Jurnal Pijar MIPA
https://jurnalfkip.unram.ac.id/index.php/JPM

ISSN 1907-1744 (Print)
ISSN 2460-1500 (Online)

Relationship between Cognitive Learning Outcomes and Student Entrepreneurial Motivation in Biology Subjects

Aprilia Ika Dewi Anjani, A. Wahab Jufri, I Putu Artayasa*, Jamaluddin

Biology Education Study Program, FKIP, University of Mataram, Mataram, Indonesia
*E-mail: artayasa75@gmail.ac.id

Received: January 25, 2024. Accepted: February 20, 2024. Published: March 19, 2024

Abstract: The demand for high-quality human resources is increasingly needed because the industrial world requires the readiness of prospective workers and the creation of more jobs. More entrepreneurial power is needed to create new jobs and cultivate the entrepreneurial spirit early. This study analyzes the relationship between cognitive learning outcomes and student entrepreneurial motivation in biology subjects in class XI MA NW Narmada. The type of research used is quantitative descriptive research with correlational research methods. The population in this study was female students in grades XI, totaling 198. The sampling method used purposive sampling with a sample of XI MIPA Putri class students totaling 88. The data collection method is a survey research method using a questionnaire on entrepreneurial motivation and report card documents. The data analysis technique used in this study is the Pearson product-moment correlation test. The results showed a significant relationship between cognitive learning outcomes and student entrepreneurial motivation, with a significance value of 0.035 ($p < 0.05$) and a correlation coefficient of -0.225. The correlation index is in a low category so that the relationship between the two variables is negatively correlated and classified as low, which indicates that if the value of entrepreneurial motivation is high, the student's cognitive learning outcomes are low, and vice versa if the learning outcomes are high, the value of entrepreneurial motivation is low.

Keywords: Biology; Cognitive Learning Outcomes; Entrepreneurial Motivation.

Introduction

The demand for high-quality Human Resources (HR) is increasingly needed because the industrial world requires the readiness of prospective workers and the creation of more jobs. In 2015, countries that are members of ASEAN were free to enter between ASEAN countries without a visa. This can be used as a motivation to improve the quality of human resources through education and to be able to compete with prospective professional labor in the free market [1]. In 2018, the proportion of entrepreneurs in Indonesia remained at around 3.1% of the overall population, indicating a need for at least 4 million additional entrepreneurs. Although the ratio of entrepreneurs in Indonesia in 2018 exceeded the international standard of 2 percent, Indonesia needs to catch up with the achievements of neighboring countries such as Singapore, which reached 7 percent, and Malaysia at 5 percent [2]. This is done to face the current industrial era of 5.0. In 2023, according to the International Monetary Fund (IMF), Indonesia ranks second in unemployment among Southeast Asian countries, with a projected unemployment rate of 5.3 percent [3].

The cause of the significant unemployment created by educated groups is the education system that only produces *technical skills*. So those who have completed their education generally only look for jobs to become civil servants or employees. Only a small percentage are willing and able to create jobs for themselves and others and become entrepreneurs. This reality indicates that the education system can only prepare students to fill jobs and has not been able to prepare students to become entrepreneurs [4].

Developing an entrepreneurial spirit is one way to get over the obstacles above. A project-based biopreneurship program is one illustration. The project-based biopreneurship module in Rosyidi et al.'s research from 2023 is a learning module that integrates entrepreneurial and biological ideas to highlight project-based learning. The biopreneurship module's design considers the students' creative and entrepreneurial literacies. The project-based biopreneurship science module was assessed in this study as feasible to use with the acquisition of scores from three science education expert validators which amounted to 77.3% [5].

Entrepreneurship by paying attention to knowledge aligns with the concept of *Knowledge-Based Entrepreneurship*. The concept of *Knowledge-Based Entrepreneurship* is a new idea that links knowledge with entrepreneurship. According to Kanellos, *Knowledge-based Entrepreneurship, or KBE for short, regroups entrepreneurial initiatives based on scientific or technological expertise that combine* new resources. KBE is a specialized form of entrepreneurship, often called the knowledge economy, which conducts activities that create new knowledge to create value. The knowledge economy was first introduced by the OECD (1996), which refers to an economy consisting of the production, distribution, and use of knowledge [6].

