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Profile Of Science Motivation And Student Learning Outcomes On Environmental Change And Global Warming Materials

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Abstract

Abstract: The need to achieve in life triggers persistent efforts and responses. As a result, a person develops determination, aspirations and motivation to achieve optimal learning outcomes. This research involved 312 students from phase E class X – 4 SMA Negeri 1 Batangan, consisting of 9 classes. The research sample consisted of 32 students in one class who were chosen randomly. The research results revealed that the highest motivation score from Science Motivation was 75%, some students lacked a deep understanding of the reasons for choosing their career with a percentage of 67.30%. Based on the measurement of learning outcomes, it was found that 56% of students had achieved the KKTP, but there were still 44% who had not achieved the KKTP. At level C2 (understanding) it is shown that this class obtained a result of 89%, this indicates that the majority of students have obtained adequate conceptual knowledge. At the C3 (applying) level, this class also shows a fairly good achievement percentage, namely 76%. Shows that most students already have procedural knowledge that allows them to apply concepts and principles in new situations. At level C4 (analyzing), the achievement percentage decreases to 55% indicating that only some students have adequate mastery of conceptual and procedural knowledge. At level C5 (evaluating), the achievement percentage is also relatively low, namely 58%. This condition shows that many students do not yet have strong metacognitive knowledge to be able to evaluate effectively.
Keywords: Science Motivation, Learning Outcomes, Environmental Change

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1. INTRODUCTION

Students are expected to be highly motivated when studying science, especially those related to important environmental issues, such as environmental change and global warming. An in-depth mastery of these topics is needed to create a generation that has the care and ability to contribute to facing environmental challenges. Unfortunately, the reality in the field shows that students are still not interested and motivated in studying environmental science. This indication can be seen from the achievement of learning results of environmental change materials that have not been maximized and the lack of understanding of the importance of global environmental problems. In learning activities, motivation is all the encouragement in students that results in responsibility, continuity and providing input to the learning process, so that the goals can be achieved by the student (Muawanah, E.I & Muhid, A., 2021).

The lack of interest and motivation in studying science needs to be a concern for all of us, because in Bryan, R. R. et al (2011) the motivation to learn science is beneficial for young students who aspire to become future scientists. According to the OECD (2017) in Bryan, R. R. et al (2011) which is no less important, science learning motivation provides benefits for all students in fostering their science literacy, namely the ability to understand scientific knowledge, identify important scientific questions, draw conclusions based on evidence, and make decisions about how human activities affect nature.

Low student motivation and learning outcomes can be caused by a variety of factors, including less engaging teaching methods and

limited actual and relevant learning resources. In addition, science subjects are considered not only boring but too abstract which makes students think that science does not lead them to get a decent job and sufficient income (Putri, D. S. et al. 2022). Quoted from Rohman and Karimah (2018) factors that affect low student motivation to learn include learning places, physical functions, intelligence, facilities and infrastructure, time, study habits, teachers, parents, emotional and health, and friend factors. Motivation comes from the root word motive, which means a commonly used hypothesis construction explaining why people do what they do (Brophy, J. 2004). According to Muhammad, M. (2017) motivation is a change in energy in a person which is characterized by the drive that comes from a person to achieve goals. The need to achieve achievements in life triggers persistent efforts and responses. As a result, a person develops determination, aspiration, and motivation to achieve optimal learning outcomes. Still according to Muhammad, M. (2017) in learning, the motivational factor has an important influence. Motivation is one of the factors that determine the learning outcomes of students, in this case what makes the behavior to learn with initiative, creativity and direction.

To bridge this gap in student motivation and learning outcomes, it is necessary to apply a more creative learning approach and related to real-life contexts. The use of technology, field practice, and discussion that actively involve students can increase their participation in learning activities. It is also important to relate environmental change and global warming materials to students' daily experiences to build relevance and increase learning motivation. According to Schumm and Bogner (2016), one approach to address this may lie in a better method of assessing motivation in science to understand students' needs for tailored programs and teaching methods. In order to support learners in a targeted way, we need to characterize (not) motivated students as precisely as possible, and also to analyze specific aspects of motivation. The exponential growth of scientific knowledge is accompanied by the need to innovate public policy decisions about complex ius-su. To participate effectively in the decision-making process, it is important for science and non-science students to become scientifically literate citizens (Glynn, et al. 2011).

According to Glynn et. al (2009) in his article entitled **Science Motivation Questionnaire: Construct validation with nonscience majors** , it is stated that "*The future of our society depends upon an understanding of the scientific method. Otherwise, we shall be bedeviled byquackery, and our ability to adapt to our rapidly changing technological environment will be at risk*" Otherwise, we will be deceived by shamanism, and our ability to adapt to the rapidly changing technological environment will be threatened." Coupled with the massive amount of information circulating on social media, if students lack understanding of science, it can cause them to be trapped in false information.

