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THE RELATIONSHIP BETWEEN CREATIVE THINKING SKILLS AND STUDENTS' SCIENCE LITERACY ABILITY

Eka Maryam
Universitas Bina Insan Lubuklinggau, Indonesia
E-mail: eka_maryam@univbinsan.ac.id

Abstract

This study analyses the relationship between creative thinking skills and students' science literacy skills. Creative thinking is essential in higher education, especially in Physics learning, which requires solving complex problems. Science literacy includes understanding, application, and the ability to communicate about scientific concepts. This study uses a quantitative method with a correlational approach. The results showed a significant relationship between creative thinking skills and students' science literacy, with a correlation coefficient of 0.85, which showed a positive relationship. These findings indicate that improving creative thinking skills can improve students' science literacy skills.

Keywords: Critical Thinking Skills, Relationships, Science Literacy.

INTRODUCTION

The development of science and technology in the era of globalization requires individuals to have 21st-century skills that include critical thinking, creativity, collaboration, and communication skills (Trilling & Fadel, 2009). Among these skills, creative thinking is essential in facing the challenges of a dynamic world. These skills include generating new ideas, evaluating information innovatively, and solving complex problems effectively (Chavula et al., 2022). Meanwhile, according to Karunarathne & Calma, (2024) creative thinking skills refer to a person's ability to produce new and valuable ideas, solutions, or products through divergent, imaginative, and original thinking processes such as fluency (fluency in generating ideas), flexibility (flexibility in seeing various perspectives), originality (originality of ideas), and elaboration (development of idea details).

The Importance of Creative Thinking Skills In an increasingly complex and dynamic world, creative thinking skills are an important competency. According to Runco & Acar, (2012) creativity is one of the keys to success in various fields, including education, business, and technology. Creative thinking encourages individuals to find innovative solutions to their challenges, increasing efficiency and effectiveness. According to Eshet & Margaliot, (2022) factors that affect creative thinking skills, various factors affect creative thinking skills, including 1) Environment: An environment that supports freedom of expression, collaboration, and exploration can increase creativity; 2) Education: Learning approaches that encourage discussion, problem-solving, and creativity-based projects can help students develop creative thinking skills, 3) Motivation: Intrinsic motivation plays an important role in encouraging individuals to be creative and explore new ideas.

Sedangkan Strategi untuk Mengembangkan Keterampilan Berpikir Kreatif Beberapa strategi yang dapat digunakan untuk mengembangkan keterampilan berpikir kreatif meliputi: 1) brainstorming: teknik ini mendorong individu atau kelompok untuk menghasilkan banyak ide tanpa evaluasi awal, 2) mind mapping: alat visual untuk mengorganisasi ide secara bebas dan kreatif, 3) pemecahan masalah: melibatkan individu dalam situasi nyata yang memerlukan solusi inovatif, 4) pertanyaan terbuka: mendorong siswa untuk mengeksplorasi dan memberikan jawaban tanpa batasan tertentu. Sedangkan menurut (Kim, 2017) Pengukuran Keterampilan Berpikir Kreatif Torrance Tests of Creative Thinking (TTCT) adalah alat yang sering digunakan untuk mengukur tingkat keterampilan berpikir kreatif. Tes ini mengevaluasi fluency, flexibility, originality, dan elaboration seseorang melalui tugas-tugas berbasis verbal dan non-verbal (Marzuki et al., 2020).

Meanwhile, science literacy, as one of the primary abilities that students must have, refers to understanding scientific concepts, analysing natural phenomena, and using scientific knowledge in daily life (OECD, 2019). cience literacy is also an important indicator of a country's education quality, which is measured through international programs such as the Programme for International Student Assessment (PISA). In PISA 2018, Indonesian students' average science literacy score was 396, far below the OECD average of 489. This condition illustrates the need to strengthen science literacy at all levels of education, including higher education (Fausan et al., 2021). Science literacy is an important factor affecting student achievement in physics learning. Science literacy is understanding scientific concepts meaningfully, explaining scientific phenomena, describing them based on scientific evidence, and applying them in daily life (Ke et al., 2021). Meanwhile, according to Valladares, (2021) science literacy is knowledge about the substance of science in understanding, evaluating, and using information and the ability to think critically about science to make the right decisions and think critically in daily life. Science literacy requires not only knowledge of scientific concepts and theories but also knowledge of general procedures and practices related to scientific inquiry (Husna et al., 2022). So, students must have a basis of scientific knowledge about concepts and ideas that are the basis of science and technology thinking, how the knowledge is acquired, and the extent to which this knowledge is proven by evidence or theoretical explanations (Virtič, 2022). According to Chakravartty (2022) science must be seen from four dimensions: science as a way of thinking, science as a way of investigating, science as a body of knowledge, and the interaction of science with technology.

