the natural science education department of UNHASY. The indicators of interest in entrepreneurship refer to Kusumajanto (2015), consisting of 1) desire for entrepreneurship, 2) interest in establishing a business, 3) pleasure in entrepreneurship activities, 4) attention to entrepreneurial activities, 5) willingness to work hard, 6) willingness to develop the business, and 7) willingness to take business risks. The calculation of the entrepreneurship interest questionnaires used the Likert scale (Riduwan, 2018) based on the scores of the answer choices: Strongly Agree (SA) = score 4, Agree (A) = score 3, Disagree (DS) = score 2, and Very Disagree (VD) = score 1.

Table 1 presents the examples of entrepreneurship interest questionnaires.

Table 1.
Instrument of Entrepreneurship Interest Questionnaires

No.	Statements	Answers				Indicators
		Strongly Agree	Agree	Disagree	Very Disagree	
1.	I want to be an entrepreneur because entrepreneurship helps to reduce unemployment					Willingness to be an entrepreneur
2.	After graduating, I am interested in setting up a business to realize the dream of becoming a successful person					Interest in setting up a business
3.	I like entrepreneurship because it trains my creativity always to create new products					Enjoying entrepreneurship

The cognitive learning outcomes test was in the form of 20 multiple choice questions and five open-ended essays. The instrument has been empirically validated by a Biology lecturer at the natural science education department of UNHASY. Question indicators to measure cognitive learning outcomes include: 1) explaining the definition of biotechnology, 2) determining the characteristics of conventional biotechnology, 3) mentioning examples of conventional biotechnology, 4) explaining the process of making tempeh through practical activities, 5) explaining the process of making fermented rice through practical activities, 6) explaining the process of making nata through practical activities, 7) explaining the process of making yogurt through practical activities, and 8) creating business products from the results of conventional biotechnology practicums.

Table 2 are examples of the questions to measure the students' cognitive learning outcomes.

Table 2.
Grid of Cognitive Learning Outcome Measurement Questions

No.	Questions	Indicators
1.	Pay attention to the following questions 1) Requiring sophisticated technology and equipment 2) Not modifying biology agents 3) Not mass-produced 4) Mass-produced 5) Using fermentation technique The number indicates the characteristics of conventional biotechnology…. a. 1), 2), and 3) b. 1), 2), and 4) c. 1), 3), and 5) d. 2), 3), and 5) e. 2), 4), and 5)	Determining the characteristics of conventional biotechnology
2.	The following is the example of the application of conventional biotechnology.... a. Pest-resistant crop production b. Making tempeh using yeast c. Making superior seeds with plant tissue isolation method d. In vitro embryo formation	Mentioning the example conventional biotechnology

No.	Questions	Indicators
	e. Radiating grain with electromagnetic waves	
3.	In making nata, the cause of the nata layer to rise on the surface of the liquid is …. a. Nitrogen content of additional nutrients b. CO_2 gas during the fermentation process c. The amount of glucose from the ingredients used d. Bacterials' activity for making nata e. The length of time for the nata fermentation	Explaining the process of making nata through practical activity

Procedure

This study consisted of several stages, including 1) problem analysis, 2) preparing research instruments, 3) instrument validation, 4) pretest and filling out early entrepreneurial interest questionnaires, 5) applying biodiversipreneurship learning method, 6) posttest and filling out final entrepreneurship interest questionnaires, 7) data analysis, 8) discussing the research results, and 9) concluding.

In step 5, namely the application of biodiversipreneurship learning, its learning activities are described as follows:

