Thinking Skills and Creativity Journal
Volume 6, Number 1, Tahun 2023, pp. 44-51
P-ISSN: 2615-4692 E-ISSN: 2615-6105
Open Access: https://doi.org/10.23887/tscj.v6i1.54916

Creativity in Higher Education: The Effect of Personality on Students' Creative Thinking Skills

Rahmat Aziz[1*]

[1] Department, of Psychology, Faculty of Psychology, Universitas Islam Negeri Maulana Malik Ibrahim Malang, East Java, Indonesia

ARTICLE INFO

Article history:
Received January 18, 2023
Revised Jaunary 21, 2023
Accepted March 30, 2023
Available online April 25, 2023

Kata Kunci:
Kepribadian Kreatif, Berpikir Kreatif, Ketekunan dalam Belajar, Mahasiswa Perguruan Tinggi

Keywords:
Creative Personality, Creative Thinking Skill, Perseverance in Learning, Students Higher Education

ABSTRAK

Keterampilan berpikir kreatif pada mahasiswa merupakan keterampilan yang penting untuk dikembangkan di perguruan tinggi. Pentingnya keterampilan tersebut tidak sejalan dengan keadaan mahasiswa di perguruan tinggi. Beberapa penelitian pada mahasiswa menunjukkan rendahnya tingkat ketrampilan tersebut. Kepribadian kreatif merupakan faktor yang mempengaruhi ketrampilan berpikir kreatif. Penelitian ini bertujuan untuk menguji pengaruh kepribadian kreatif terhadap keterampilan kreatif mahasiswa di perguruan tinggi. Penelitian ini menggunakan pendekatan kuantitatif dengan desain asosiatif. Subjek penelitian berjumlah 90 (sembilan puluh) mahasiswa yang dipilih secara random dengan mempertimbangkan proporsi dari tiga perguruan tinggi negeri di Jawa Timur. Data diperoleh melalui alat ukur kepribadian kreatif dan ketreampilan berpikir kreatif. Analisis data menggunakan teknik analisis regresi. Pengujian dilakukan secara simultan dan parsial. Hasil analisis menunjukkan bahwa kepribadian kreatif berpengaruh terhadap keterampilan kreatif. Ketekunan dalam mengerjakan tugas merupakan faktor yang paling dominan dalam mempengaruhi keterampilan berpikir kreatif mahasiswa. Hasil penelitian ini berimplikasi terhadap pengembangan berpikir kreatif mahasiswa yang sebaiknya dilakukan bersamaan dengan pengembangan kepribadian kreatif mereka.

ABSTRACT

Creative thinking is an essential skill to be developed in college students. The importance of these skills is not in line with the existing student creativity in higher education. Several studies on students show low levels of these skills. A creative personality is a factor that influences these skills. This study aims to test the influence of creative personality on creative thinking skills. The research uses a quantitative approach with associative design. The research subjects were 90 (ninety) students who were randomly selected by considering the proportion of three state universities in East Java. Data were obtained by measuring creative personality and creative thinking skills through the creative personality scale and creative thinking test. The data were analyzed through regression analysis techniques. Testing is performed simultaneously and partially. The results show that a creative personality affects creative thinking skills. Perseverance is the most dominant factor in influencing students' creative thinking skills. The results of this study imply that the development of students' creative thinking should be in line with the development of their creative personality.

1. INTRODUCTION

The complexity of the problems faced by students in higher education has entrusted the importance of creative thinking skills to solve these problems. However, the importance of these skills is different from the facts that show the level of creative thinking skills of students in higher education. Several studies provide information on the existence of low levels of creativity in students in higher education. This fact aligns with the research results that found that student creativity is unsatisfactory (Fan & Cai, 2022; Yusnaeni et al., 2017). In fact, creativity is very crucial to the academic life of students, and students' mental health (Duenyas & Perkins, 2021; Malele, 2021; Robino et al., 2021). Some of these studies show the importance of improving creative thinking skills in students' higher education. Two factors causing the high or low level of creative thinking skills in students in higher education have been studied by previous

*Corresponding author
E-mail addresses: azira@uin-malang.ac.id (Rahmat Aziz)

researchers. The first causal factor focuses its study on external aspects. For example, the research examines the influence of the school environment on creative thinking (Catarino, 2019; Jamaluddin et al., 2021; Puspita et al., 2020). Another example is, research tests that family life affects creative thinking (Jankowska & Karwowski, 2019). The second causative factor focuses on the internal aspects of the individual. For example, research that tests personality influence on creative thinking (Chiu et al., 2014; García-García et al., 2019). Studies have shown that students' personality is an essential factor that affects these skills (Kao, 2016; Lee & Min, 2016). In other words, research examining the relationship between these two variables becomes essential in understanding creativity in students in higher education. Especially the perseverance in learning aspect in influencing creative thinking.