Previous research has shown that creative thinking is important in mastering science literacy. Individuals with creative thinking skills can understand scientific concepts in depth, connect knowledge with the context of life, and find innovative solutions to complex problems (Nurdiana et al., 2020). This relationship is increasingly important in today's era, where science and technology are developing rapidly, demanding that students not only understand science but also be able to apply it creatively (Permana et al., 2021). However, research examining the relationship between creative thinking skills

and science literacy, especially in the context of students in Indonesia, is still limited (Fitria & Widi, 2015). The mastery of these two abilities is interrelated and has a strategic role in increasing students' global competitiveness (Sternberg et al., 2012). Therefore, this study aims to analyze the relationship between creative thinking skills and students' science literacy skills. The research results are expected to contribute to the development of a learning model that supports the strengthening of these two abilities.

RESEARCH METHOD

This study uses a quantitative approach with a correlational design. The research sample comprised 30 students from the Department of Engineering in the Bina Insan Lubuklinggau University physics course. The research instruments include a creative thinking skills test and a science literacy test that has been validated previously—a science literacy test that provides for understanding concepts, application in everyday contexts, and scientific communication.

Data Collection Procedure

1. Creative Thinking Skills Test: This test measures four aspects of creative thinking, namely fluency, flexibility, originality, and elaboration.
2. Science Literacy Test: This test consists of context-based questions that measure the ability to understand, apply, and communicate about scientific concepts.

Data Analysis

The data were analyzed using Pearson's correlation technique to measure the relationship between creative thinking skills and science literacy. The significance of the relationship was tested with a $p <$ value of 0.05.

RESULT AND DISCUSSION

Research Results To provide an overview of the variables of students' creative thinking skills and science literacy, the following are descriptive statistics from the research results:

Table 1. Descriptive Statistics

Variable	Average	Standard Deviation	Minimum Score	Maximum Score
Creative Thinking Skills	78.5	8.2	60	95
Science Literacy	81.3	7.6	62	96

Table 1 shows that the average score of students' creative thinking skills is 78.5, with a standard deviation of 8.2. The minimum and maximum values are 60 and 95, respectively. Meanwhile, the average student science literacy score is 81.3,

with a standard deviation 7.6, and the minimum and maximum scores are 62 and 96, respectively. A Pearson correlation test was conducted to determine the relationship between creative thinking skills and science literacy. The results can be seen in the following table:

Table 2. Correlation Test Results

Variable X	Variable Y	Correlation Coefficient (r)	Significance (p)
Creative Thinking Skills	Science Literacy	0.85	< 0.001

Table 2 shows that the correlation coefficient between creative thinking skills and science literacy is 0.85, meaning that creative thinking skills affect science literacy skills by 85% while other factors influence the other 15%. This value also indicates a strong and positive relationship between the two variables. In addition, the significance value ($p < 0.001$) suggests that the relationship is statistically significant.

Discussion

Analysis and Discussion These findings show that students with high creative thinking skills tend to have better science literacy. Aspects of creative thinking, such as the ability to generate new ideas (originality) and develop detailed solutions (elaboration), support the understanding and application of scientific concepts (Hadzigeorgiou et al., 2012). Good science literacy allows students to understand and apply science concepts effectively, while creative thinking skills help them explore innovative solutions in learning (Sinolungan et al., 2021). Thus, higher education needs to design a curriculum that encourages the development of creative thinking skills through active learning and problem-solving.

The results of the study show that there is a very strong and significant relationship between creative thinking skills and student science literacy. These findings provide some important insights that can be broken down as follows:

a. The Relationship between Creative Thinking and Science Literacy

The correlation coefficient of 0.85 shows that students with high creative thinking skills tend to have better science literacy skills. This is due to the ability to think creatively, which supports analyzing, synthesizing, and evaluating scientific information (Chang, 2018). Students who can think creatively are better at producing innovative solutions to scientific problems and understanding complex concepts.

b. The Role of Creative Thinking Aspects in Science Literacy

Fluency: Students who can generate many ideas have flexibility in solving various science problems.