As quoted from Rahman, S. (2022) motivation in the sense that develops in society is often equated with "enthusiasm", and learning outcomes are a result achieved by an individual in developing his or her abilities through a process that is carried out with efforts with cognitive, affective, psychomotor and mixed abilities that he has to gain an experience in a relatively long period of time so that an individual experiences a change and Changes from what is observed either directly or indirectly that will be attached to him permanently, learning outcomes can be seen from the evaluation values obtained by students. In Aritonang (2018) it is stated that learning is a business process carried out by individuals who aim to obtain new behavioral changes as an experience for themselves. Motivation is the basis for students to be able to obtain maximum learning outcomes, where the next learning outcomes will be used as the basis for determining the achievement of expected competencies (Rahman, S., 2022).

Student Science Motivation is obtained from the role of teachers at school, teachers can provide many efforts to motivate students to like science lessons, one of which is through strategies in the learning process (Andika, T. B. et al, 2021). Still according to Andika T.B. et al (2021) that a person with high learning motivation will pay full attention to what he is learning during the learning process so that he can absorb to the maximum of every material, both the main material and the enrichment material he learns in the learning process. This study aims to examine the motivation profile of students' science and its relationship with the achievement of learning outcomes, especially in environmental change and

global warming materials. By exploring the factors that affect motivation and learning outcomes, it is hoped that effective learning methods can be designed to improve the quality of environmental science education. High and positive motivation encourages students to consider learning as a necessity, improving their learning outcomes. Therefore, a learning approach is needed that supports the development of students' reasoning power in studying science (Dewi, N. S. et al, 2023). According to Minarti, I. B (2018) the existence of high *science motivation* in students will indirectly affect them in science.

2. METHOD

This study involved 312 students from phase E class X of SMA Negeri 1 Batangan, consisting of 9 classes. The research sample consisted of 32 students in one randomly selected class. The research was conducted from May 13, 2024 to May 22, 2024, and the data collection method was a questionnaire and assessment test. Assessment tests are used to measure student learning outcomes on environmental change and global warming materials. The questionnaire was used to find out students' science motivation in learning biology about environmental change and global warming material. The study adopts a qualitative descriptive approach, which aims to explore and describe the student's condition in depth.

The science motivation analysis used refers to Science Motivation Questionaire II (SMQ-II). which includes the following scales, each with 5 items: intrinsic motivation, self-determination, self-efficacy, career motivation, and value motivation (Glynn, S.M. et. al, 2011). Still according to Glynn, the question items are focused on the motivation to learn science in the course rather than many contexts, such as hobbies. Because of this focus, the scale is not long, and the entire questionnaire can be completed efficiently in about 15 minutes. Students respond to the questionnaire on a grading scale: never (1), rarely (2), sometimes (3), often (4), or always (5). The range of scores obtained on each indicator of 5 scales consisting of 5 items is 1-25. The data analysis method is carried out by triangulation techniques, with the steps of collecting data, calculating percentages, analyzing data, then categorized based on Benchmark Reference Assessment.

Table 1. SMQ-II Benchmark Assessment (Sholihah, R., et al, 2020)

No	Internal Score	Percentage (%)	Category
1	112 – 125	89,60 – 100	Very high
2	98 – 111	78,40 – 88,80	High
3	85 – 97	68,00 - 77,60	Medium
4	72 – 84	57,60 – 67,20	Low
5	≤ 71	≤ 56,80	Very low

The value of learning outcomes of environmental change and global warming material is in the form of numbers 1 to 100. It was measured using multiple-choice questions as many as 20 questions with levels of understanding ranging from C2, C3, C4 and C5 according to the Bloom dimension of knowledge. The achievement of scores at the level of understanding is carried out as a percentage of the maximum score obtained in each competency achievement and the achievement of student learning outcomes with KKTP (70).

3. RESULTS AND DISCUSSION

The results obtained from *the Science Motivation Questionnaire* – II (SMQ-II) were then analyzed and the results of the analysis of 32 Phase E students in grades X – 4 had an average score of 87. If this score is percentaged, it will produce a score of 70.20% which is included in the medium category. The following results of the analysis *of the Science Motivation Questionnaire-II (SMQ – II)* can be seen in Table 2.