So far, research on creativity in students in higher education has been performed by focusing on four studies. The first study focused on efforts to develop creativity through the educational process. In this study, creativity is understood as an educational environment that supports the development of student creativity (Aziz et al., 2022; Holis, 2017). The second study examines creativity as a product of the educational or training process. In this study, creativity is understood as a creative product. Among the creative products studied include creative writing (Göçen, 2019; Jaffe et al., 2021). Third, research makes creativity a thinking process. This study studied creativity as a process of creative thinking in students (Huang et al., 2020; Puspita et al., 2020). Finally, creativity is researched as a creative personality. The previous study studied creativity as a personality characteristic that characterizes creative people (Gutterman & Aafjes Van-Doorn, 2022; Tang, 2019). This article elaborates on previous research by examining creativity as a personality characteristic and thinking process in students' higher education. The creativity in this article is understood from two approaches. The first approach understands creativity as a type of thinking. As a thinking process, creativity is characterized by the ability to think flexibly, realistically, and originally. Various psychological measurements can identify creativity as a process of creative thinking. Torrence's test of creativity is a measurement tool that reveals creative thinking skills from flexibility, originality, and elaboration (Said-Metwaly et al., 2018, 2020, 2021). The second approach is to understand creativity as a personality characteristic that is non-cognitive. Creativity as a creative personality is measured through a creative personality test. Some instruments often used include the measuring instrument creative behavior inventory and the Revised Creative Domains Questionnaire measuring tool (Chen & Zhang, 2020; Roth et al., 2022).

Several studies that examine the relationship between the two types of creativity have been performed in various contexts and levels of education. Several studies have found that students' creative thinking skills can be analyzed based on the student's personality type (Murtianto et al., 2020; Sari et al., 2020). Other research has found that students' creative thinking skills can be influenced by creative personalities in students (An et al., 2016; Liu et al., 2015). Some of these studies conclude that creative personality affects creative thinking skills. From this description, the hypothesis is that creative personality positively affects students' creative thinking skills in higher education. In general, this article has two objectives. The first objective is to describe and analyze two types of student creativity. The description process is performed by categorizing creative personalities into three categories and categorizing creative thinking skills into seven categories. The analysis process is performed by testing the influence of creative personality on creative thinking skills. Testing is performed simultaneously and partially. Both goals are expected to contribute academically to understanding and developing student creativity in higher education.

2. METHOD

The research uses a quantitative approach with an associative type of research. The selection of this approach is based on the purpose of the study, the type of data obtained, and the data analysis techniques used. This study aims to test the influence of creative personality on students' creative thinking ability. Creative variable testing is performed simultaneously and partially. The data obtained are in the form of numbers and are analyzed using statistical analysis techniques. The research subjects were 90 (ninety) students from three state universities in East Java. Each college is taken as many as one class from the psychology department in the third semester. The selection of subjects were randomly selected by considering the proportion of three state universities in Malang, East Java, and they express their willingness to be the subject researcher. The willingness is given in writing before data collection is carried out.

Two research measuring instruments are used to obtain data on creative thinking skills and personality scales. This study's creative thinking ability test is the Torrence Test of Creative Thinking (TTCT). The test reveals fluency, flexibility, originality, and elaboration (Humble et al., 2018; Said-Metwaly et al., 2018; Yoon, 2017). The Semantic differential scale measures the characteristics of the creative

personality. This scale can measure six characteristics of creative personalities: perseverance, courage to take a risk, willingness to grow, tolerance of ambiguity, openness to new experiences, and constancy in opinion. The author creates this scale regarding the theory developed from previous research. The data analysis techniques used are descriptive analysis techniques and inferential analysis. Descriptive analysis is performed by categorizing personality characteristics into three categories: high, medium, and low. Creative thinking ability is categorized into seven categories: very superior, superior, above average, average, under average, borderline, and low. The inferential analysis is performed using the regression analysis technique to determine the influence of creative personality on creative thinking skills.

