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DESCRIPTION OF CREATIVE THINKING SKILLS BASED ON CREATIVE THINKING TEST IN OPTICAL MATERIALS

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Abstract

This study aims to describe the creative thinking of high school students in solving physics problems. Creative thinking skills are crucial for developing long-term success and improving the quality of life. This research is qualitative descriptive research, research methods used in research is a qualitative method, participants in this study were students of class XI SMA IPA 2 and IPA 6, totaling 66 students, data obtained from student's thinking creativity test instrument which is strengthened by data from student and teacher interviews. Data analysis referred to three indicators of creativity used in the study: fluency, flexibility, and originality. The results showed that the aspect of fluency exhibits the highest average proportion among the characteristics of creative thinking, while the aspect of originality shows the lowest average proportion. It is necessary to apply various kinds of learning models that are applied to be able to improve students' creative thinking skills. Although there are some students with lower levels of creative thinking, it does not imply that they lack creativity, as creativity can be fostered through other activities.

Keywords: Creativity; Phhysics Concepts; Test Instrument

Introduction

The rapid development of technology in contemporary times necessitates the acquisition of creative and innovative skills across all facets of life. Creative individuals possess the ability to perceive problems from diverse perspectives, enabling them to conceive novel solutions previously unimagined. Moreover, creative individuals are more adept at identifying new opportunities and generating innovative outputs required in this era. Conversely, professions involving decision-making, planning, and creative work are less susceptible to technological displacement. Hence, it is imperative to foster creativity in children from an early age. Education assumes a pivotal role in equipping students with creative thinking abilities, enabling them to navigate global challenges and thrive in a competitive world. Consequently, education should emphasize the development of students' potential in areas encompassing spirituality, character, intelligence, and skills that meet societal demands. With the evolving landscape, education must adapt to students' needs and foster creativity and innovation. Teachers, driven by social interactions and technological advancements, should harness their abilities to nurture creative individuals who can contribute positively to society (Navarrete, 2013).

Despite the indispensable nature of creative thinking skills for long-term success and an enhanced quality of life, they are often overlooked within classrooms (Newcombe, 2014).

Therefore, there is a pressing need for a creative thinking instrument capable of assessing students' creative thinking abilities and encouraging their active participation in problem-solving endeavors.

Creative thinking holds tremendous value across various domains as it stimulates innovation and enables individuals to generate fresh ideas rooted in their own cognition. Cultivating creative thinking skills promotes active engagement and the expression of diverse opinions, establishing it as a life skill that profoundly impacts one's quality of life and long-term success (Yıldırım, 2010).

Relevant prior research includes a study conducted by Puspa Armandita (2017) that examined students' creative thinking skills in problem-solving related to optics. The research utilized qualitative analysis and revealed that evaluative thinking skills exhibited the highest proportion, while original thinking and flexible thinking skills had the lowest average proportions. In another study, Astuti and Adi Nugroho (2018) employed quantitative descriptive research, utilizing written tests and statistical analysis. They found a positive correlation between critical and creative thinking skills and students' ability to solve physics problems. Furthermore, Susilawati and Kaniawati (2017) utilized qualitative analysis, specifically content analysis, to evaluate students' physics essay assessments and observe the learning process. The study revealed that students demonstrated creative thinking abilities by generating original ideas, connecting physics concepts to everyday experiences, and offering alternative solutions to physics problems.

Based on observations conducted at one of senior high school in Medan regarding students' creative thinking skills, several findings were obtained. Firstly, it was discovered that the utilization of creative thinking questions within the school curriculum is still infrequent. Secondly, the effectiveness of the existing learning model in fostering creative thinking skills has not been adequately developed. Lastly, although the lack of utilization of creative thinking instruments does not necessarily imply a lack of creative skills among students, it emphasizes the absence of measurement and assessment in this particular area. Consequently, the researcher emphasizes the identified issues and formulates the following research problems: 1) How can the description of students' creative thinking abilities be captured through tests? 2) The tests employed should possess the capability to depict students' creative thinking skills. 3) The validation and reliability of the test instruments specifically applied to optical material physics need to be assessed.

