



## Is there a correlation between creativity and learning achievement? A meta-analysis study

Abdul Manaf<sup>1\*</sup>; Sintha Sih Dewanti<sup>2</sup>; Socheath Mam<sup>3</sup>; Endang Susetyawati<sup>4</sup>; Ika Ernawati<sup>4</sup>

<sup>1</sup>Universitas Muhammadiyah Buton, Indonesia

<sup>2</sup>Universitas Islam Negeri Sunan Kalijaga, Indonesia

<sup>3</sup>Royal University of Phnom Penh, Cambodia

<sup>4</sup>Universitas PGRI Yogyakarta, Indonesia

\*Corresponding Author. E-mail: [manaf.6429@yahoo.com](mailto:manaf.6429@yahoo.com)

### ARTICLE INFO

#### Article History

**Submitted:**

29 June 2022

**Revised:**

30 June 2022

**Accepted:**

30 June 2022

#### Keywords

creativity; learning achievement; meta-analysis

### ABSTRACT

This study aims to describe the actual correlation between creativity and learning achievement. The research method used is a meta-analysis involving 41 research titles with 9,675 respondents. This research study involved respondents consisting of elementary education students, secondary education students, and higher education students. The data analysis technique used is a bare-bones meta-analysis. Based on the data analysis, it can be concluded that there is a positive and significant correlation between creativity and learning achievement, both overall and by considering the education level of the respondents. The results of this study recommend that teachers and lecturers develop student creativity in each learning process so that learning outcomes can be optimized.

This is an open access article under the [CC-BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.



#### Scan Me:



#### How to cite:

Manaf, A., Dewanti, S., Mam, S., Susetyawati, E., & Ernawati, I. (2022). Is there a correlation between creativity and learning achievement? A meta-analysis study. *REID (Research and Evaluation in Education)*, 8(1), 78-89. doi:<https://doi.org/10.21831/reid.v8i1.51493>

## INTRODUCTION

In the 21st century, the development of knowledge and technology is very fast. Therefore, it is necessary to improve the education system. Mostly, government decisions related to education were not preceded by research. There are several decisions based on research, but they are not accurate. This inaccuracy is mostly caused by the study, which was solely a single study or had not used a meta-analysis method. The shortcomings occurred in the majority of educational kinds of scholarly research, particularly in relation to the way of thinking, creativity, learning achievement, and other psychological aspects. Binkley et al. (2012) state that the ways of thinking are divided into three skills, namely: (1) innovation and creativity, (2) critical thinking in decision-making, and (3) learning in processing metacognitive abilities. The relationship between creativity and learning achievement needs special attention since many studies have found that there is a significant correlation between creativity and learning achievement, but several studies reported that the correlation between creativity and learning achievement is not significant.

Learning is a change in behavior that lasts a long time or in the capacity to behave in a certain way, resulting from practice or other forms of experiences (Schunk, 2012). It is a process in

which a student organizes his experience, summarizes something from several examples that have something in common, and uses it with one concept name for all that is related (Haylock & Thangata, 2007). Achievement is the result when students attempt to learn certain subjects or acquire difficult skills successfully in their efforts (Arends & Kilcher, 2010). Adolescent achievement is determined not only by intellectual ability (Santrock, 1996). The achievement has three relationships, (1) the relationship to behavior, (2) the relationship to the results, and (3) the relationship to attitudes and dispositions (Johnson & Johnson, 2002). Learning achievement by Schwan (2002) is defined as students' achievement in the learning process, which includes various academic abilities such as reading, writing, and mathematical abilities in the form of scores determined by the teacher. Learning achievement is the result of more effective teaching and learning resulting from the positive actions of teachers in motivating (Pritchard & Woollard, 2010).

Creativity may be defined as equipment for an individual to express either imaginativeness or ingenuity, which is owned as a result of the ability to think productively. It is the capacity to organize reasoning to generate ideas, to create something new, original, extraordinary, and valuable thinking in the form of abstract, real in the form of ideas or arguments, looking for meanings, and solving problems innovatively. Creative thinking, or the ability to think creatively, includes the competence to see new possibilities and find connections between different ideas and be able to reconstruct or catch approaches to solving problems (Van Velsor et al., 2010). The ability to think creatively has the characteristics that distinguish it from the ability to think normally. Its characteristics are fluency, flexibility, originality, and elaboration (Silver, 1997).

The relationship between creativity and learning achievement needs special attention since many studies have found that there is a significant correlation between creativity and learning achievement, but several studies reported that the correlation between creativity and learning achievement is not significant. Is the relationship between these two variables meaningful or not? This study engaged respondents from primary and secondary education levels to higher education levels. The focus of this research is the correlation between creativity and learning achievement of (1) all respondents (combination of primary and secondary education and higher education), (2) primary and secondary education respondents, (3) higher education respondents, and (4) shrinkage or decrease in mean correlation value due to measurement error.

## METHOD

This study is a quantitative meta-analysis by combining two or more published research results using statistical analysis (Hunter & Schmidt, 1990). By process, the meta-analysis is a retrospective observational study in which the researcher recapitulates the facts without performing experimental manipulation (Wolf, 1986). The research publications are related to the relationship between creativity and learning achievement.