a. Learning activities began with the division of student groups conducted at the previous meeting and the distribution of instructions for practice activities.
b. The first meeting consisted of 3 groups of students. The learning activity was the practice of making tempeh. Group 1 did the practice on making tempeh from soybeans, group 2 did the practice on making tempeh from red beans, and group 3 did the practice on making tempeh from green beans. After two days, the tempeh was produced, then processed based on each group's creativity, where this activity was carried out at home and documented due to time constraints. On the next day, the processed tempeh was packaged and marketed in the campus area.
c. The second meeting consisted of 3 groups of students. The learning activity was the practice of making tape. Group 1 did practice on making tape from cassava, group 2 did practice in making tape from white glutinous rice, and group 3 did practice in making tape from black glutinous rice. After three days, the tape was produced, then processed based on each group's creativity, where this activity was carried out at home and documented due to time constraints. On the next day, the processed tape is packaged and marketed in the campus area.
d. The third meeting consisted of 2 groups of students. The learning activity was the practice of making nata. Group 1 did practice on making nata from watermelons, and group 2 did practice on making nata from tomatoes. The making of nata in this study used *Acetobacter xylinum* bacteria obtained from the mushroom cultivation laboratory of Universitas Muhammadiyah Malang (UMM). After two weeks, the produced nata was checked, where students measured the weight and thickness of the nata layer. The next activity was processing nata done outside class hours. When processing nata, the students were not divided into their practice groups, but nata processing activities were carried out together in one class.
e. The fourth meeting consisted of 2 groups of students. The learning activity was the practice of making yogurt. Group 1 did the practice of making yogurt from cow's milk, and group 2 did the practice of making yogurt from soy milk. On the next day, the students checked and processed the yogurt produced. This activity was carried out outside of class hours. After that, the processed yogurt was marketed in the campus area the next day.

The method of data collection was by using tests and questionnaires. Before the biodiversipreneurship learning method was implemented, a pretest was conducted, and an entrepreneurship interest questionnaire was administered. The next step was the implementation of the biodiversipreneurship learning method in Biotechnology courses. These

treatments were carried out for seven meetings with the topic of conventional biotechnology. After that, a post-test and the questionnaires about interest in entrepreneurship were done. The data obtained consisted of learning outcomes data in the form of pretest and posttest results and early students' entrepreneurial interests before the application of biodiversipreneurship learning and final students' entrepreneurial interests after the application of biodiversipreneurship learning. Figure 1 is a summary of the research procedures.