Knowledge does not lead to performance and innovation but requires the ability to launch valuable ideas. KBE maintains mechanisms to transform knowledge into

How to Cite:
Anjani, A. I. D., Jufri, A. W., Artayasa, I. P., & Jamaluddin. (2024). Relationship between Cognitive Learning Outcomes and Student Entrepreneurial Motivation in Biology Subjects. *Jurnal Pijar Mipa*, *19*(2), 216–221. https://doi.org/10.29303/jpm.v19i2.6502

economic activities. This refers to the nature of activities based on exploiting new knowledge to create economic value [6]. Knowledge may be effectively transformed into innovation through knowledge-based entrepreneurship. Further information from many sources is crucial for generating new ideas since it is characterized by extensive knowledge utilization and inventive endeavors [6]. So, it can be concluded that *knowledge-based entrepreneurship is an idea about the relationship between knowledge and entrepreneurship, which are interrelated to developing ideas* or new businesses.

Cognitive learning outcomes are learning outcomes related to memory, thinking, or intellectual abilities. Cognitive learning outcomes can determine the level of success in achieving learning. Cognitive learning outcomes in Biology subjects are the achievement of learning objectives in the knowledge domain, including the ability to understand, know, memorize, interpret, translate, and distinguish, expressed in scores [7]. The cognitive aspect's goals are focused on thinking skills that include more basic intellectual aptitudes, such as recalling how to solve issues that call on pupils to link and integrate various concepts, ideas, techniques, or processes they have studied to solve difficulties [8].

Entrepreneurial motivation is a strong drive from within humans to start, run, and develop a business by utilizing all knowledge and abilities to improve the welfare of themselves, society, and the environment. Entrepreneurial motivation can be instilled in students with precise delivery and examples that are acceptable to the students themselves. If students have strong knowledge, entrepreneurial motivation related to that knowledge will arise. However, there is a fear in students that often becomes an obstacle, namely failure. Therefore, the role of educators is to convince students how entrepreneurship can run and develop [9]. The results of observations obtained at MA NW Narmada from interviews with biology teachers/ustadzah explained that students' cognitive learning outcomes in biology subjects were good and above average. Good student cognitive learning outcomes indicate that students have mastered specific material in biology. However, it is not yet known whether, with the understanding of the concept, students have thoughts of how to make it a business in the future.

This study aims to analyze the relationship between cognitive learning outcomes and entrepreneurial motivation of students in biology class XI MA NW Narmada. Entrepreneurial motivation will be associated with cognitive learning outcomes in biology subjects to see if the relationship between the two variables is positive or negative. In biology, several subjects can be used as entrepreneurial ideas, such as biotechnology material, kingdom Animalia, Plantae, fungi, and bacteria. According to Majid, when studying plants and doing a leaf-bone practicum, Sugiwati invented keychain crafts and bookmarks [10]. So, it can be seen that biology subjects can be used as a motivation to start a business because some materials can be connected to entrepreneurship. Based on the above problems, this study was conducted to know whether there is a relationship between cognitive learning outcomes and student entrepreneurial motivation in biology subjects in class XI MA NW Narmada.

Research Methods

This study uses the correlational approach to conduct a quantitative descriptive research study. Quantitative descriptive research aims to use statistics to observe, analyze, and explain a subject. At the same time, it is being investigated to make inferences about events that may be attended [11]. The correlational method is used to determine the effect of two or more variables [12]. MA NW Narmada was the research location and the data-collecting site. The study's participants were all XI MIPA students at MA NW Narmada. Purposive sampling was employed in the investigation. The study utilized samples from four classes, namely grade XI MIPA 1 to grade XI MIPA 5, consisting of students from grade XI MA NW Narmada who had just progressed to grade XI.

A questionnaire designed to gauge students' motivation for entrepreneurship was the study tool. There are nineteen statements on the Likert scale in the questionnaire. Respondents are presented with a reality and given the option to select one of four responses on a Likert scale: strongly agree, agree, disagree, and strongly disagree [1]. In contrast, the data on students' cognitive learning outcomes were obtained from the report card scores of grade XI in biology subjects in the 2022/2023 school year.