The research method employed is a meta-analysis involving the publications of 41 studies. The 41 studies are classified into two groups, consisting of 28 studies involving respondents from primary and secondary education and 13 studies involving respondents from tertiary education. There are 7,482 respondents from primary and secondary education and 2,193 from higher education, making a total number of 9,675 respondents.

The data collection was performed by tracking the results of research on the relationship between creativity and learning achievement. This data collection was conducted with the help of the Google Scholar platform. The components in the coding of the article (artifacts) are information about the year of publication of the study, researcher or author, sample size (N), correlation coefficient ( $r$ ) or the coefficient of determination, and variables (dependent and independent). The scientific papers used as the subject of this meta-analysis have to meet the specified characteristics, namely: (1) the scientific papers used are the research reports published in journals, and they can be accessed through Google Scholar; (2) the scientific papers are published by international journals, which can be confirmed and searched on Scopus Rank; (3) the scientific papers employed are scholarly articles published in the last ten years, and the range of the time

was selected on the ground that the results of this meta-analysis would consist of novelty components; (4) the instruments used in independent and dependent variables would list their reliability coefficients; (5) the education level of the respondents as the subjects of the studies: primary, secondary, and higher education; and (6) the results of data analysis in this study will obtain summary effect value of correlation ( $r$ ) which indicates a relationship between the independent variable and the dependent variable. The data tabulation in this study is presented in Table 1.

Table1. Instrument Reliability, Correlation between Variables, and Artifacts which Can Be Corrected

Research Number	Reliability V.I ( $r_{xx}$ )	Reliability V.D ( $r_{yy}$ )	Total Subject (N)	Coefficient Correlation ( $r_{xy}$ )
1	0.78	0.60	297	0.130*
2	0.71	0.60	297	0.27*
3	0.85	0.85	228	0.35*
4	0.85	0.86	228	0.23*
5	0.89	0.84	70	0.48*
6	0.79	0.827	209	0.45*
7	0.89	0.827	209	0.53*
8	0.744	0.613	392	0.248*
9	0.592	0.613	392	0.257*
10	0.592	0.65	392	0.278*
11	0.74	0.817	392	-0.021
12	0.592	0.817	392	0.065
13	0.80	0.94	342	0.70*
14	0.847	0.93	186	0.286*
15	0.89	0.86	255	0.48*
16	0.89	0.85	255	0.38*
17	0.89	0.91	255	0.42*
18	0.89	0.84	255	0.48*
19	0.89	0.81	255	0.46*
20	0.78	0.7	359	0.610*
21	0.83	0.78	606	0.84*
22	0.90	0.61	152	0.41*
23	0.90	0.67	152	0.45*
24	0.93	0.75	152	0.21*
25	0.93	0.61	152	0.21*
26	0.93	0.67	152	0.27*
27	0.90	0.87	152	0.56*
28	0.93	0.87	152	0.32*
29	0.84	0.75	217	0.32*
30	0.74	0.61	237	0.295*
31	0.74	0.86	237	0.281*
32	0.74	0.66	237	0.122
33	0.93	0.88	55	0.300*
34	0.93	0.89	55	-0.200
35	0.86	0.85	178	0.44*
36	0.86	0.86	178	0.12
37	0.77	0.93	141	0.279*
38	0.81	0.7	480	0.65*
39	0.83	0.81	22	0.53*
40	0.89	0.93	186	0.231*
41	0.68	0.85	122	0.04

Information: \* significant at  $\alpha = 0.05$

The data analysis technique used is bare-bones meta-analysis, namely statistical analysis to correct sampling errors by correcting artifacts for which information is available in almost all studies (Cooper et al., 2019). The stages of the analysis include (1) estimating the correlation coefficient of the population; (2) estimating the variance of population correlation; (3) variance of sampling errors; (4) estimating the variance of population correlation; (5) making interval confidence level (95%); (6) estimating the reliability required in the attenuation formula, and (7) estimating the rate of large depreciation correlation due to measurement error.

## FINDINGS AND DISCUSSION

This study aims to determine the significance of the relationship between creativity and learning achievement. Based on the results of previous studies, it was found that there was a significant correlation between creativity and learning achievement, but several studies reported that the correlation between creativity and learning achievement was not significant. Therefore, it is necessary to conduct a meta-analysis study that uses statistical techniques that combine two or more similar studies so that a quantitative blend of data is obtained.

### Findings

The meta-analysis in this study was conducted on 41 Scopus-indexed scientific papers. This section describes the characteristics of the scientific work used as the subject of the meta-analysis and the results of testing the research hypotheses. This section describes the characteristics of the grouping results based on the publication form, year of publication, instruments on the dependent and independent variables, educational level of research subjects, and research findings. Then, several correction calculations were carried out, including corrections for simultaneous sampling errors, corrections for sampling errors for elementary and secondary education subgroups, and corrections for sampling errors for higher education subgroups. Based on the results of the correction, then an analysis of the asymmetric measurement error artifacts was carried out.