Tabel 2. Hasil Science Motiveion Questienaire – This Face A Kelas X-4

No	Criterion	Score Range	Freq	Percentage (%)
1	Very high	112 – 125	2	6
2	High	98 – 111	8	25
3	Medium	85 – 97	10	31
4	Low	72 – 84	6	19
5	Very low	≤ 71	6	19

Table 2 shows the science *motivation category of* phase E students in grades X - 4 SMA Negeri 1 Batangan. Of the 32 students who answered the questionnaire, 2 students (6%) had *very high science motivation*, 8 students (25%)

had high *science motivation*, 10 students (31%) had moderate *science motivation*, 6 students (19%) had low *science motivation*, and 6 students (19%) had science *motivation* very low. According to Glynn, et al (2011), the five indicators of Science Motivation are intrinsic motivation, self-efficacy, self-determination, value motivation and career motivation. The highest score is in the motivation indicator of the score which obtained a score of 600 out of a total score of 800, or 75%, this indicates that students want to get better grades in science lessons than their peers so that students compete positively with each other to get the best indigo in science lessons. In accordance with Adan's opinion, S IA (2023) when students know the learning outcomes can be used as a motivational tool, by knowing the learning outcomes, students will be encouraged to study harder.

Meanwhile, career motivation has the lowest score with a score of 538 out of a maximum score of 800 or 67.30%. Students appear to be less motivated in pursuing careers in science-related fields. In this case, it can be seen that students are more likely to have a career outside the field of science that suits their respective students' talents and interests because it is considered difficult. This is in accordance with his opinion Bandura, A. (1994). *People avoid activities and situations they believe exceed their coping capabilities, but they undertake and perform assuredly those that they judge themselves capable of handling* . Seeing this, there is a need for a better encouragement from teachers, families and the environment. No less important is the internal encouragement or motivation from the students themselves to be able to achieve the expectations they want to achieve. Building intrinsic motivation in students will be better compared to extrinsic motivation. *"Intrinsic motivation is sustained by the inherent satisfaction of activities and their outcomes, whereas extrinsic motivation relies on external rewards or punishments. Intrinsically motivated activities tend to be more enduring and self-sustaining than those driven by external incentives"* Intrinsic motivation is maintained by the inherent satisfaction of activities and their outcomes, whereas extrinsically motivated activities depend on external rewards or punishments. Intrinsically motivated activities tend to be more durable and self-sustaining compared to those driven by external incentives (Bandura, A. 1997). Because students' intrinsic motivation in learning comes from the sincerity of their hearts, positive results from learning will be displayed. However, extrinsic motivation also determines students' interest in learning (Emda, A. 2018).

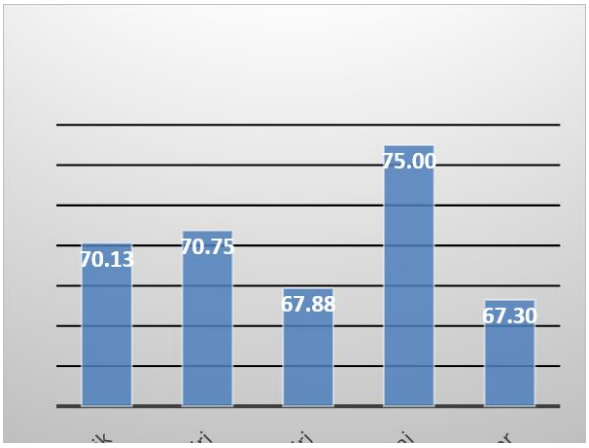


Figure 1. SMQ-II Indicator Achievements

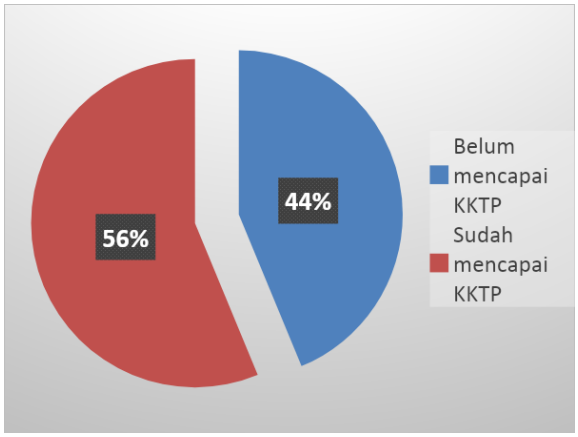
From the measurement of learning outcomes carried out on 32 students, a normality test was carried out using SPSS 22, and the results showed that the class was normally distributed because the Sig value (0.162) > more than α (0.05). From the results of the KKTP score set at 70, the results were obtained as many as 18 students have reached the KKTP and 14 students have not reached the KKTP. Of the 4 levels of competency achievement contained in the questions, the results of the C2 level obtained a percentage of 89% of the maximum score, C3 obtained a result of 76% of the maximum score, C4 obtained 55% of the maximum score achievement, and C5 obtained 58% of the maximum score.