The research aims to accomplish the following objectives: 1) To provide a comprehensive depiction of students' creative thinking skills in the context of Optical material. 2) To evaluate the quality of the test instruments in effectively measuring students' creative thinking abilities. 3) To determine the feasibility of the test instruments used, with a specific focus on validation and

reliability, within the domain of optical material physics.

Methods

This research employs a qualitative descriptive approach, which is a fundamental research method utilized to describe the phenomenon of learning outcomes under investigation (Sugiyono, 2018). The research was conducted at a selected class of the XI grade in Medan State Senior High School. Based on previous observations, the participants in this study consisted of students from both Class XI MIPA 2 and MIPA 6, both of which had completed the Optics course. The selection of participants was carried out using purposive sampling, taking into account various factors such as students' enrollment in the specific class and recommendations from subject teachers.

The research utilized two instruments, namely a description test to assess students' thinking creativity and an interview guide for students. The data analysis process employed Miles and Huberman's approach, which involves a systematic analysis and interpretation of data (Saldana, 2015). The analysis process consisted of three main stages: data reduction, data presentation, and drawing conclusions.

Data collection techniques are essential for gathering relevant and accurate materials that align with the research purpose. In this study, data collection techniques included tests and interviews. The assessment instrument employed a rubric with a 1-4 scale, which referred to indicators of creative thinking. The data collection process involved administering essay tests to students. Subsequently, four students were selected, comprising two with high creative abilities and two with low creative abilities. The students' essay test responses were analyzed based on the accuracy of their answers, aided by assessment guidelines. The analysis focused on the four creativity indicators used in the learning process: fluency, flexibility, originality, and elaboration.

Results and Discussion

The number of classes used as research subjects there are two classes, namely class XI MIPA 2 and XI MIPA 6, with a total of 66 students.

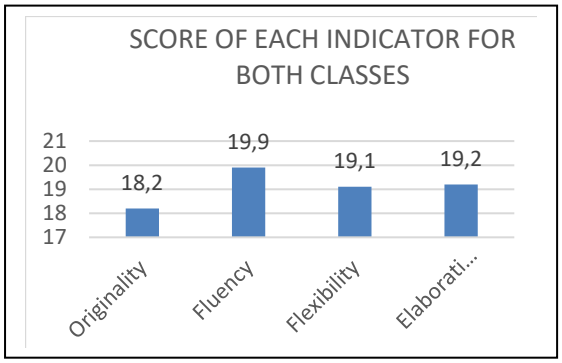

Figure 1. Score of each indicator for both classes

Figure 1, presents the overall results of each indicator for the two classes. The analysis shows that students have a relatively good ability to think creatively in terms of fluency with an average score of 19.9, as they can generate multiple answers or ideas for a given problem. However, there is room for improvement in encouraging students to explore alternative answers or ideas. This finding is consistent with a previous study by (Fitriyani & Indrawati, 2018), found that the ability to think fluently by 71% which reported a high fluency thinking ability due to students' prior exposure to similar problems. Overall, the results indicate that students possess the capacity for creative and fluent thinking when provided with suitable problem-solving tasks.

The aspects of flexibility and elaboration display low levels of performance with an average score of 19.1 and 19,2 out of 66 students, as students are required to generate a variety of ideas and adapt their thinking approaches, as well as provide detailed explanations. Similar findings were reported in research by (Puspa Armandita, 2017), it was found that in the aspect of flexibility the percentage was 64% out of 30 students which shows that students especially face difficulties in generating varied ideas. While their elaborative thinking skills show some improvement, most students still struggle with the accuracy and effectiveness of problem solving.

In addition, the originality aspect exhibits the lowest level of creative thinking ability among students, as indicated by an average score of 18.2 out of 66. This aligns with (Astuti & Adi Nugroho, 2018) research, which found that originality had the lowest performance at 57%. The low percentage highlights a lack of sensitivity in students' responses to the questions. Sensitivity to the questions plays a vital role in fostering creative thinking and generating novel ideas.

Previously conducted research, the researcher tested the validated question instrument using Kappa Cohen with the validity of the questions in the valid (moderate) category and the questions also received very high reliability values, so that the questions that could be used in this study totaled 10 questions.