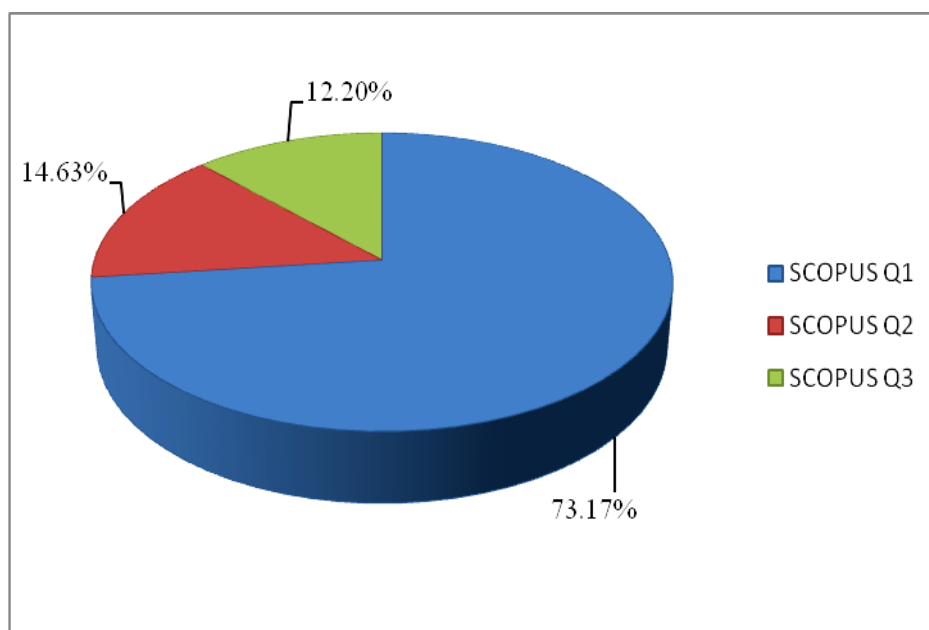


Figure 1. Meta-analysis Objects based on the Year of Issue

According to the form of publication, 100% of the scientific papers under study are published in journals. To obtain those scientific papers from international journals, confirmation is made through the SCImago websites. This identifies the scientific paper based on the Scopus

Rank groups. The types of data are based on the way how they are gained. All the scientific papers under study are the primary data. Based on the place of publication, most of the scientific papers are articles published by international journals, amounting to 88%. The papers used as the objects of this meta-analysis are 41 papers indexed by Scopus (scattered from Scopus Q1 to Scopus Q3). Of the 41 journal papers/articles, 73.17% are Scopus Q1 journal articles, 14.63% are Scopus Q2 journal articles, and 12.20% are Scopus Q3 journal articles. Figure 1 presents the distribution of meta-analysis objects based on the Scopus Rank.

The scientific papers which function as the objects in this meta-analysis are those published in the last 10 years. The period was chosen because the results of it consist of novelty components. From 2010 to 2020, the largest number of scientific papers published in 2018 was 11 articles. Figure 2 presents the distribution of the objects of this analysis based on the year of publication.