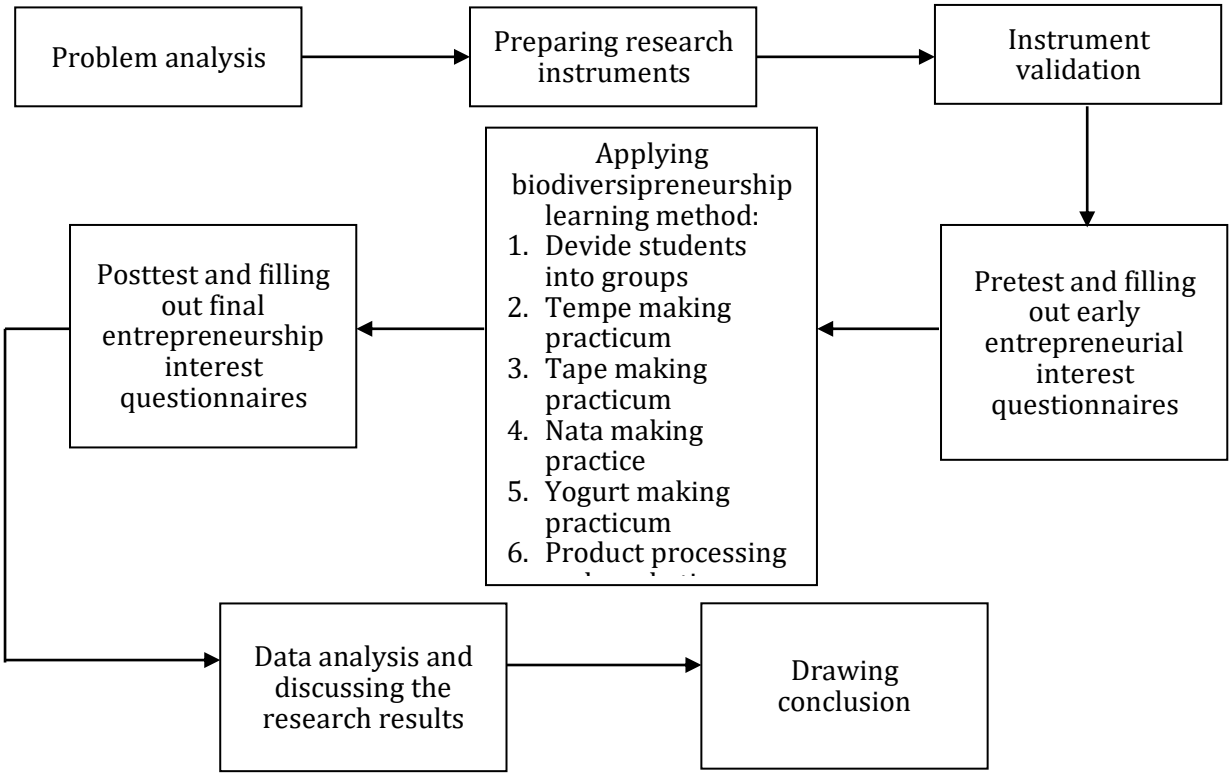

Figure 1. Research Procedures

Data Analysis Techniques

The data analysis technique was done quantitatively and descriptively because of the small samples. Students' cognitive learning outcomes are obtained from the students' scores on the test. The calculation of the scores of entrepreneurship interest was by calculating the total scores of the answer choices from each individual, then calculating its average and its percentage (Rahayu, 2011). Furthermore, the percentage of interest in entrepreneurship was determined based on the criteria as in Table 3 below.

Previously, data on entrepreneurship interest and cognitive learning outcomes were tested for prerequisites in the form of a normality test using the Kolmogorov-Smirnov One-Sample test to determine whether the data were normally distributed or not. If the significance value of the normality test were ≥ 0.05, the data distribution would be normal. After this prerequisite test, a hypothesis test was conducted in the form of a t-test (Independent sample t-test) to determine the effectiveness of the biodiversipreneurship learning method on students' entrepreneurship interest and cognitive learning outcomes. This research hypothesizes that the biodiversipreneurship learning method effectively increases entrepreneurship interest and student cognitive learning outcomes. The research hypothesis is accepted if the significance value of the t-test results were ≤ 0.05.

Table 3.
Criteria of Entrepreneurship Interest Percentage

Interval (%)	Criteria
20-36	Very Low
37-53	Low
54-70	Netral
71-87	High
88-100	Very High

(Source: Rahayu, 2011)

Table 4 below presents the result of the normality test on the data of students' entrepreneurship interest and cognitive learning outcomes.

Table 4.
The Result of Normality Test on the Data of Students' Entrepreneurship Interest and Cognitive Learning Outcomes based on One-Sample Kolmogorov-Smirnov Test

		Pretest	Postest	Early Entrepreneurship Interest	Final Entrepreneurship Interest
N		15	15	15	1
Normal Parameters[a]	Mean	59.6667	77.6000	78.0667	84.000
	Std. Deviation	14.07463	4.86680	5.14735	4.8843
Most Extreme Differences	Absolute	.235	.134	.171	.10
	Positive	.221	.134	.171	.10
	Negative	-.235	-.106	-.164	-.08
Kolmogorov-Smirnov Z		.911	.519	.662	.38
Asymp. Sig. (2-tailed)		.378	.951	.774	.99

a. Test distribution is Normal

Based on Table 4, it is known that the significance value of the pretest data is 0.378; posttest is 0.951; early entrepreneurial interest is 0.774, and the final entrepreneurship interest is 0.998. The significance value of the data is ≥ 0.05, so it can be concluded that the data distribution is normal.

RESULTS AND DISCUSSION

The results of the t-test on the students' entrepreneurship interests are described in Table 5 below. It can be known that the significance values of students' early and final entrepreneurship interest were 0.000 or ≤ 0.05. It means that the research hypothesis is accepted so that the biodiversipreneurship learning method effectively develops the students' entrepreneurship interest.

Table 6, showed the significance values of pretest and posttest, which were 0.000 or ≤ 0.05. It means that the research hypothesis is accepted so that the biodiversipreneurship learning method effectively increases the students' cognitive learning outcomes. This study applied the biodiversipreneurship learning method to determine its effectiveness on students' entrepreneurship interest and cognitive learning outcomes. This learning method provides knowledge and skills in creating conventional biotechnology business products. In addition, according to Pratiwi et al. (2019), biodiversity and conservation learning aims to increase students' biodiversity literacy to understand and apply knowledge about biodiversity in solving problems. Through the biodiversipreneurship learning method, the students learned to carry

out the conventional biotechnology practicum activities by utilizing agricultural products in Jombang Regency. Mumpuni (2013) states that education that utilizes local advantages in economic, cultural, language, information technology, communication, ecology, and other aspects is beneficial for developing the students' competencies. The relevance of local excellence education to the real world encourages practical applications in contextual biology learning.