3. RESULT AND DISCUSSION

Result

The prerequisites of analysis is performed by testing the normality and linearity of the relationship between the two variables of creative personality and creative thinking skills. Full results are presented in Table 1.

Table 1. Test of Normality by One-Sample Kolmogorov-Smirnov Test

N		Per.	Cou.	Wil.	Tol.	Ope.	Con.	Thinking
		90	90	90	90	90	90	90
Normal Parameters	Mean	4.8222	4.1556	5.7000	5.3000	5.1778	5.3889	117.2444
	SD	2.20101	2.15110	1.50243	1.73820	1.63238	1.26041	28.45075
Most Extreme Differences	Absolute	0.226	0.153	0.251	0.225	0.193	0.155	0.125
	Positive	0.161	0.142	0.193	0.164	0.132	0.154	0.125
		-0.226	-0.153	-0.251	5.3000	-0.193	-0.155	-0.123
	Negative	0.226	0.153	0.251	0.225	0.193	0.155	0.125
		0.000	0.000	0.000	0.000	0.000	0.000	0.001

Based on the data in Table 1, it can be concluded that the data contained in the variables all have a normal distribution. Furthermore, the result of linearity testing by Durbin-Watson is 0.894. These results indicate that the relationship between the variables tested is linear.

The analysis of creative personality is performed by grouping the data into three groups, namely high (the subject score is higher than the mean value of the group), medium (the subject score is equal to the value of the group means), and low (the subject score is lower than the mean value of the group). The full result are presented in Table 2.

Table 2. Description of Student's Creative Personality

No.	The creative personality	High		Moderate		Low		Total	
		F	%	F	%	F	%	F	%
1	Perseverance in learning	61	67.8	4	4.4	25	27.8	90	100
2	Courage to take a risk	45	50.0	12	13.3	33	36.7	90	100
3	Willingness to grow	69	76.7	12	13.3	9	10.0	90	100
4	Tolerance of ambiguity	60	66.7	13	14.4	17	18.9	90	100
5	Openness to experience	58	64.4	20	22.2	12	13.3	90	100
6	Constancy in opinion	66	73.3	19	21.1	5	5.6	90	100

Table 2 indicates that the creative personality traits of students fall within the high range. The creative personality level of pupils comprises their willingness to grow, perseverance, openness to experience, self-confidence, willingness to take risks, and tolerance for ambiguity. Only the tolerance for ambiguity is moderate and poor among the six variables. These findings are crucial for elucidating the underlying causes for why these traits exhibit distinct patterns in response to other factors. Furthermore, the results of the descriptive analysis of creative thinking skills are grouped into seven categories. The full results are presented in Table 3.

Table 3. Categorization of Student Creative Thinking

No.	Categories	Score	Frequency	Percentage
1	Very Superior	More than 130	38	42.2
2	Superior	120-129	8	8.9

No.	Categories	Score	Frequency	Percentage
3	Above average	110-119	8	8.9
4	Average	90-109	18	20
5	Under average	80-89	5	5.6
6	Borderline	60-79	7	7.78
7	Low	Less than 60	6	6.67
Total			**90**	**100**

Table 4 demonstrates that, in general, the degree of creative thinking skills of students at the three research sites is within the high range since the number of subjects with criteria above the mean is greater than the number of subjects with criteria below the mean (19:6). Topics with exceptionally high standards are more prevalent than those with medium standards (15:4).

The results of regression analysis tests on the influence of class activity on student religiosity showed values R=.685, R^2=.470 p<.010. These results suggest that the hypothesis that tests for the influence of class activity on religiosity is accepted. The effective contribution of the school climate as a predictor factor for high or low religiosity was 47%. The full test results are shown in Table 4.

Table 4. Model Summary of Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.685	0.470	0.470	22.12529

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3343.267	6	5641.296	12.260	0.010
	Residual	4580.223	83	460.155		
	Total	**7923.490**	**89**			

Furthermore, the results of a partial analysis of testing the most dominant creative personality indicator affecting students' creative thinking skills are perseverance in learning. More data is shown in Table 5.