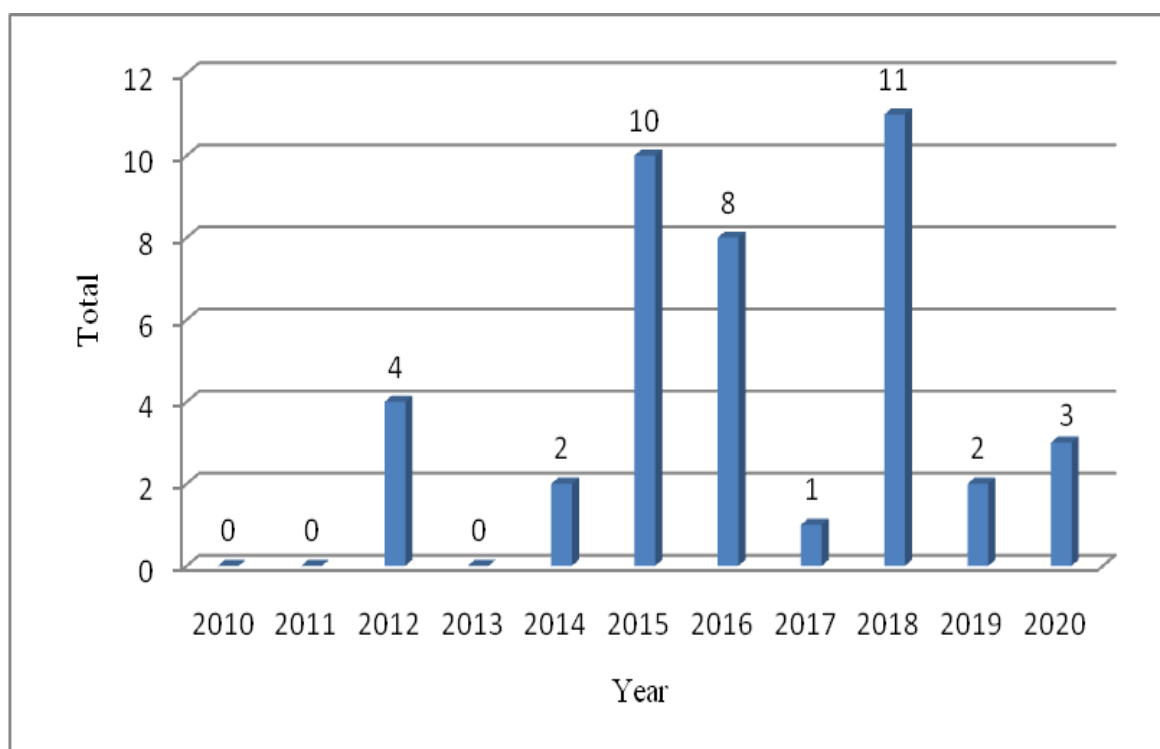


Figure 2. Identification of Meta-analysis Objects based on the Year of Issue

As to the instruments for collecting the data on the dependent variable, 50% of the 41 studies used tests, 6% used scales, 20% used self-reports, 22% used assessment sheets, and 2% used the respondent's GPA (Grade Point Average). Meanwhile, as to the instruments for collecting the data on the independent variables, 36% of the 41 studies used tests, 42% used scales, 2% used questionnaires, 16% used self-reports, and 4% used assessment sheets. In relation to the education level of the subjects of the 41 studies, 68.29% of the subjects have primary and secondary education, and the remaining 31.71% have higher education. The subject with primary and secondary education comprised two kinds of subjects, namely, junior high school and senior high school students.

The characteristics of the objects of the meta-analysis are based on the research results reported in each scientific paper (there is a tendency or a significant correlation between the independent and dependent variables). Of the 41 studies under analysis, 85.37% have a tendency or a significant correlation between independent and dependent variables. Meanwhile, 14.63% of the studies do not have a significant correlation. Figure 3 presents the distribution of meta-analysis objects based on the level of education of the subject.

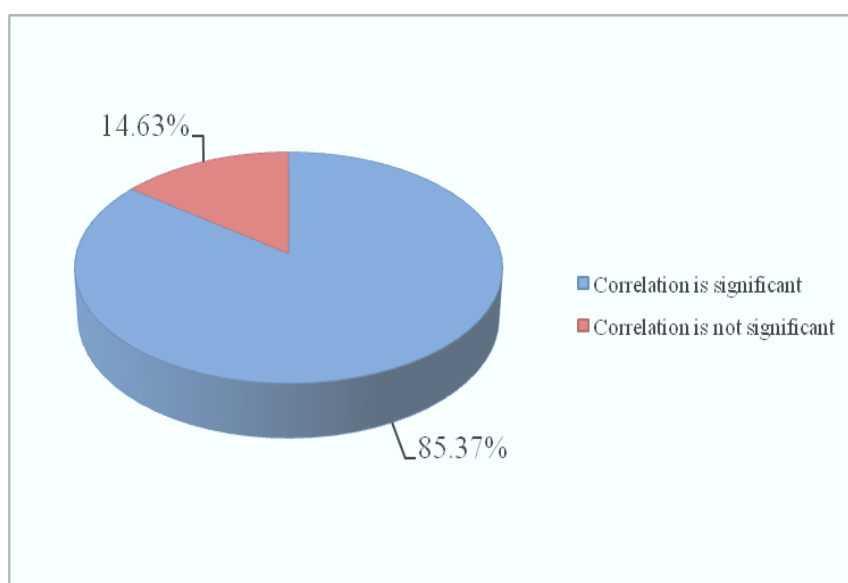


Figure 3. Identification of Meta-analysis Objects based on the Research Findings

Before the entire analysis was performed, the results of the study, which had a value of  $F$  or  $t$  to  $r$ , should first be converted, but given that all of the findings of the studies reported in 41 scientific papers used as the research objects are already in the form of the  $r$  value (correlation), thus the conversion results of the studies are not needed. The result of the analysis shows that there is a positive and significant correlation between creativity and learning achievement. This result is known based on the resulting population correlation coefficient of 0.364. The magnitude of the resulting population correlation coefficient is influenced by (1) population correlation variance, which is 0.048; (2) sampling error variance, which is 0.003; (3) estimated population correlation variance, which is 0.212; (4) the 95% confidence interval for correlation, which is  $-0.052 < \rho_{xy} < 0.780$ ; and (5) the reliability required in the formula of attenuation, which is 0.934.

In this study, the role of the moderating variable was analyzed by grouping the data. Within each sub-group, the sampling error can be calculated. In the sub-group of primary and secondary education, there is a positive and significant correlation between creativity and learning achievement. This is based on the results of the analysis of the estimated population correlation coefficient, which is 0.385, the population correlation variance, which is 0.056, the variance of sampling error, which is 0.003, the estimated population correlation variance, which is 0.232, the 95% confidence interval for correlation, which is  $-0.070 < \rho_{xy} < 0.840$ , and the required reliability in the attenuation formula, which is 0.952. These results indicate that the estimated population correlation values fall within the value interval categorized as meaningful at the 95% confidence level. After the correlation based on sampling error, it turned out that the correlation between creativity and learning achievement remains considerably significant. Besides, it was also found that only about 4.8% of the correlation variance was caused by artifacts.

In Subgroup 2 (higher education group), there is a positive and significant correlation between creativity and learning achievement. The result of the analysis shows that the estimated population correlation coefficient is 0.290, the population correlation range is 0.013, the variance of the sampling error is 0.005, the estimated population correlation variance is 0.091, the 95% confidence interval for correlation is  $0.112 < \rho_{xy} < 0.468$ , and the required reliability in the attenuation formula is 0.621. The results indicate that the value of the estimated population correlation falls within the value interval categorized as significant at the 95% confidence level. It turns out that the correlation between creativity and learning achievement is very significant. Additionally, the result of the analysis indicates that there is a 37.9% variance in the correlation affected by artifacts.