Table 5.
Results of t-Test for the Students' Entrepreneurship Interest

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Early Entrepreneurship Interest	58.739	14	.000	78.06667	75.2162	80.9172
Final Entrepreneurship Interest	66.606	14	.000	84.00000	81.2951	86.7049

The results of the t-test for the data of students' cognitive learning outcomes form pretest and posttest are explained in Table 6.

Tabel 6.
Results of t-Test for Students' Cognitive Learning Outcomes

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Pretest	16.419	14	.000	59.66667	51.8724	67.4609
Postest	61.754	14	.000	77.60000	74.9049	80.2951

Meanwhile, the raw materials from local biodiversity from agriculture and livestock in Jombang Regency used in this practicum included: 1) green beans, peanuts, and red beans (Gudo District) for making tempeh, 2) cassava (Diwek District) and glutinous rice (Kabuh District) for making tape (fermented cassava or fermented glutinous rice), 3) tomatoes (Kabuh District), watermelon and cantaloupe (Tembelang District) for making nata, 4) soy milk (Diwek District) and pure cow's milk (Wonosalam District) for making yogurt.

1. The Effectiveness of Biodiversipreneurship Learning Method on the Students' Entrepreneurship Interest

The Biodiversipreneurship learning method in this study is one example of the implementation of entrepreneurship education. According to Wibowo (2011), the ways to instill an entrepreneurial mentality in the students can be done by: 1) integrating entrepreneurship education into the curriculum and 2) organizing systematic and directed extracurricular activities to build motivation and entrepreneurial mental attitude students. By using the biodiversipreneurship learning method, the students are expected to have a high interest in entrepreneurship. It is in line with what was conveyed by Suhartini (2011); Fatimah & Purdianto (2020) that there is an influence between entrepreneurship education and interest in entrepreneurship. Someone who takes entrepreneurship education will understand the

benefits of being an entrepreneur and will be increasingly interested in becoming an entrepreneur.

The results of data analysis based on the t-test showed the effectiveness of the biodiversipreneurship learning method on the students' interest in entrepreneurship. This finding is in line with the research results of Wardhani et al. (2020), finding that bio entrepreneurship contributes to increasing the students' creativity because the students learn contextually with the manufacture of products. Next, the research results of Winarti (2014) show that entrepreneurship-based natural science learning tools can provide new knowledge and skills for the students to strengthen their soft skills in making products. Another study conducted by Aqil et al. (2019) shows that learning bio entrepreneurship can increase the students' life skills and entrepreneurship interest. The improvement of these life skills encourages the students to be creative in managing information into products or services, such as applying biology products from scientific research results into marketable products with high selling value, for example, tempeh and yogurt.

In this study, the biodiversipreneurship learning method was implemented in the form of conventional biotechnology practicum activities that provided direct experiences to the students in the form of making tempeh, fermented cassava and rice, nata, and yogurt with local biodiversity raw materials, as well as the further processing the products from the practicum. Through the practicum activities carried out, the students practice carrying out activities related to entrepreneurship so that they have the potential to develop their interest in entrepreneurship. Those entrepreneurial activities include determining the business product to be made, selecting tools and materials, packaging, analyzing the product strengths and weaknesses, product marketing strategies, and profit estimation. The following is a student practicum activity for making nata (Figure 2).

Figure 2. Nata Making Process

The research results of Machin (2012) show that the application of entrepreneurship-based biotechnology learning can positively impact the students' entrepreneurial attitudes. According to Machin (2012), entrepreneurial ability as measured through bio entrepreneurship learning includes (1) exploration of business opportunities; (2) determination of tools and materials for the manufacture of products; (3) product manufacturing planning; (4) plans-based manufacture of products; (5) business product innovation; (6) business profit analysis; (7) finding the best taste through organoleptic testing, and (8) evaluating the advantages and disadvantages of the product made.