Table 5. Result of Partial Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	46.473	11.932		3.895	0.000
	Perseverance in learning	5.781	1.413	0.447	4.090	0.000
	Courage to take a risk	1.331	1.397	0.101	0.953	0.343
	Willingness to grow	2.151	1.797	0.114	1.197	0.235
	Tolerance of ambiguity	1.636	1.447	0.100	1.131	0.261
	Openness to experience	0.843	1.803	0.048	0.468	0.641
	Constancy in opinion	2.241	2.185	0.099	1.026	0.308

Table 5 explains that the six creative personality characteristics that have a significant effect on creative thinking skills are perseverance in learning, while the other five personality characteristics have an insignificant influence. Thus, perseverance in learning can be used as a solution to developing creative thinking skills in students in higher education.

Discussion

The results of the analysis, which prove that only the character of perseverance in learning can be a predictor of the high or low creative thinking skills of students in higher education, have entrusted the importance of university managers, including lecturers who teach to pay attention to the development of creative personality aspects. This study's results align with several previous studies that found that personality affects creative thinking (Kiraga et al., 2021; Murtianto et al., 2020; Young-Mi & Hye-Jeon, 2016). However, this research has contributed academically by finding empirical evidence about the influence of perseverance in learning on creative thinking skills in students' higher education.

Recently, the study of perseverance in learning has attracted the attention of many experts because it is an important factor related to various psychological aspects of human beings. For example, studies found the importance of perseverance in online learning during the pandemic (Campbell et al., 2020; Van Ngo, 2022). The study of perversion has also been linked to the learning process of mathematics (Barnes, 2021; Prastiti, 2020; Wilburne & Dause, 2017). Experts began to develop various measurements specific to

the academic measurement of perseverance (Abd-Elsamad et al., 2021; Ebadi et al., 2018). The research shows that perseverance is a construct that is increasingly grabbing the attention of researchers.

Some researchers consider there to be similarities between perseverance and grit. The similarity is because the two concepts measure something relatively the same. Other researchers distinguish between the two concepts. Perseverance is one of the indicators of grit. Other researchers also found that grit correlates positively with high or low creativity. The study's results reflect that the study of perseverance has been performed for a long time but in different terms. Thus, using perseverance as an alternative to developing students' thinking creativity has an adequate empirical foundation.

The results of this study recommend that the development of creativity, both creative personality and creative thinking, should be performed in two forms of educational programs in higher education. The first development is performed through the learning process in the classroom. Some learning models that can develop student creativity include problem-based learning models (Hsia et al., 2021; Ismail et al., 2018) and inquiry models (Conradty & Bogner, 2019; Wahyuni & Husein, 2019). These learning models provide opportunities for students to act actively in the learning process. The second model of creativity development can be performed by creating a campus academic atmosphere that supports the growth of student creativity (Lee & Min, 2016; Rizki et al., 2020). Both development models can be an alternative to developing student creativity in higher education.

The finding states that perseverance is one of the characteristics of a creative personality that affects creative thinking skills. It means the finding has entrusted the importance of developing aspects of student personality, especially in developing perseverance in learning. The purpose of education is not only to focus on academic objectives, but the development of personality aspects is another aspect that must be developed in educational practice in higher education (Aziz et al., 2022; Didin & Wiji, 2020). Lecturers, as actors who act as delivery of subject matter, should design teaching goals that are not only in achieving an understanding of lecture material but must make students' creative personalities develop optimally.

Some of the limitations contained in this study include two aspects. First, the number of subjects used still needs to be increased for a theoretical model test. Researchers can further increase the number of such subjects to be more suitable for testing a theoretical model. The second limitation is that this research uses the survey method. Therefore, causality testing still needs to satisfy many parties. Researchers can further use experimental research to refine this study's limitations further. Finally, the limitation lies in the measuring instruments used, especially in measuring creative personality. Further research should create measuring instruments that meet the reliability of measurements.

4. CONCLUSION

Several studies that examine the relationship between creative personality and students' creative thinking have been conducted by many researchers before. However, studies that found that perseverance in learning is an aspect of creative personality that significantly affects creative thinking skills still require much attention from researchers about creativity. Thus, these findings provide an academic contribution to the importance of studying perseverance in learning in developing creativity, especially creative thinking skills, in students in higher education.

5. REFERENCES

Abd-Elsamad, F. I., Zaki, M. A., Mahmoud, M. K., & Sayed, M. A. K. (2021). Psychometric properties of the Academic Perseverance Scale for pupils with learning difficulties in primary school. *Journal of Research in Education and Psychology*, *36*(1), 383–402. https://doi.org/10.21608/mathj.2021.135977.