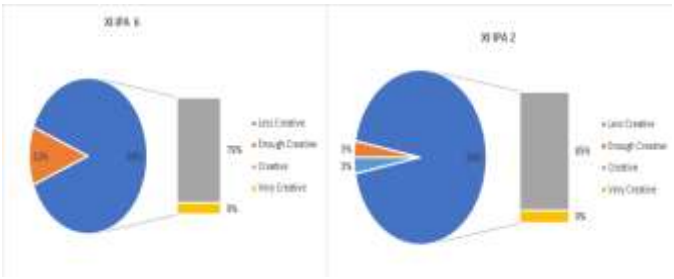

Figure 2. Percentage of Creative Thinking Skills of Both Classes

Based on the figure it can be seen that as many as 6% or 2 students have sufficient creative thinking skills, namely 88% or as many as 29 students have the ability to think creatively, and as

many as 6% or 2 students have the ability to think very creatively. Based on the calculation of the data that has been done, the two classes have an overall average score of 27.1. Class XI IPA 2 gets an overall score of 19.7. This shows that class XI IPA 2 scored below the average value of the two classes. Nevertheless, based on the data in Figure 4.6, the ability to think creatively in class XI IPA 2 is classified as creative at 88%.

While class XI IPA 6 as 12% or 4 students have sufficient creative thinking skills, 79% or as many as 26 students have the ability to think creatively, and as many as 9% or 3 students have the ability to think very creatively. Based on the calculation of the data that has been done, the two classes have an overall average score of 20.1. Meanwhile, class XI IPA 6 obtained an overall score of 19.9. This shows that class XI IPA 6 scored above the average value of the two classes. While the ability to think creatively in class XI IPA 6 is classified as creative, namely 88%. The percentage of students who can think creatively in class XI IPA 6 is also greater than in class XI IPA 2, which is 9%.

Based on question number 1, students are faced with an introduction to the types of lenses from simple experiments, students are asked to represent, analyze, and describe types of lenses through simple experiments. Students provide many ideas for answers to find out the type of lens through a simple experiment. In questions number 2 and number 8, students are faced with giving ideas to design glasses to reduce glare on motorists and consider solving problems in these questions.

Then in numbers 3,4,6, 9, and 10, these five questions require students to provide many ideas from various points of view regarding the concept of light dispersion, the rainbow phenomenon, and its application in everyday life. Students who can understand thoroughly related to light dispersion material will be able to solve this problem well. In problem number 5, students are faced with a more imaginative way of designing a tool that can measure the speed of light. This question requires students to have high creativity, it is evident that several student's answers are unique. In problem number 10, students are given a question about how to design a camera position, students must make more than one design. However, students are only able to make one series of designs.

CONCLUSION

Based on the results of the research that has been done, the creative thinking skills of class XI students can be categorized as moderate and quite good. Even though there are some students who have a low level of creative thinking, it does not mean they are less creative, because creativity can be fostered through other activities. The fluency aspect shows the highest average proportion

among the characteristics of creative thinking, while the originality aspect shows the lowest average proportion. The test instrument is feasible to use with the Cohen's kappa coefficient in the category of valid and very high reliability so that the instrument can be used. The suggestions that can be given in this study are that it is necessary to apply various kinds of learning models that are applied to be able to improve students' creative thinking skills.

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REFERENCES

Aizikovitsh-Udi, E. &. (2015). Developing critical thinking skills from dispositions to abilities: Mathematics education from early childhood to high school. creative education, 456-461.

Arikunto, S. (2010). Dasar-Dasar Evaluasi Pendidikan. Jakarta: Bumi Aksara.

Astuti, E. P., & Adi Nugroho, A. (2018). Analysis of critical and creative thinking skills in physics problem solving. Journal of Physics: Conference Series, 28-44.

Azhari. (2013). Peningkatan Kemampuan Berpikir Kreatif Matematik Siswa Melalui Pendekatan Konstruktivisme Di Kelas VII Sekolah Menengah Pertama (SMP) Negeri 2 Banyuasin III. Jurnal Pendidikan Matematika, 4-6.

Baum, L. M. (2010). Instructional design as critical and creative thinking: A journey through a Jamestown-Era Native American Village. TechTrends, 26-36.