The study hypothesizes that students' cognitive learning outcomes in biology class XI significantly correlate with their entrepreneurial desire. NW Narmada, Putri MA. Product-moment correlation analysis methods with recommendations are used in hypothesis testing. Ho is rejected, and Ha is accepted if the significance value is less than 0.05. Conversely, if the significance value is higher than 0.05, Ho is accepted, and Ha is rejected. In the interim, the correlation coefficient is used to determine the strength of the association between the two variables following Table 1's instructions [13].

Table 1. Correlation Coefficient Interpretation Guidelines

Coefficient Interval	Relationship Level
0,00-0,199	Very Low
0,20-0,399	Low
0,40-0,599	Medium
0,60-0,799	Strong
0,80-1,000	Very Strong

Categories of entrepreneurial motivation and student learning outcomes can be determined based on category guidelines, as shown in Table 2 below [14].

Table 2. Categorization Guidelines

Category	Criteria
Low	$X < M - 1SD$
Medium	$M - 1SD \leq X < M + 1SD$
High	$M + 1SD \leq X$

Results and Discussion

Cognitive learning outcomes of students in biology subjects are taken from the report card scores of grade XI MA NW Narmada. Cognitive learning outcomes data were collected from 88 students of class XI. Frequency data of

students' cognitive learning outcomes in biology subjects are shown in Figure 1.

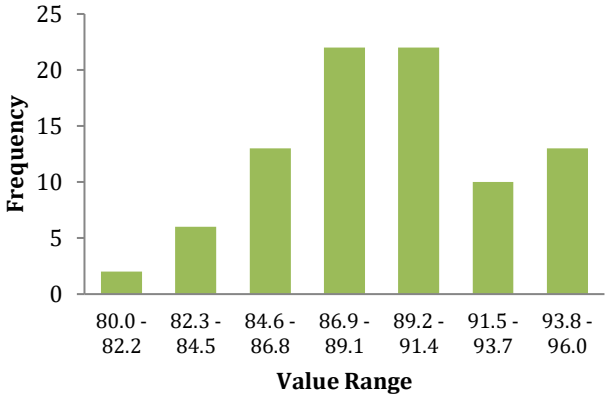

Figure 1. Frequency Distribution of Cognitive Learning Outcomes of Biology Subject Students

Figure 1 shows the frequency of cognitive learning outcomes of biology students. The majority are in the interval 86.9 - 89.1 and the interval 89.2 - 91.4 with 22 students (25%). The frequency of the minor cognitive learning outcomes variable is 80.0 - 82.2 with two students (2.3%).

Table 3. Categorization of Students' Cognitive Biology Learning Outcome Score

Category	Criteria	Frequency	%
Low	X < 85	8	9.1%
Medium	85 ≤ X < 91	44	50.0%
High	91 ≤ X	36	40.9%
	Total	88	100%

The data in Table 3 is obtained from the report card scores of Biology, even for semester class X MIPA Putri, as students' cognitive learning outcomes in biology subjects. Data on the category of student learning outcomes show that the low score category is 9.1% of students, the medium category is 50% of students, and the high category is 40.9% of students. Based on this data, students generally have scores in the medium value category, and very few are in the low category.

Student motivation is taken from the results of students filling out a questionnaire. The questionnaire was filled out by 88 students of class XI MIPA MA NW Narmada. The frequency data of students' entrepreneurial motivation is shown in Figure 2.

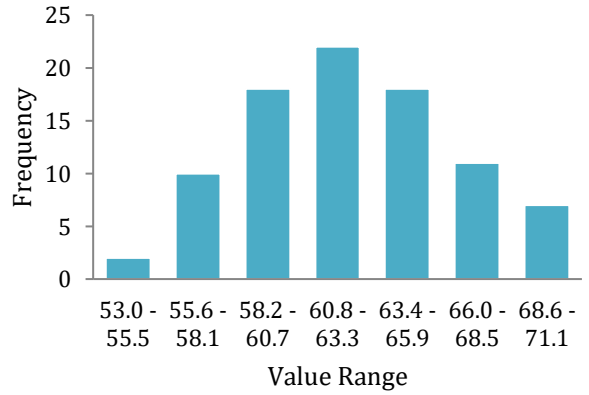

Figure 2. Frequency Distribution of Student Entrepreneurial Motivation

Figure 2 shows that the frequency of student entrepreneurial motivation is mainly in the interval 60.8 - 63.3 with 22 students (25%). The least frequency of entrepreneurial motivation variables is in the interval 53.0 - 55.5 with two students (2.3%)

Table 4. Categorization of Student Entrepreneurial Motivation

Category	Criteria	Frequency	%
Low	X < 58	10	11.4%
Medium	58 ≤ X < 66	60	68.2%
High	66 ≤ X	18	20.4%
	Total	88	100%

Based on the data in Table 3, students in the medium score category have the highest number of students, while students in the low category have the lowest number.