At the beginning of the practicum activities, some students looked confused and did not understand the steps of the practicum activities. To overcome the problems that occur, the lecturer approaches the student. In addition, the lecturer also gave a re-explanation of the concepts and practical steps so that students would understand better. At the first meeting, students did a tempeh-making practicum. In general, the results of the tempeh-making practicum from soybeans and red beans are perfect in texture and taste, but tempeh from green beans has a less dense texture. This condition is due to the difficulty during the step of separating the mung bean shells. Some of the products produced from the tempeh practicum are tempeh nuggets, tempeh 'perkedel,' and tempeh sticks.

The tape produced by students from the three ingredients, namely cassava, white glutinous rice, and black glutinous rice, has a good texture and sweet taste. The processed tape products are marketed in 'proll' tape and 'tapcin' ice (cincau-tape ice). At the third meeting, students did a practicum of making nata from watermelon and tomatoes. The resulting nata has a suitable thickness so that the practical activity is said to be successful—students process nata into fruit ice mixed with nata. Students prepare various fruits from home and process them together in class. Especially for processed nata products because the amount of nata produced is not in large quantities, so students can only enjoy it themselves. The last practicum activity is making yogurt from cow's milk and soy milk—processed yogurt in the form of pudding and ice lolly with flavor variants. Students benefit from product marketing carried out in the campus area, with buyers consisting of lecturers and other students. Based on the observations during the practicum, the students seemed enthusiastic and enjoyed the practicum.

In this study, the students have analyzed the business opportunities that arise from making tempeh, tape, and nata and making yogurt from cow's milk and soy milk using local biodiversity raw materials. Wardhani et al. (2020) state that the resulting product can be adapted to the surrounding environment. The students also plan and prepare the tools and materials needed to process the results of the practicum. Then, the students innovate the results of their practicum into high-value products. For example, tempeh nuggets, tapcin ice (the ice from the combination of fermented glutinous rice, cappuccino, and grass jelly), and proll tape, nata fruit ice, and a yogurt ice lolly. In addition, innovation can also be seen from packaging using cups and labeling. The students also perform organoleptic tests, including the products' texture, color, taste, and smell. Before being marketed, the students also calculate the profit that will be obtained from the sale. The next activity is product marketing. From the marketing results, besides gaining profits, the students also get suggestions and feedback from the buyers. The buyers gave the suggestions and then became the materials for analysis to improve the quality of the following product. All of the soft skills possessed by these students are expected to be developed into provisions after they graduate (Winarti, 2014).

The sample of this research is mostly cottage students who come from various regions, where they spend more time in the boarding school environment. This practical activity that utilizes local biodiversity provides entrepreneurship skills in the form of knowledge, experience, and skills in manufacturing conventional biological products. Students of natural science education programs need this knowledge and skills because they are a provision when they graduate, both as science teachers and entrepreneurs. Susilaningsih (2015) states that entrepreneurship education in higher education is needed in any field regardless of the field one is engaged in or one's profession.

2. The Effectiveness of Biodiversipreneurship Learning Method on the Students' Cognitive Learning Outcomes

The results of data analysis based on the t-test in this study indicate the effectiveness of the biodiversipreneurship learning method on students' cognitive learning outcomes. This finding aligns with the previous study results showing that bio entrepreneurship learning

contributes positively to the students' learning process and learning outcomes. Based on their research results, Fitri et al. (2014) explain that making *nata de lerri* through bio entrepreneurship worksheets makes the students active in learning. This is reinforced by Hayati & Fitriyah's (2021) statements that entrepreneurship-based learning can stimulate students' learning activities and create variations in learning models so that the teaching and learning become more attractive, not dull. Finally, the students can understand the material more easily. Machin (2012) also explains that the application of entrepreneurship-based biotechnology learning can positively impact the students' learning outcomes.

Figure 3. Example of Yogurt Packaging

Furthermore, Hayati & Fitriyah (2021) state that the entrepreneurship-based biology learning model allows students to understand conventional biotechnology concepts and take practical steps. This means that the mastery of biotechnology concepts is essential to support the practicum activities. As also stated by Wardhani et al. (2020) that bio entrepreneurship products that can be developed require knowledge from the biological sciences. Therefore, an understanding of biology in developing bio entrepreneurship products is necessary to continue innovating and being creative.