An, D., Song, Y., & Carr, M. (2016). A comparison of two models of creativity: Divergent thinking and creative expert performance. *Personality and Individual Differences*, *90*, 78–84. https://doi.org/10.1016/j.paid.2015.10.040.

Aziz, R., Surur, M., Lestari, S., Hotifah, Y., & Naim, N. (2022). Lecturer-Student Collaboration in Higher Education as a Solution for Fostering Student's Creative Personality. *Jurnal Pendidikan Progresif*, *12*(1), 241–253. https://doi.org/10.23960/jpp.v12.i1.202219.

Barnes, A. (2021). Enjoyment in learning mathematics: its role as a potential barrier to children's perseverance in mathematical reasoning. *Educational Studies in Mathematics*, *106*(1), 45–63. https://doi.org/10.1007/s10649-020-09992-x.

Campbell, P., Witenko, C., & Dzierba, A. L. (2020). Perseverance in a pandemic: A unique pharmacy residency learning experience. *American Journal of Health-System Pharmacy*, *77*(18), 1459–1460. https://doi.org/10.1093/ajhp/zxaa206.

Catarino, P. (2019). Cooperative learning on promoting creative thinking and mathematical creativity in higher education. *REICE. Revista Iberoamericana Sobre Calidad, Eficacia y Cambio En Educacion*, *17*(3), 5–22. https://doi.org/10.15366/reice2019.17.3.001.

Chen, P., & Zhang, J. (2020). Development of Chinese junior high school students' creative potential: Within-person and between-person effects of student–student support and need for cognition. *Frontiers in Psychology*, *11*, 552831. https://doi.org/10.3389/fpsyg.2020.552831.

Chiu, Y. T. H., Lee, W. I., & Chen, T. H. (2014). Environmentally responsible behavior in ecotourism: Antecedents and implications. *Tourism Management*, *40*, 321–329. https://doi.org/10.1016/j.tourman.2013.06.013.

Conradty, C., & Bogner, F. X. (2019). From STEM to STEAM: Cracking the code? How creativity & motivation interacts with inquiry-based learning. *Creativity Research Journal*, *31*(3), 284–295. https://doi.org/10.1080/10400419.2019.1641678.

Didin, W., & Wiji, L. Z. (2020). The implementation of project-based learning approach in students' creativity programs in indonesia. *Humanities & Social Sciences Reviews*, *8*(3), 702–708. https://doi.org/10.18510/HSSR.2020.8375.

Duenyas, D. L., & Perkins, R. (2021). Making Space for a Makerspace in Counselor Education: The Creative Experiences of Counseling Graduate Students. *Journal of Creativity in Mental Health*, *16*(4), 537–547. https://doi.org/10.1080/15401383.2020.1790456.

Ebadi, S., Weisi, H., & Khaksar, Z. (2018). Developing an Iranian ELT context-specific grit instrument. *Journal of Psycholinguistic Research*, *47*, 975–997. https://doi.org/10.1007/s10936-018-9571-x.

Fan, M., & Cai, W. (2022). How does a creative learning environment foster student creativity? An examination on multiple explanatory mechanisms. *Current Psychology*, *41*(7), 4667–4676. https://doi.org/10.1007/s12144-020-00974-z.

García-García, C., Chulvi, V., Royo, M., Gual, J., & Felip, F. (2019). Does the work environment affect designers' creativity during the creative phase depending on their personality profile? *Thinking Skills and Creativity*, *33*, 100578. https://doi.org/10.1016/j.tsc.2019.100578.

Göçen, G. (2019). The effect of creative writing activities on elementary school students' creative writing achievement, writing attitude and motivation. *Journal of Language and Linguistic Studies*, *15*(3), 1032–1044. https://doi.org/10.17263/jlls.631547.

Gutterman, D., & Aafjes Van-Doorn, K. (2022). An Exploration of the Intersection Between Creativity and Psychotherapy. *Creativity Research Journal*, *1*(1), 1–12. https://doi.org/10.1080/10400419.2022.2127566.

Holis, A. (2017). Peranan Keluarga/Orang Tua dan Sekolah dalam mengembangkan kreativitas anak usia dini. *Jurnal Pendidikan UNIGA*, *1*(1), 22–43. https://doi.org/10.52434/jp.v1i1.8.