In this study, corrections were made for unsystematic measurement errors. The results of the artifact analysis showed that the variables were influenced by the instrument: Mean of an (attenuation factor for independent variable reliability) = 0.906, and mean of b (attenuation factor for dependent variable reliability) = 0.883, combined artifact attenuation factor mean was 0.800, correlation the actual study mean was 0.454, the variance due to artifact variation was 0.0011, the variance in the real correlation was 0.055, the standard deviation of the effect size correlation was 0.233, and the 95% confidence interval was  $-0.002 < \rho < 0.911$ . Derived from the calculation, the mean correlation after the correction was  $\rho = 0.454$ , while the uncorrected mean correlation was  $r = 0.364$ . It can be identified that there was a decline in the mean correlation of 0.090 due to measurement errors. It turned out that the corrected mean value also included the 95% confidence interval. In other words, the correlation is very significant.

## Discussion

Based on the results of data analysis of the 41 meta-analysis objects (artifact), it was found that there is a positive and significant correlation between creativity and learning achievement. The resulting correlation coefficient is 0.364. According to Cohen et al. (2007), the coefficient value is in the medium category. The significant correlation produced confirms that the learning achievement of students at the primary, secondary, and higher education levels can be reached optimally by fostering the students' creativity. Creative learners have many new ideas, so it is petrifying to solve academic problems. This is in line with the opinion of LTSIN (2004) that creative thinking is a process for generating new ideas, and it is a combination of ideas that were not previously put together. Besides, creative thinking is viewed as the capacity to see new possibilities of finding relationships among different ideas and being able to reconstruct or find innovative ways of solving problems (Van Velsor et al., 2010).

In the sub-group of primary and secondary education, there was a positive and significant correlation between creativity and learning achievement. The population correlation coefficient results in 0.389 with a moderate category (Cohen et al., 2007). The finding is in line with some of the studies conducted by Danesh and Nourdad (2017), Denson and Buelin-Biesecker (2015), Erbas and Bas (2015), Hajilou et al. (2012), Huang et al. (2020), Kattou et al. (2012), Mahama et al. (2019), Paek et al. (2016), Preiss et al. (2019), Putwain et al. (2012), Schoevers et al. (2018), and Thuneberga et al. (2018). Creativity is a mental process in which past experiences are recombined in a modified form so that new forms and patterns can emerge that can address certain needs (Schubert, 2021). Creativity is one aspect that encourages students to excel (Kettler et al., 2021). The level of learning achievement achieved by each student will be greatly influenced by the personal qualities of each student (Alani & Hawas, 2021; Lateef et al., 2019). Intelligence and non-intelligence factors as internal factors make a big contribution to learning achievement. In general, the thought processes that are usually trained in school are limited to memory and the ability to think convergently. In addition to this convergent thinking ability, there is a thinking ability called divergent thinking ability, which is the basis of creativity (Benedek et al., 2014). In the world of education, the ability to think creatively or creativity needs to be developed by increasing the pleasure of students to be creatively busy, students are expected to increase their knowledge of knowledge so that students can solve their learning tasks effectively. The students at the primary and secondary education levels have high curiosity, so they are motivated to be creative (Chad-Friedman et al., 2018).

Based on the cognitive aspects, at the ages of 7-12 years, students begin to develop knowledge in various academic disciplines, including language, arts, mathematics, science, social studies, and fine arts (Akgül, & Kahveci, 2017; Neubauer et al., 2018; Şahin, 2016; Trigueros et al., 2020; Tyagi, 2015; Vessels & Huitt, 2005). Furthermore, Vessels and Huitt (2005) state that the cognitive aspect is very influential on the development of students' ideas and self-regulation. At the age of 13 and above, from the cognitive aspect, they begin to develop competence as a disciplined thinker and in the aspect of reasoning. They have improved symbolic thinking in abstract

principles, regulating right and wrong thinking (Vessels & Huitt, 2005). Experience and knowledge allow him to create more when compared to someone who does not have much experience and knowledge (Kettler et al., 2021). One of the things that determine the extent to which a person is creative is his ability to be able to create new combinations of existing things.

Creative thinking or creativity shown by elementary and middle school students cannot be separated from the role of the teacher. Kartowagiran et al. (2019) state that teachers are required to teach their students to think at higher levels, such as by creating or being creative. Creative thinking students mean higher-order thinking that is able to create various original solutions (Hidajat, 2021). Students who always think creatively will have high creativity and will have a good character (attitude). A good creative attitude or character in students will have an impact on the achievement of learning outcomes (Harun et al., 2021). Creativity is one of the character values that can be improved through character education to answer the challenges of the 21st century (Kartowagiran et al., 2021). The value of the good character that exists in students will have an effect on students' readiness to face the era of the industrial revolution 4.0 (Khadijah et al., 2021). Teachers can find out the development of students' creative thinking skills, which is necessary to measure. Those measurements need to be made during the learning process (Hamdi et al., 2018); thus, students' creative thinking or creativity while participating in the learning process needs to be evaluated by taking measurements.