The mastery of the concepts and the ability to understand are related to learning outcomes in the cognitive domain. In order to be able to carry out practicum steps well, the students must master the principles and concepts of conventional biotechnology in depth. Through practicum activities, the students are also trained to have the ability to analyze the suitability between the theory and concept while studied with the results of their practicum. Suppose the products produced from practicum activities are not appropriate with what is expected based on theory, indirectly. In that case, the students will learn to analyze the causes of inappropriate steps during practicum. Thus, it can be concluded that if the students understand the concepts and theories well and can apply them in practicum activities, they will be able to produce good products. These activities contribute to the improvement of the students' learning outcomes.

In general, students are said to have been able to do the practicum of making tempeh, tape, nata, and yogurt well. This can be seen from the practical steps that have been carried out well, resulting in good conventional biotechnology products. Students can process tempeh, tape, nata, and yogurt into various products. This indicates that students have understood the concept of biotechnology and can relate the concept to the steps of practicum activities. Through the learning activities, students gain direct experience in making conventional

biotechnology products, processing, and marketing products so that learning becomes more meaningful.

Mumpuni (2013) states that the constitutions of biology learning are minds-on, hands-on, and hearts-on, so the biology learning process must activate these three aspects. The achievement of these three aspects is achieved through thinking skills and experiences. It leads to learning by discovering concepts the students learn from their direct experiences through contextual learning. Entrepreneurship-based biology learning connects learning to real-life in society by presenting various conventional biotechnology products into the classroom to make the students' learning activities more meaningful (Machin, 2012; Hayati & Fitriyah, 2021). Related to this, Putri et al. (2018) state that learning bio entrepreneurship encourages students to discover their knowledge. The students' thinking processes are formed when the students are faced with a problem that is contextual or related to the real world.

Additionally, Khotimah et al. (2016) argue that learning involving the students directly on the actual objects can foster the students' curiosity. Besides, product manufacture can instill independent, productive, and creative traits in the students themselves. Wardhani et al. (2020) add that bio entrepreneurship can be a solution to increase contextual thinking activities to stay active, creative, and productive.

CONCLUSION

The results of this study indicate that the biodiversipreneurship learning method effectively increases the students' learning outcomes and entrepreneurship interest. The results of the t-test on learning outcomes data in the form of pretest and posttest show a significance value of 0.000 or ≤ 0.05, and the results of the t-test of entrepreneurship interest data show a significance value of 0.000 or ≤ 0.05. Thus, the biodiversipreneurship learning method is recommended in learning, especially on the conventional biotechnology topic. The efforts to develop the students' entrepreneurship interests are not accessible. Entrepreneurship-based learning needs to be applied sustainably so that the students' entrepreneurship interests can be applied in real life to form an entrepreneurial culture.

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REFERENCES

Adinugraha, F. (2017). Media Pembelajaran Biologi Berbasis Ecopreneurship. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *7*(3), 219–233. https://doi.org/10.30998/formatif.v7i3.2233

Afriadi, R., & Yuni, R. (2018). Pengembangan Jiwa Bioentrepreneur Mahasiswa Biologi. *Jurnal Biolokus*, *1*(2), 123–127. https://doi.org/10.30821/biolokus.v1i2.353

Apriana, E. (2012). Pengintegrasian Konsep Biokonservasi dalam Pembelajaran Biologi sebagai Upaya Menumbuhkan Literasi dan Kesadaran Lingkungan di Kalangan Siswa. *Jurnal Serambi Ilmu*, *13*(1), 1–10.

Aqil, D. I., Hudaya, A., & Arifin, Z. (2019). Penerapan Pembelajaran Bioentrepreneurship untuk Meningkatkan Life Skills dan Minat Wirausaha Siswa SMK. *Jurnal Inspirasi Pendidikan*, *9*(2), 95–102. http://ejournal.unikama.ac.id/index.php/jrnspirasi/article/view/3011

Budiati, Y., Yani, T. E., & Universari, N. (2012). Minat Mahasiswa Menjadi Wirausaha (Studi pada Mahasiswa Fakultas Ekonomi Universitas Semarang). *Jurnal Dinamika Sosbud*, *14*(1), 89–101.