Hsia, L. H., Lin, Y. N., & Hwang, G. J. (2021). A creative problem solving-based flipped learning strategy for promoting students' performing creativity, skills and tendencies of creative thinking and collaboration. *British Journal of Educational Technology*, *52*(4), 1771–1787. https://doi.org/10.1111/bjet.13073.

Huang, N. T., Chang, Y. S., & Chou, C. H. (2020). Effects of creative thinking, psychomotor skills, and creative self-efficacy on engineering design creativity. *Thinking Skills and Creativity*, *37*, 100695. https://doi.org/10.1016/j.tsc.2020.100695.

Humble, S., Dixon, P., & Mpofu, E. (2018). Factor structure of the Torrance Tests of Creative Thinking Figural Form A in Kiswahili speaking children: Multidimensionality and influences on creative behavior. *Thinking Skills and Creativity*, *27*, 33–44. https://doi.org/10.1016/j.tsc.2017.11.005.

Ismail, N. S., Harun, J., Zakaria, M. A. Z. M., & Salleh, S. M. (2018). The effect of Mobile problem-based learning application DicScience PBL on students' critical thinking. *Thinking Skills and Creativity*, *28*, 177–195. https://doi.org/10.1016/j.tsc.2018.04.002.

Jaffe, M., Kelly, E., Williams, A., Beroiza, A., DiGiacomo, M., & Kafle, M. (2021). Collaboration and 'potential space': creative play in the writing alliance. *Teaching in Higher Education*, *1*(1), 1–16. https://doi.org/10.1080/13562517.2021.1989581.

Jamaluddin, A. B., Zubaidah, S., Mahanal, S., & Gofur, A. (2021). Character, creative thinking and learning achievement in higher education: How they are correlated. *AIP Conference Proceedings*, *2330*. https://doi.org/10.1063/5.0043184.

Jankowska, D. M., & Karwowski, M. (2019). Family factors and development of creative thinking. *Personality and Individual Differences*, *142*, 202–206. https://doi.org/10.1016/j.paid.2018.07.030.

Kao, C. (2016). Analogy's straddling of analytical and creative thinking and relationships to Big Five Factors of personality. *Thinking Skills and Creativity*, *19*, 26–37. https://doi.org/10.1016/j.tsc.2015.08.001.

Kiraga, M. K., Mason, N. L., Uthaug, M. V., van Oorsouw, K. I., Toennes, S. W., Ramaekers, J. G., & Kuypers, K. P. (2021). Persisting Effects of Ayahuasca on Empathy, Creative Thinking, Decentering, Personality,

and Well-Being. *Frontiers in Pharmacology*, *12*, 721537. https://doi.org/10.3389/fphar.2021.721537.

Lee, S. Y., & Min, J. (2016). The Profiles of Creative Potential and Personality Characteristics of Adult Professionals. *Creativity Research Journal*, *28*(3), 298–309. https://doi.org/10.1080/10400419.2016.1195634.

Liu, H., Wang, F. X., & Yang, X. Y. (2015). More dialectical thinking, less creativity? the relationship between dialectical thinking style and creative personality: The case of China. *PLoS ONE*, *10*(4). https://doi.org/10.1371/journal.pone.0122926.

Malele, V. (2021). From Science, Technology and Innovation to Creativity, Innovation and Entrepreneurship Indicators' Framework for the Academic Promotion with Impact on Socio-Economic Development. *Journal of Scientometric Research*, *10*(3), 373–379. https://doi.org/10.5530/jscires.10.3.55

Murtianto, Y. H., Rahmawati, N. D., & Apriana, D. (2020). Creative thinking profile of students in the completion of the area of 2D-shapes reviewed from the type of personality of Myer-Briggs dimension. *Journal of Physics*, *1663*(1), 012013. https://doi.org/10.1088/1742-6596/1663/1/012013.

Prastiti, T. D. (2020). Problem-based learning on the learning perseverance of indonesian senior high school students in solving mathematical problems. *Bolema - Mathematics Education Bulletin*, *34*(68), 1206–1220. https://doi.org/10.1590/1980-4415v34n68a17.

Puspita, D. A., Muchlas, M., & Kuat, T. (2020). The Implementation of Teaching Factory to Improve Student Interest in Entrepreneurship at Multimedia Competencies. *Journal of Technology and Humanities*, *1*(2), 42–50. https://doi.org/10.53797/jthkkss.v1i2.5.2020.