Data on learning outcomes and entrepreneurial motivation were tested for normality using the *Kolmogorov-Smirnov* test. A normality test is conducted to determine whether the data is normally distributed or not. The results of the data normality test are shown in Table 4.

Table 5. Normality Test Results

Variables	*Kolmogorov-Smirnov*		Criteria
	Sig. Level	Sig. Value	
Learning Outcomes	0.05	0.288	Normal
Entrepreneurial Motivation	0.05	0.699	Normal

Based on the normality test in the table above, the significance value for the learning outcomes variable is 0.288, and the significance value for the entrepreneurial motivation variable is 0.699. The significance value of the two variables can be greater than 0.05 so that the data for the two variables is declared usually distributed.

The linearity test using the SPSS tool, by paying attention to the F test obtained for the *deviation from the linearity line, aims to determine whether or not two variables have a linear relationship*. The results of the linearity test are presented in Table 6.

Table 6. Linearity Test Results

Variables	Df	F Value		Sig.	Criteria
		Count	Table (5%)		
Learning Outcomes ⬇ Entrepreneurial Motivation	13	1.366	1.857	0.197	Linear

Based on the results in the table above, the significance value in the linearity test results is 0.197, which is more significant than 0.05. So, the variable value of learning outcomes (X) and students' entrepreneurial motivation (Y) have a significantly linear relationship. The relationship between learning outcomes and entrepreneurial motivation is shown in Table 7.

Table 7. Correlation Test Results

Variables	Correlation Coefficient	Correlation Product Moment		Criteria
		Sig. Level	Sig. Value	
Learning outcomes with entrepreneurial motivation	-0.225	0.05	0.035	Has significant and negatively correlated relationships.

Based on the analysis data in the table above, it is known that the significance value is 0.035, where this value is smaller than 0.05. Following the results of hypothesis testing in the table, it can be concluded that Ho is rejected and Ha is accepted. So, a significant relationship exists between entrepreneurial motivation and students' cognitive learning outcomes in biology class XI MA NW Narmada.

The significant relationship between learning outcomes and entrepreneurial motivation has a negative direction, which can be seen in the Pearson correlation value. This indicates that the relationship between the two variables is opposite, which means that if cognitive learning outcomes are low, entrepreneurial motivation is high, and vice versa, cognitive learning outcomes are high, and entrepreneurial motivation is low. In the table of hypothesis test results, it can be seen that the *Pearson correlation value* is negative 0.225. The *Pearson correlation* value is in the coefficient interval 0.20-0.399, indicating a low negative relationship between learning outcomes and entrepreneurial motivation.

Table 8. Student Entrepreneurial Motivation Score for Each Category of Cognitive Learning Outcomes

Category	Criteria	F	Average	%
Low	$X < 85$	8	66	34.4%
Medium	$85 \leq X < 91$	44	64	33.3%
High	$91 \leq X$	36	62	32.3%
	Total	88	192	100%

The data table above shows that the highest entrepreneurial motivation is in the low cognitive learning outcomes category. Although the category of moderate cognitive learning outcomes has the most significant number of students, the average entrepreneurial motivation is less than the low category. The average entrepreneurial motivation with the smallest value is in the high learning outcomes category.

According to Hoy and Cecil, the factors that influence the emergence of entrepreneurial motivation in a person are not only knowledge. Knowledge is in the third order of 3 factors, the first of which is hope or a strong desire to succeed, the second is valence, which means the level of inner bonding and involvement that likes the entrepreneurial activities undertaken, and the third is equipment/needs in the form of support, tools, abilities, and knowledge [15]. Based on the above opinion, even though the value of a person's knowledge is high, if the inner desire is not in entrepreneurship, entrepreneurial motivation cannot arise even though business opportunities are wide open. If you only rely on knowledge without preparing anything else, there is less chance of success. There is another essential aspect of learning, namely skills. Skills are also needed in entrepreneurship to pour the knowledge gained into a business/product. Entrepreneurship is closely related to knowledge and skills as basic abilities crucial to innovation [20]. There are six skills needed: strategic, social, managerial, process, learning, adaptive, and digital skills [21].