Flexibility: The ability to think flexibly allows students to adopt various approaches to understanding science concepts.

Originality: Original ideas encourage students to find new solutions that have never been implemented.

Elaboration: The in-depth development of ideas helps students to formulate more detailed and relevant scientific arguments.

c. Implications for Higher Education

The results of this study show the importance of integrating the development of creative thinking skills into the higher education curriculum. Project-based learning approaches, group discussions, and case studies can improve these abilities. In addition, tasks that encourage exploration and innovation must be implemented in learning (Tan & Chapman, 2016).

d. Relationship with Science Literacy

Science literacy includes not only the ability to understand scientific concepts but also to apply and communicate them (Jurecki & Wander, 2012). Students with creative thinking skills tend to be more capable of:

- Understand the relationships between concepts in science.
- Apply scientific knowledge in daily life.
- Communicate research ideas and results in an engaging and informative way.

e. Theoretical Support

This study's results align with theories stating that creative thinking is an essential foundation in developing science literacy. Creative students can see problems from various perspectives and produce more effective solutions (Zuhra & Arifiyanti, 2021). This reinforces the view that science literacy must be developed along with creative skills.

f. Challenges and Opportunities

While the findings show a strong positive association, it is essential to consider other factors, such as the learning environment, faculty support, and learning facilities (Zhang et al., 2019). Further research may explore how specific interventions, such as creative thinking training, can significantly improve science literacy. By understanding these relationships, educational institutions can design more holistic learning strategies, improving theoretical understanding and preparing students for real-world challenges.

CONCLUSION

Conclusion This study reveals a significant relationship between creative thinking skills and students' science literacy. Improving creative thinking skills

can be an effective strategy to improve science literacy. Recommendations for further research are to explore other factors that influence this relationship and evaluate the effectiveness of educational interventions to improve both abilities.

REFERENCES

Chakravartty, A. (2022). Scientific Knowledge vs. Knowledge of Science: Public Understanding and Science in Society. *Science and Education*, *0123456789*. https://doi.org/10.1007/s11191-022-00376-6

Chang, S. (2018). Impacts of an augmented reality-based flipped learning guiding approach on students' scientific project performance and perceptions. *Computers and Education*, *125*, 226–239. https://doi.org/10.1016/j.compedu.2018.06.007

Chavula, C., Choi, Y., & Rieh, S. Y. (2022). Understanding creative thinking processes in searching for. *CHIIR 2022 - Proceedings of the 2022 Conference on Human Information Interaction and Retrieval*, 321–326. https://doi.org/10.1145/3498366.3505783

Eshet, Y., & Margaliot, A. (2022). Does creative thinking contribute to the academic integrity of education students? *Frontiers in Psychology*, *13*(August), 1–10. https://doi.org/10.3389/fpsyg.2022.925195

Fausan, M. M., Susilo, H., Gofur, A., Sueb, & Yusop, F. D. (2021). The scientific literacy performance of gifted young scientist candidates in the digital age. *Cakrawala Pendidikan*, *40*(2), 467–498. https://doi.org/10.21831/cp.v40i2.39434

Fitria, M., & Widi, A. (2015). The Development of Ethnoscience-Based Chemical Enrichment Book as a Science Literacy Source of Students. *International Journal of Chemistry Education Research –*, *2*(1), 50–57. https://doi.org/10.20885/ijcer.vol2.iss1.art8

Hadzigeorgiou, Y., Fokialis, P., & Kabouropoulou, M. (2012). Thinking about Creativity in Science Education. *Creative Education*, *03*(05), 603–611. https://doi.org/10.4236/ce.2012.35089

Husna, N., Halim, A., Evendi, E., Syukri, M., Nur, S., Elisa, E., & Khaldun, I. (2022). Impact of Science Process Skills on Scientific Literacy. *Jurnal Penelitian Pendidikan IPA*, *8*(4), 2123–2129. https://doi.org/10.29303/jppipa.v8i4.1887

Jurecki, K., & Wander, M. C. F. (2012). Science literacy, critical thinking, and scientific literature: Guidelines for evaluating scientific literature in the classroom. *Journal of Geoscience Education*, *60*(2), 100–105.