Deveci, I., & Cepni, S. (2017). The Effect of Entrepreneurship Education Modules Integrated with

Science Education on the Entrepreneurial Characteristics of Pre-service Science Teachers. *Socialinis Darbas*, *15*(2), 56–85. https://doi.org/10.13165/SD-17-15-2-04

Fatimah, S. E., & Purdianto, A. (2020). Factors Affecting Entrepreneurial Interest Among Students in Higher Education. *Proceeding of the 1st International Conference on Accounting, Management and Entrepreneurship (ICAMER 2019)*, *123*, 145–147. https://doi.org/10.2991/aebmr.k.200305.036

Fitri, E. E., Ratnasari, E., & Budijastuti, W. (2014). Pengembangan LKS Bioentrepreneurship Pembuatan Nata de lerri Materi Biotekologi Konvensional Kelas XII SMA. *BioEdu: Berkala Ilmiah Pendidikan Biologi*, *3*(3), 416–424.

Hasni. (2018). Urgensi Pendidikan Kewirausahaan dalam Menghasilkan Wirausahawan Muda dari Perguruan Tinggi. *Ekspose*, *17*(2), 653–664. https://doi.org/10.30863/ekspose.v17i2.121

Hayati, N., & Fitriyah, L. A. (2021). Biotechnopreneurship: Model Pembelajaran untuk Meningkatkan Hasil Belajar dan Minat Berwirausaha Mahasiswa. *Biodik: Jurnal Ilmiah Pendidikan Biologi*, *7*(1), 62–76. https://online-journal.unja.ac.id/biodik/article/view/10752

Isrososiawan, S. (2013). Peran Kewirausahaan dalam Pembangunan. *Society: Jurnal Jurusan Pendidikan IPS Ekonomi*, *IX*(April), 26–49. http://diqudiamond.blogspot.co.id/2014/06/peran-kewirausahaan-dalam-pembangunan.html

Kementerian Lingkungan Hidup dan Kehutanan. (2015). *10 Profil Lokasi Taman Kehati. Jakarta*.

Khotimah, K., Endang, A. R., & Muspiroh, N. (2016). Penerapan Pembelajaran Bioentrepreneurship pada Sub Konsep Pisces untuk Meningkatkan Hasil Belajar Siswa Kelas X di SMA Negeri 1 Plumbon. *Scientiae Educatia: Jurnal Sains Dan Pendidikan Sains*, *5*(1), 39–47. www.syekhnurjati.ac.di/jurnal/index.php/sceducatia

Kristanti, E. A., Bintari, S. H., & Ridlo, S. (2012). Pengembangan Perangkat Pembelajaran Bioentrepreneurship Pembuatan Makanan dari Limbah Cair Pengolahan Kedelai. *Journal of Innovative Science Education*, *1*(2), 112–118.

Kusumajanto, D. D. (2015). The Role of Entrepreneurship Education and Self Efficacy in Shaping Student Interest in doing Entrepreneurship. *European Journal of Business and Management*, *7*(28), 153–158.

Machin, A. (2012). Pengembangan Model Pembelajaran Bioteknologi Bervisi Kewirausahaan di Sekolah Menengah Atas. *Bioedukasi*, *5*(2), 50–60.

Mopangga, H. (2015). Studi Kasus Pengembangan Wirausaha Berbasis Teknologi (Technopreneurship) di Provinsi Gorontalo. *Trikonomika*, *14*(1), 13–24. http://www.journal.unpas.ac.id/index.php/trikonomika/article/view/587

Mujab, S., Nugraheni, D., & Winarni, D. S. (2019). Penerapan Pembelajaran Bioentrepreneurship pada Materi Bioteknologi Fermentasi Kefir untuk Meningkatkan Motivasi Belajar Siswa. *Indonesian Journal of Natural Science Education (IJNSE)*, *2*(2), 227–231.

Mulyani, E. (2011). Model Pendidikan Kewirausahaan di Pendidikan Dasar dan Menengah. *Jurnal Ekonomi Dan Pendidikan*, *8*(1), 1–18.

Mumpuni, K. E. (2013). Potensi Pendidikan Keunggulan Lokal Berbasis Karakter dalam Pembelajaran Biologi di Indonesia. *Prosiding Seminar Nasional X Pendidikan Biologi FKIP UNS*, 1–7.