Collins, R. (2014). Skills for the 21st Century: Teaching higher-order thinking. Curriculum & Leadership Journal, 2-6.

Fitriyani, R., & Indrawati, I. (2018). Analysis of students' creative thinking in solving conceptual physics problems. Journal of Physics: Conference Series, 77-88.

Guildford. (2012). Pengembangan Kreativitas Anak. Jakarta: Rineka Cipta.

Hamzah, A. (2014). Evaluasi pembelajaran Matematika. Jakarta: Rajawali Pers.

Jihad, A. d. (2012). Evaluasi Pembelajaran. Yogyakarta: Multi Pressindo.

Kiryak, Z. &. (2017). Improving grade 7 students' conceptual understanding of water pollution via common knowledge construction model. International Journal of Science and Mathematics Education,, 2-20.

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. Biometrics, 15-74.

Maayah, B., Karim, N., & Makhadmeh, L. (2022). The Role of Problem-Based Learning in Developing Students' Critical Thinking Skills. International Journal of Instruction, 104-112.

Moma, L. (2015). Pengembangan Instrumen Kemampuan Berpikir. Jurnal Matematika dan Pendidikan Matematika, 32-33.

Munandar, U. (2009). Pengembangan Kreativitas Anak Berbakat. Jakarta: PT. Rineka Cipta.

Navarrete, C. C. (2013). Creative thinking in digital game design and development: A case. Computers & Education, 321-330.

Newcombe, N. S. (2014). Studying visual and spatial reasoning for design creativity: Thinking about spatial thinking. Dordrecht: Springer.

Nurul Fitriani, G. S. (2017). Berfikir Kreatif Dalam Fisika Dengan Pembelajaran Conceptual Understanding Procedures (CUPs) Berbantuan LKPD. Jurnal Pendidikan Fisika dan Teknologi, 24-33.

Purwanto. (2011). Evaluasi Hasil Belajar. Yogyakarta: Pustaka Pelajar.

Puspa Armandita, E. W. (2017). Analisis Kemampuan Berpikir Kreatif Pembelajaran Fisika Dikelas XI MIA 3 SMA Negeri 11 Koya Jambi. Jurnal Penelitian Ilmu Pendidikan, 130-134.

Rahmawati, Y., Kaniawati, I., & Suyatna, A. (2019). Analysis of students' creative thinking in solving open-ended physics problems. Journal of Physics: Conference Series, 4-8.

Ridwan. (2003). Dasar-Dasar Statistika. Bandung: Alfabeta.

Saldana, J. (2015). The Coding Manual for Qualitative Researchers. London: SAGE.

Sugiyono, P. D. (2018). Metode Penelitian Kuantitatif, Kualitatif, dan R&D. Bandung: Alfabeta.

Sukarno, B. B. (2020). Modul Pembelajaran Fisika SMA. Jakarta: Dinas.id.

Susilawati, S., & Kaniawati, I. (2017). Analyzing the creativity level of students' physics essays in the inquiry-based learning approach. Journal of Physics: Conference Series, 1-7.

Sutarto, H., Kaniawati, I., & Suyatna, A. (2019). Analysis of students' creative thinking ability in solving context-rich problems in physics. Journal of Physics: Conference Series, 4-9.

Torrance, E. (1969). Creativity, What Research Says to the Teacher. Washington, D.C: National Education Association.

Utomo, B. (2019). Analisis Validitas Isi Butir Soal sebagai Salah Satu Upaya Peningkatan Kualitas Pembelajaran di Madrasah Berbasis Nilai-Nilai Isam. Pendidikan Matematika, 1-12.

Wahyu Arini, A. A. (2017). Analisis Kemampuan Berpikir Kreatif Pada Materi Cahaya Siswa Kelas VIII SMP Xaverius Kota Lubuklinggau. Science and Physics Education Journal (SPEJ), 23-28.

Yıldırım, E. (2010). Individual-organizational creativity and importance of creative management (In Turkish). KMU Journal of Social And Economic Research, 110-119.

Yuliati, L, S. A., & Samsudin, A. (2018). The analysis of creative thinking ability of high school students in solving physics problem. Journal of Physics: Conference Series, 28-48.