https://doi.org/10.5408/11-221.1
Karunarathne, W., & Calma, A. (2024). Assessing creative thinking skills in higher education: deficits and improvements. *Studies in Higher Education*, *49*(1), 157–177. https://doi.org/10.1080/03075079.2023.2225532
Ke, L., Sadler, T. D., Zangori, L., & Friedrichsen, P. J. (2021). Developing and Using Multiple Models to Promote Scientific Literacy in the Context of Socio-Scientific Issues. *Science and Education*, *30*(3), 589–607. https://doi.org/10.1007/s11191-021-00206-1
Kim, K. H. (2017). The Torrance Tests of Creative Thinking - Figural or Verbal : Which One Should We Use ? *Creativity. Theories – Research – Applications*, *4*(2), 302–321. https://doi.org/10.1515/ctra-2017-0015
Marzuki, Cahya, E., & Wahyudin. (2020). Relationship between mathematical creative thinking ability and student's achievement in gender perspective. *Journal of Physics: Conference Series*, *1521*(3). https://doi.org/10.1088/1742-6596/1521/3/032039
Nurdiana, H., Sajidan, & Maridi. (2020). Creative thinking skills profile of junior high school students in science learning. *Journal of Physics: Conference Series*, *1567*(2), 316–328. https://doi.org/10.1088/1742-6596/1567/2/022049
OECD. (2019). *PISA 2018 Results (Volume I) What Students Know and Can Do: Vol. I*. https://doi.org/10.1787/5f07c754-en
Permana, M. P., Didik, R., Bayu, G. P., Amiruddin, M., & Yoanita, Y. V. (2021). Development of Integrated Online Learning Content Distribution Module Based on Social Media for Beginners Online Teachers in Creating Learning Content Due to The Covid-19 Pandemic. In *Journal of Physics: Conference Series* (Vol. 1823, Issue 1, p. 12023). IOP Publishing. https://doi.org/10.1088/1742-6596/1823/1/012023
Runco, M. A., & Acar, S. (2012). Divergent Thinking as an Indicator of Creative Potential. *Creativity Research Journal*, *24*(1), 66–75. https://doi.org/10.1080/10400419.2012.652929
Sinolungan, V. D. M., Wenas, J. R., & Damai, W. (2021). Development of Learning Device Using Discovery Learning Model with a Scientific Approach on Sequence and Series Material. In *Proceedings of the 5th Asian Education Symposium 2020 (AES 2020)*. Atlantis Press. https://doi.org/10.2991/assehr.k.210715.074
Sternberg, R. J., Sternberg, K., & Mio, J. (2012). Cognitive Psychology. *Case-Based Reasoning*, 643. https://doi.org/10.1007/978-3-031-01562-5_3
Tan, J. C. L., & Chapman, A. (2016). Project-based learning for academically-able students: Hwa Chong institution in Singapore. In *Project-Based Learning for Academically-Able Students: Hwa Chong Institution in Singapore*. https://doi.org/10.1007/978-94-6300-732-0

Trilling, B., & Fadel, C. (2009). 21st Century Skills_ Learning for Life in Our Times. In *Jossey-Bass* (Vol. 2, Issue 1). Jossey-Bass A Wiley Imprint.

Valladares, L. (2021). Scientific Literacy and Social Transformation: Critical Perspectives About Science Participation and Emancipation. In *Science and Education* (Vol. 30, Issue 3). Springer Netherlands. https://doi.org/10.1007/s11191-021-00205-2

Virtič, M. P. (2022). Teaching science & technology: components of scientific literacy and insight into the steps of research. *International Journal of Science Education*, *44*(12), 1916–1931. https://doi.org/https://doi.org/10.1080/09500693.2022.2105414

Zhang, W., Zhou, Y., & Yi, B. (2019). An Interpretable Online Learner's Performance Prediction Model Based on Learning Analytics. In *Proceedings of the 2019 11th International Conference on Education Technology and Computers*. ACM. https://doi.org/10.1145/3369255.3369277

Zuhra, F., & Arifiyanti, F. (2021). Indonesian Review of Physics (IRiP) The Analysis of Students' Critical Thinking and Scientific Literacy Skills. *Rev. Phys*, *4*(1), 32–38. https://doi.org/10.12928/irip.v4i1.3980