Mumpuni, K. E., Susilo, H., & Rohman, F. (2014). Potensi Tumbuhan Lokal sebagai Sumber Belajar Biologi. *Prosiding Seminar Nasional XI Pendidikan Biologi FKIP UNS*, 825–829. https://media.neliti.com/media/publications/175254-ID-potensi-tumbuhan-lokal-sebagai-sumber-be.pdf

O'Leary, S., & El-Gohary, H. (2011). Teaching Entrepreneurship on Science and Technology Degrees in Developing Economies : Egypt case. *ISBE 2011 Conference*, *November*, 1–12.

Obschonka, M., Hakkarainen, K., Lonka, K., & Salmela-Aro, K. (2017). Entrepreneurship as a 21st Century Skill: Entrepreneurial Alertness and Intention in the Transition to Adulthood. *Small Business Economics*, *48*(3), 487–501. https://doi.org/10.1007/s11187-016-9798-6

Okorie, N. N., Kwa, D. Y., Olusunle, S. O. O., Akinyanmi, A. O., & Momoh, I. M. (2014). Technopreneurship: an Urgent Need in the Material World for Sustainability in Nigeria. *European Scientific Journal*, *10*(30), 59–73.

Pratiwi, B., Ali, R. N., & Sulistiyowati, E. (2019). Pendidikan Biodiversitas Berbasis Potensi Lokal pada Tingkat SMA/MA. *Prosiding Seminar Nasional Pendidikan Biologi Dan Saintek (SNPBS) Ke -IV*, 500–509.

Putri, Y., Gloria, R. Y., & Mulyani, A. (2018). The Effectiveness of Bioentrepreneurship Learning Using Comics on the Sub Concepts of Angiosperms for High School Students. *Scientiae Educatia: Jural Pendidikan Sains*, *7*(2), 159–172. https://doi.org/10.24235/sc.educatia.v7i2.3154

Rahayu, E. (2011). *Pembuatan Tempe sebagai Sumber Belajar Sub Materi Bioteknologi untuk Menarik Minat Berwirausaha Siswa SMA Negeri 1 Tunjungan Blora*. Skripsi. Semarang: Jurusan Biologi Universitas Negeri Semarang.

Ramadoss, A., & Moli, G. P. (2011). Biodiversity Conservation through Environmental Education for Sustainable Development - A Case Study from Puducherry, India. *International Electronic Journal of Environmental Education*, *1*(2), 97–111. https://doi.org/10.18497/iejee-green.99495

Riduwan. (2018). *Dasar-dasar Statistika (Edisi Revisi)*. Bandung: Afabeta.

Sugiyono. (2019). *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Bandung: Afabeta.

Suhartini, Y. (2011). Analisis Faktor-Faktor yang Mempengaruhi Minat Mahasiswa dalam Berwiraswasta (Studi pada Mahasiswa Universitas PGRI Yogyakarta). *Akmenika UPY*, *7*, 38–59.

Susilaningsih. (2015). Pendidikan Kewirausahaan di Perguruan Tinggi: Pentingkah untuk Semua Profesi? *Jurnal Economia*, *11*(1), 1–9. https://doi.org/10.21831/economia.v11i1.7748

Suyahman. (2017). Penguatan Karakter Kewirausahaan melalui Pendidikan Keluarga. *Jurnal Pendidikan Ilmu Sosial*, *27*(1), 11–18.

Wardhani, I. Y., Amanda, S. M., & Kusuma, A. R. (2020). Bioentrepreneurship Sebagai Upaya Meningkatkan Kreatifitas dan Alternatif Bisnis di Masa Pandemi. *Journal of Biology Education*, *3*(2), 99–109. https://doi.org/10.21043/jobe.v3i2.8475

Wibowo, M. (2011). Pembelajaran Kewirausahaan dan Minat Wirausaha Lulusan SMK. *Eksplanasi*, *6*(2), 109–122. https://doi.org/10.31932/ve.v8i2.42

Winarti, P. (2014). Pengembangan Perangkat Pembelajaran IPA Berbasis Kewirausahaan untuk Menguatkan Softskill Siswa. *Saintifika*, *16*(2), 1–9.