In the higher education sub-group, there is a positive and significant correlation between creativity and learning achievement. The population correlation coefficient results in 0.290, which is categorized as moderate (Cohen et al., 2007). We can find out that a considerable amount of research findings has been researched by Chew et al. (2012), Jauk et al. (2014), Lin and Wu (2016), and Puryear (2015). In terms of university students, creative thinking is viewed as an essential skill in constructing new ideas. Creative learning is being sensitive or aware of problems, deficiencies, gaps in knowledge, missing elements, disharmony, gathering existing information, limiting difficulties or identifying missing elements, seeking answers, making hypotheses, modifying and testing them, refining and communicating them (Bieńkowska, 2015; Korte, 2014). Moreover, creativity does not decline or stop with age (Torrance, 1977). Thus, university students have creativity that does not show a decline. Students' creativity has a positive impact on their creative thinking (Oncu, 2016).

Based on the analysis of the two sub-groups above, there is no significant difference in the mean correlation between the secondary and primary education sub-group and the higher education sub-group ( $r_1 = 0.385$ ; and  $r_2 = 0.290$ ). The corrected variance value for the secondary primary education sub-group is greater than that for the whole or the higher education sub-group ( $\sigma_{p_n}^2 = 0.008$ ,  $\sigma_p^2 = 0.045$ , and  $\sigma_{p_1}^2 = 0.054$ ). It can be interpreted that there is no role of the moderating variable in the correlation between creativity and learning achievement. Factors that can inhibit individual creativity depend on internal and external conditions (Chen et al., 2021). Internal conditions are related to psychological safety where the individual is accepted as a person who is very valuable and does not have an external evaluation, but there is an understanding and psychological freedom regarding complete freedom of symbolic expression. The freer education from repression, the greater the individual creativity (Roopalakshmi & Rajasekaran, 2022).

In addition, by considering the values of  $r_1 r_2$  and which are included in the 95% confidence level, it can be concluded that, for both the secondary primary education sub-group and the higher education sub-group, there is a positive significant correlation between creativity and learning achievement. Hence, to increase the learning achievement of the students, it is suggested that teachers and lecturers should strengthen pedagogical actions which will help them boost students' creativity. Creativity is one of the efforts of educators to improve students' abilities, namely increasing learning achievement (Chad-Friedman et al., 2018; Huang et al., 2020; Lin & Wu, 2016). Oncu (2016) revealed that creativity must be integrated into the education system, from preschool to the university level.



## CONCLUSION

By employing the correlation approach from 41 scholarly papers regarding creativity and learning achievement, used as meta-analysis objects, the researchers have found that there is a positive and significant correlation between creativity and learning achievement. In the elementary and secondary subgroups, there is a positive and significant correlation between creativity and learning achievement. Likewise, in the sub-group of higher education, there is a positive and significant correlation between creativity and learning achievement. The moderator variable (in the case of this education level) does not play a significant role in the correlation between creativity and learning achievement. There is a decline amounting to 0.090 because of the measurement error. These findings imply that improvement in students' achievement can be achieved by advancing their creativity. Based on the summary, the teachers and lecturers can be sure that creativity in the learning process can affect students' achievements. Therefore, to increase students' creativity, it is suggested that both teachers and lecturers pay attention to and enhance their performance which helps to boost students' creativity.

## REFERENCES

- Akgül, S. & Kahveci, N. G. (2017). Developing a model to explain the mathematical creativity of gifted students. *European Journal of Education Studies*, 3(8), 125-147. <https://doi.org/10.5281/zenodo.822804>.
- Alani, F. S., & Hawas, A. T. (2021). Factors affecting students academic performance: A case study of Sohar University. *Psychology and Education*, 58(5), 4624-4635. Retrieved from [www.psychologyandeducation.net](http://www.psychologyandeducation.net)
- Arends, R. L., & Kilcher, A. (2010). *Teaching for student learning becoming an accomplished teacher*. Routledge.
- Benedek, M., Jauk, E., Sommer, M., Arendasy, M., & Neubauer, A. C. (2014). Intelligence, creativity, and cognitive control: The common and differential involvement of executive functions in intelligence and creativity. *Intelligence*, 46(1), 73-83. <https://doi.org/10.1016/j.intell.2014.05.007>.
- Bieńkowska, J. (2015). *Creativity and innovation in business*. Łódź University Press.
- Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., Miller-Ricci, M., & Rumble, M. (2012). Defining twenty-first century skills. In P. Griffin, B. McGaw, & E. Care (Eds.), *Assessment and teaching of 21st century skills* (pp. 17-66). Retrieved from <https://www.springer.com/gp/book/9789400723238>.
- Chad-Friedman, E., Lee, Y., Liu, X., & Watson, M. W. (2018). The effects of visual arts pedagogies on children's intrinsic motivation, creativity, artistic skill, and realistic drawing ability. *The Journal of Creative Behavior*, 1-14. <https://doi.org/10.1002/jocb.228>.
- Chen, Y., Yu, C., Yuan, Y., Lu, F., & Shen, W. (2021). The influence of trust on creativity: A review. *Frontiers in Psychology*, 12(August). <https://doi.org/10.3389/fpsyg.2021.706234>.
- Chew, L. Z., Chang, P. K., & Piaw, C. Y. (2012). A relationship between creativity and musical achievement: A survey of music major trainee teachers in a teacher education institution. *Malaysian Music Journal*, 1(2), 59-71. <https://ejournal.upsi.edu.my/index.php/MJM/article/view/572>.
- Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education* (6<sup>th</sup> ed.). Madison Avenue.
- Cooper, H., Hedges, L. V., & Valentine, J. C. (2019). *The handbook of research synthesis and meta-analysis* (3<sup>rd</sup> ed.). Russell Sage Foundation.