Rizki, M. A., Ruslana, R., & Artika, W. (2020). Potensi Kreatif dan Pengukurannya dari Perspektif Psikologi. *Al-Din: Jurnal Dakwah Dan Sosial Keagamaan*, *6*(2). https://doi.org/10.35673/ajdsk.v6i2.1131.

Robino, A. E., Corrigan, V. K., Anderson, B., Werre, S., Farley, J. P., Marmagas, S. W., & Buechner-Maxwell, V. (2021). College Student Mental Health in an Animal-Assisted Intervention Program: A Preliminary Study. *Journal of Creativity in Mental Health*, *16*(1), 49–58. https://doi.org/10.1080/15401383.2020.1757002.

Roth, T., Conradty, C., & Bogner, F. X. (2022). Testing creativity and personality to explore creative potentials in the science classroom. *Research in Science Education*, *52*(4), 1293–1312. https://doi.org/10.1007/s11165-021-10005-x.

Said-Metwaly, S., Fernández-Castilla, B., Kyndt, E., & Van den Noortgate, W. (2018). The factor structure of the Figural Torrance Tests of Creative Thinking: A meta-confirmatory factor analysis. *Creativity Research Journal*, *30*(4), 352–360. https://doi.org/10.1080/10400419.2018.1530534.

Said-Metwaly, S., Kyndt, E., & Van den Noortgate, W. (2020). The factor structure of the Verbal Torrance Test of Creative Thinking in an Arabic context: Classical test theory and multidimensional item response theory analyses. *Thinking Skills and Creativity*, *35*, 100609. https://doi.org/10.1016/j.tsc.2019.100609.

Said-Metwaly, S., Van den Noortgate, W., & Barbot, B. (2021). Torrance test of creative thinking-verbal, Arabic version: Measurement invariance and latent mean differences across gender, year of study, and academic major. *Thinking Skills and Creativity*, *39*, 100768. https://doi.org/10.1016/j.tsc.2020.100768.

Sari, H. I., Munawaroh, M., & Raharjo, H. (2020). Analysis of Student's Creative Thinking Ability in Mathematical Problem Solving in Terms of Extrovert and Introvert Personality Types. *Eduma: Mathematics Education Learning and Teaching*, *9*(1), 34–42. https://doi.org/10.24235/eduma.v9i1.6153.

Tang, M. (2019). Fostering creativity in intercultural and interdisciplinary teams: The VICTORY Model. *Frontiers in Psychology*, *10*, 2020. https://doi.org/10.3389/fpsyg.2019.02020.

Van Ngo, T. (2022). Students' Perceptions of Perseverance in Online Learning Through the Flipped Classroom Model: A Case Study in a Physics Course. *International Journal of Online Pedagogy and Course Design (IJOPCD)*, *12*(1), 1–17. https://doi.org/10.4018/IJOPCD.311439.

Wahyuni, S., & Husein, S. (2019). Physics Learning Devices based on Guided Inquiry with Experiment to Improve Students' Creativity. *Journal of Physics: Conference Series*, *1233*(1). https://doi.org/10.1088/1742-6596/1233/1/012034.

Wilburne, J. M., & Dause, E. (2017). Teaching self-regulated learning strategies to low-achieving fourth-grade students to enhance their perseverance in mathematical problem solving. *Investigations in Mathematics Learning*, *9*(1), 38–52. https://doi.org/10.1080/19477503.2016.1245036.

Yoon, C. H. (2017). A validation study of the Torrance Tests of Creative Thinking with a sample of Korean elementary school students. *Thinking Skills and Creativity*, *26*, 38–50. https://doi.org/10.1016/j.tsc.2017.05.004.

Young-Mi, K., & Hye-Jeon, H. (2016). The Effects of 'Physics, Let's Dance', as an Integrated Dance Art Education Program Related to Science Subject, on the Personality and Creative Thinking Ability of Elementary School Students. *Indian Journal of Science and Technology*, *9*(29), 1–6. https://doi.org/10.17485/ijst/2016/v9i29/94754.

Yusnaeni, Corebima, A. D., Susilo, H., & Zubaidah, S. (2017). Creative Thinking of Low Academic Student Undergoing Search Solve Create and Share Learning Integrated with Metacognitive Strategy. *International Journal of Instruction*, *10*(2), 245–262. https://doi.org/10.12973/iji.2017.10216a.