Students are still unfamiliar with entrepreneurship in biology because the learning content focuses on theory. Schools hold practicums as a form of continuation of the theory taught so that learning can be utilized for grades and many other things. Students still think that entrepreneurship is only if studying entrepreneurship, as evidenced by the distribution of questionnaires where students are confused about why studying biology can be entrepreneurial. Students still do not know that biology can create wider business opportunities due to learning that focuses on biology alone. Based on empirical studies at MAN Kalimukti and MA Al Shigor Al Dauly Cirebon Regency, the biology learning that has been running tends to be verbalistic and oriented solely to the delivery of material [22]. In addition to learning that focuses on theory and the lack of practicum activities, this is also caused by facilities and infrastructure that have not referred to entrepreneurship, such as textbooks or modules. In the research of Rosyidi et al., the results of preliminary observations conducted at junior high schools in the Mandalika Special Economic Zone (SEZ) of Lombok found that learning materials have not integrated biological concepts with entrepreneurial concepts, project-based learning has not been applied optimally and the unavailability of science modules that can facilitate students' independent learning [23]. Many textbooks still focus on biological theory and have not added the type of entrepreneurship that can be done through learning. At the same time, many biological materials can be connected to entrepreneurship. One example is fungi. Some fungi that can be bred and have economic value are oyster mushrooms (Pleurotus ostreatus). In addition, there is material about plants, where one of the business opportunities that can be developed is the creation of ornamental plants [24].

The results of this study show a relationship between cognitive learning outcomes in biology subjects and student entrepreneurial motivation. However, the relationship between students' cognitive biology learning outcomes is low, and the relationship is opposite to entrepreneurial motivation. To maximize both students with medium or high scores to have high entrepreneurial motivation, schools can add or slip entrepreneurial concepts related to subjects other than entrepreneurship, not just biology but in subjects connected to entrepreneurship. This is done so that schools can make students who can utilize their knowledge for quality things after graduation. A learning model that has the potential to empower entrepreneurial skills is bioentrepreneurship.

Biopreneurship integrates biology and entrepreneurship, utilizing biological materials that can be valuable in marketable products [16]. Biorpreneurship is an empowerment approach that combines biological concepts with entrepreneurship. In biology learning, *bioentrepreneurship is* inserted, which is entrepreneurial-based biology learning, so that students who study biology not only think about fighting for one job but can also be

entrepreneurs by utilizing their knowledge in biology. Empowerment activities in pesantren through *biopreneurship* can increase youth entrepreneurial interest, and most students are interested in starting a business after the activities are carried out [17]. Learning implemented with a biopreneurship approach can change the increase in entrepreneurial interest and entrepreneurial life skills from before the activity begins to after the application of *bioentrepreneurship* learning. Research shows that *biopreneurship-based* learning positively impacts students' cognitive abilities [18].

Research that corroborates the statement that *biopreneurship* has a positive impact is the results of Fitriah's research (2012), which states that entrepreneurship-based learning can increase student entrepreneurial interest by 7.30% and improve student learning outcomes by 18.85%. Schools and teachers have an essential role in introducing entrepreneurship to students by using biopreneurship learning tools designed for students who want to learn to explore entrepreneurship, make product creativity, and take steps to get new entrepreneurial opportunities. This is done so that students become graduates who can utilize their knowledge to create jobs for themselves and society [19].

Conclusion

Based on the data analysis and discussion results, it can be concluded that there is a significant negative relationship between cognitive learning outcomes of biology subjects and the entrepreneurial motivation of students in class XI Putri MA NW Narmada. This shows that biology students with high cognitive learning outcomes have low entrepreneurial motivation and vice versa.

Acknowledgements

The research was carried out well, thanks to the support and prayers of various parties. Thank you to MA NW Narmada for giving permission and facilities to implement the research.

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