- Danesh, M., & Nourdad, N. (2017). On the relationship between creative problem-solving skills and EFL reading comprehension ability. *Theory and Practice in Language Studies*, 7(3), 234-240. <http://dx.doi.org/10.17507/tpls.0703.10>.
- Denson, C., & Buelin-Biesecker, J. (2015). Investigating the relationship between students' creative self-efficacy and their creative outcomes. In *122<sup>nd</sup> ASEE Annual Conference and Exposition, 13628*, 1-11. <https://doi.org/10.18260/p.24379>.
- Erbas, A. K., & Bas, S. (2015). The contribution of personality traits, motivation, academic risk-taking, and metacognition to the creative ability in mathematics. *Creativity Research Journal*, 27(4), 299-307. <https://doi.org/10.1080/10400419.2015.1087235>.
- Hajilou, Y., Yazdani, H., & Shokrpour, N. (2012). The relationship between Iranian EFL learners' creativity and their lexical reception and production knowledge. *English Language Teaching*, 5(3), 131-146. <https://doi.org/10.5539/elt.v5n3p131>.
- Hamdi, S., Kartowagiran, B., & Haryanto (2018). Developing a testlet model for mathematics at elementary level. *International Journal of Instruction*, 11(3), 375-390. <https://doi.org/10.12973/iji.2018.11326a>.
- Harun, H., Kartowagiran, B., & Manaf, A. (2021). Student attitude and mathematics learning success: A meta-analysis. *International Journal of Instruction*, 14(4), 209-222. <https://doi.org/10.29333/iji.2021.14413a>.
- Haylock, D., & Thangata, F. (2007). *A key concept in teaching Primary Mathematics*. SAGE Publication.
- Hidajat, F. A. (2021). Students creative thinking profile as a high order thinking in the improvement of mathematics learning. *European Journal of Educational Research*, 10(3), 1247-1258. <https://doi.org/10.12973/eu-jer.10.3.1247>.
- 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, 1-10. <https://doi.org/10.1016/j.tsc.2020.100695>.
- Hunter, J. E., & Schmidt, F. L. (1990). *Methods of meta-analysis*. SAGE Publications.
- Jauk, E., Benedek, M., & Neubauer, A. C. (2014). The road to creative achievement: A latent variable model of ability and personality predictors. *European Journal of Personality*, 28, 95-105. <https://doi.org/10.1002/per.1941>.
- Johnson, D. W., & Johnson, R. T. (2002). *Meaningful assessment: A manageable and cooperative process*. Allyn & Bacon.
- Kartowagiran, B., Hadi, S., Wahyumiani, N., Alfarisa, F., & Pusporini, W. (2019). Effectiveness of the AA "4C" authentic assessment model: A single-case-research (SCR). *The New Educational Review*, 57(3), 200-209. <https://doi.org/10.15804/tner.2019.57.3.16>.
- Kartowagiran, B., Hamdi, S., Istiyono, E., Mohd Ayub, A. F., & Dewanti, S. S. (2021). Integrating the 21st century character values for elementary school students. *Ilkogretim Online*, 20(2), 33-43. <http://dx.doi.org/10.17051/io.2015.85927>.
- Kattou, M., Kontoyianni, K., Pitta-Pantazi, D., & Christou, C. (2012). Connecting mathematical creativity to mathematical ability. *ZDM Mathematics Education*, 45(2), 167-181. <https://doi.org/10.1007/s11858-012-0467-1>.
- Kettler, T., Lamb, K. N., & Mullet, D. R. (2021). *Developing creativity in the classroom: Learning and innovation for 21st-century schools*. Routledge. <https://doi.org/10.4324/9781003234104>.
- Khadijah, K., Suciati, I., Khaerani, K., Manaf, A., & Sutamrin, S. (2021). Schools' character