Tabel 3. Hasil uji normalitas

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Nilai UH	,135	32	,145	,952	32	,162

a. Lilliefors Significance Correction



Gambar 2. Achievements of KKTP phase E class X -4

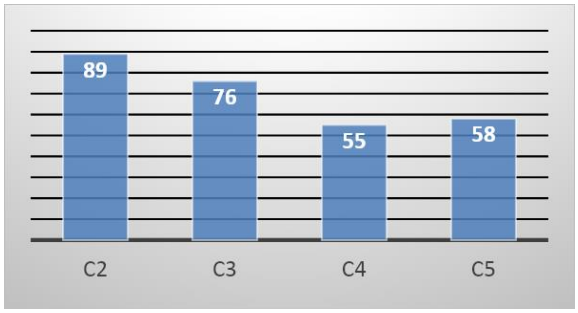


Figure 3. Achievement of phase E level of understanding class X-4

By looking at the percentage of achievement of the level of understanding, we can know about the mastery of different dimensions of knowledge by students. At the C2 (understanding) level, it was shown that this class obtained a result of 89%, this indicates that most students have acquired adequate conceptual knowledge. They are able to understand concepts, principles, and theories well, and can make meaningful connections between pieces of information. Mastery, conceptual knowledge is an important foundation to step into a higher level of understanding.

At the C3 (applying) level, this class also shows a fairly good percentage of achievement, which is 76%. Demonstrate that most students already have procedural knowledge that allows them to apply concepts and principles in new situations. They understand the methods, techniques, and criteria for performing the correct procedure, so that they can apply their knowledge in different contexts. Meanwhile, at the C4 level (analyzing), the percentage of achievement decreased to 55%. This indicates that only some students have sufficient mastery of conceptual and procedural knowledge to be able to analyze effectively. It is likely that they have difficulty understanding the structure and relationships between components, as well as applying appropriate analysis techniques and methods.

For the C5 level (evaluate), the percentage of achievement is also relatively low, which is 58%. This condition shows that many students do not have strong metacognitive knowledge to be able to evaluate effectively. They may lack awareness of their own thought processes, as well as the ability to critically assess the strengths and weaknesses of a solution, idea, or product.

Table 3. The Dimension of Knowledge (Anderson, et al., 2001)

4.1 THE KNOWLEDGE DIMENSION

MAJOR TYPES AND SUBTYPES	EXAMPLES
A. FACTUAL KNOWLEDGE—The basic elements students must know to be acquainted with a discipline or solve problems in it	
Aa. Knowledge of terminology	Technical vocabulary, musical symbols
Ab. Knowledge of specific details and elements	Major natural resources, reliable sources of information
B. CONCEPTUAL KNOWLEDGE—The interrelationships among the basic elements within a larger structure that enable them to function together	
Ba. Knowledge of classifications and categories	Periods of geological time, forms of business ownership
Bb. Knowledge of principles and generalizations	Pythagorean theorem, law of supply and demand
Bc. Knowledge of theories, models, and structures	Theory of evolution, structure of Congress
C. PROCEDURAL KNOWLEDGE—How to do something, methods of inquiry, and criteria for using skills, algorithms, techniques, and methods	
Ca. Knowledge of subject-specific skills and algorithms	Skills used in painting with watercolors, whole-number division algorithm
Cb. Knowledge of subject-specific techniques and methods	Interviewing techniques, scientific method
Cc. Knowledge of criteria for determining when to use appropriate procedures	Criteria used to determine when to apply a procedure involving Newton's second law, criteria used to judge the feasibility of using a particular method to estimate business costs
D. METACOGNITIVE KNOWLEDGE—Knowledge of cognition in general as well as awareness and knowledge of one's own cognition	
Da. Strategic knowledge	Knowledge of outlining as a means of capturing the structure of a unit of subject matter in a textbook, knowledge of the use of heuristics
Db. Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge	Knowledge of the types of tests particular teachers administer, knowledge of the cognitive demands of different tasks
Dc. Self-knowledge	Knowledge that critiquing essays is a personal strength, whereas writing essays is a personal weakness; awareness of one's own knowledge level

4. CONCLUSION

The Science Motivation Questionnaire given to students shows varying levels of motivation. Only 6% of students have very high motivation, while most students, at 31%, are at a moderate level of motivation. Although there are 25% of students who are highly motivated, there are 19% of students who have low motivation, and even another 19% have very low motivation. This indicates the need for efforts to increase students' motivation in learning science, especially for those at low and very low levels of motivation.

Students have a good grasp of the conceptual and procedural dimensions of knowledge, there is still a need for increased mastery of the metacognitive knowledge dimension and the integration of more complex knowledge dimensions. Teachers can design more effective

learning strategies to help students develop analytical, evaluative, and creative skills that are critical to achieving a higher level of understanding in Bloom's taxonomy.

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