- education values and students' mathematics learning achievement: A meta-analysis. *Cakrawala Pendidikan*, 40(3), 670-683. <https://doi.org/10.21831/cp.v40i3.39924>.
- Korte, L. E. (2014). *Collaborative and creative thinking skill development through the design of wearable technologies*. Walden.
- Lateef, A., Dahar, M. A., & Yousuf, M. I. (2019). Influence of type A and type B personality on academic achievement of university students. *Global Social Sciences Review (GSSR)*, IV(II), 109–118. [https://doi.org/10.31703/gssr.2019\(IV-II\).11](https://doi.org/10.31703/gssr.2019(IV-II).11).
- Lin, C. S., & Wu, R. Y. W. (2016). Effects of web-based creative thinking teaching on students' creativity and learning outcome. *Eurasia Journal of Mathematics, Science & Technology Education*, 12(6), 1675-1684. <https://doi.org/10.12973/eurasia.2016.1558a>.
- LTSIN. (2004). *Learning thinking*. Learning and Teaching Scotland.
- Mahama, I., Kwaw, R., Mensah, K. J., Acheampong, E., & Marfo, R. (2019). Relationship between creative thinking and students' academic performance in English language and mathematics: The moderating role of gender. *Journal of Education, Society and Behavioural Science*, 31(4), 1-10. <https://doi.org/10.9734/jesbs/2019/v31i430159>.
- Neubauer, A. C., Pribil, A., Wallner, A., & Hofer, G. (2018). The self-other knowledge asymmetry in cognitive intelligence, emotional intelligence, and creativity. *Heliyon*, 4, 1-22. <https://doi.org/10.1016/j.heliyon.2018.e01061>.
- Oncu, E. C. (2016). Improved creative thinkers in a class: A model of activity-based tasks for improving university students' creative thinking abilities. *Educational Research and Reviews*, 11(8), 517-522. <https://doi.org/10.5897/ERR2015.2262>.
- Paek, S. H., Park, H., Runco, M. A., & Choe, H. S. (2016). The contribution of ideational behavior to creative extracurricular activities. *Creativity Research Journal*, 28(2), 144-148. <https://doi.org/10.1080/10400419.2016.1162547>.
- Preiss, D. D., Ibaceta, M., Ortiz, D., Carvacho, H., & Grau, V. (2019). An exploratory study on mind wandering, metacognition, and verbal creativity in children high school students. *Frontiers in Psychology*, 10, 17-22. <https://doi.org/10.3389/fpsyg.2019.01118>.
- Pritchard, A., & Woollard, J. (2010). *Psychology for the classroom: Constructivism and social learning*. Routledge.
- Puryear, J. S. (2015). Metacognition as a moderator of creative ideation and creative production. *Creativity Research Journal*, 27(4), 334-341. <https://doi.org/10.1080/10400419.2015.1087270>.
- Putwain, D. W., Kearsley, R., & Symes, W. (2012). Do creativity self-beliefs predict literacy achievement and motivation?. *Learning and Individual Differences*, 22, 370–374. <https://doi.org/10.1016/j.lindif.2011.12.001>.
- Roopalakshmi, V., & Rajasekaran, V. (2022). Repression: Rethinking the relationship between creator and the creation. *YMER Digital*, 21(05), 929–937. <https://doi.org/10.37896/ymer21.05/a4>
- Şahin, F. (2016). General intelligence, emotional intelligence, and academic knowledge as predictors of creativity domains: A study of gifted students. *Cogent Education*, 3, 1-16. <http://dx.doi.org/10.1080/2331186X.2016.1218315>.
- Santrock, J. W. (1996). *Adolescence: An introduction*. Times Mirror Education Group.
- Schoevers, E. M., Kroesbergen, E. H., & Kattou, M. (2018). Mathematical creativity: A combination of domain-general creative and domain-specific mathematical skills. *The Journal of Creative Behavior*, 54(2), 242–252. <https://doi.org/10.1002/jocb.361>.

- Schubert, E. (2021). Creativity is optimal novelty and maximal positive affect: A new definition based on the spreading activation model. *Frontiers in Neuroscience*, 15(May), 1–15. <https://doi.org/10.3389/fnins.2021.612379>
- Schunk, D. H. (2012). *Learning theories* (6<sup>th</sup> ed.). Pearson Education.
- Schwan, G. R. (2002). *Achievement of learning standards as outcomes of services*. Retrieved on April 7, 2013, from <https://dpi.wi.gov/sites/default/files/imce/sspw/pdf/sswartic.pdf>.
- Silver, E. A. (1997). Fostering creativity through instruction rich in mathematical problem solving and thing in problem posing. *ZDM*, 29, 75-80. <https://doi.org/10.1007/s11858-997-0003-x>.
- Thuneberga, H. M., Salmia, H. S., & Bognerb, F. X. (2018). How creativity, autonomy, and visual reasoning contribute to cognitive learning in a STEAM hands-on inquiry-based math module. *Thinking Skills and Creativity*, 29, 153-160. <https://doi.org/10.1016/j.tsc.2018.07.003>.
- Torrance, E. P. (1977). Creativity and the older adult. *Creative Child & Adult Quarterly*, 2(3), 136–144.
- Trigueros, R., García-Tascón, M., Gallardo, A. M., Alías, A., & Aguilar-Parra, J. M. (2020). The influence of the teacher's prosocial skills on the mind wandering, creative intelligence, emotions, and academic performance of secondary students in Physical Education Classes. *International Journal Environmental Research Public Health*, 17(1437), 1-10. <https://doi.org/10.3390/ijerph17041437>.
- Tyagi, T. K. (2015). Is there a causal relationship between mathematical creativity and mathematical problem-solving performance? *International Journal of Mathematical Education in Science and Technology*, 1-7. <http://dx.doi.org/10.1080/0020739X.2015.1075612>.
- Van Velsor, E., McCauley, C. D., & Ruderman, M. N. (Eds.). (2010). *The center for creative leadership handbook of leadership development*. John Wiley & Sons.
- Vessels, G., & Huitt, W. (2005). Moral and character development. Paper presented at *The National Youth at Risk Conference*, Savannah, GA, March8-10. retrieved from <http://www.edpsycinteractive.org/papers/chardev.pdf>.
- Wolf, F. M. (1986). *Meta-analysis: Quantitative methods for research synthesis (Quantitative applications in the social sciences)*. SAGE Publication.