

INVESTIGATE THE RELATIONSHIP OF CREATIVE THINKING SKILLS AND JUNIOR HIGH SCHOOL STUDENT MOTIVATION

Syaiful^{1*}, Kamid², Muslim³, Nizlel Huda⁴

^{1,2,3,4}Faculty of Teaching and Education, Universitas Jambi, Jambi, Indonesia.

Email: ^{1*}pak_bakri@unja.ac.id, ²kamid@unja.ac.id, ³muslim@unja.ac.id, ⁴nizlelhuda@unja.ac.id

Article History: Received on 29th November 2019, Revised on 25th February 2020, Published on 17th March 2020

Abstract

Purpose of the study: This study aimed to describe the ability of creative thinking and student motivation and whether there is a relationship between creative thinking with student motivation to learn mathematics.

Methodology: In this study using quantitative associative research types with correlational designs using 125 junior high school students obtained using purposive sampling techniques, data analysis in this study using descriptive and inferential statistics.

Main Findings: In this study, there is a relationship between creative thinking skills and student motivation in mathematics, which is supported by creative thinking skills and motivation that shows good dominant results.

Applications of this study: This research can be a consideration for teachers in teaching mathematics to develop students' creative thinking skills and foster student motivation in learning.

Novelty/Originality of this study: In this study, the renewal is to see from two indicators possessed by creative thinking skills, namely sensitivity, and elaboration, as well as motivation that has a relationship with creative thinking.

Keywords: *Creative Thinking, Junior High School, Mathematics, Motivation, Students.*

INTRODUCTION

In learning, attitude is also an aspect that deserves to be taken into account. In the learning process, especially in mathematics lessons, participants' attitudes are important to be rejected ([Kurniawan et al, 2019](#)). The attitudes of the process are very important ([Kurniawan, Astalini, & Anggraini, 2018](#); [Astalini et al, 2019](#)). Because, students who have this view will have different attitudes, with students who have a positive outlook during the learning process ([Astalini et al, 2019](#)). Learning cognitive and affective aspects are needed because students who have high effectiveness will make these students find the self-concept, critical and creative of a student. Attitude can be defined as a tendency to give a learned, consistent, positive or negative reaction to an object ([Bulunuz, 2015](#); [Maison et al, 2019](#); [Maison et al, 2019](#)). [Astalini et al \(2019\)](#) define attitude as part of an individual's personality influenced by the behavior of his relationship with him. Attitude can also be defined as a tendency to act towards people, things, events, or ideas. Attitudes appear to be unconscious, sustainable and closely related to opinions. Attitudes are formed as a result of learning experiences that will foster motivation from a student ([Maison et al, 2020](#)).

It was further stated that to achieve, learning must be carried out interactively, inspirational, fun, challenging, motivating students to participate actively, as well as providing sufficient space for the initiative, creativity, and independence following the talents, interests and physical and psychological development of participants students ([Schunk, Pintrich & Meece, 2008](#); [Liu et al, 2013](#); [Asrial et al, 2019](#)). Creativity directs students to learn to find new concepts in solving the problems they face. Students who have creative thinking skills need to be supported with high achievement motivation to achieve the expected educational goals. Learning motivation can arise due to "intrinsic factors, in the form of the desire and desire to succeed and the drive for learning needs, hopes for ideals. Extrinsic factors are appreciation, a conducive learning environment, and interesting learning activities ([Astalini et al, 2019](#); [Maison et al, 2019](#)).

In addition to the affective aspects, the curriculum now also emphasizes cognitive aspects, especially on creative thinking skills. Although creative thinking includes cognitive and affective elements like other ways of thinking, it mainly involves the use of cognitive processes ([Bacanli et al, 2011](#); [Haryanto et al, 2019](#)). Because mathematics is focused on practicing ways of thinking and reasoning, developing creative activities, developing problem-solving skills and communicating ideas. Creative thinking skills are inherent to normative cognitive functioning rather than an innate talent available to only a few ([Ward, Smith & Finke, 1999](#); [Colzato, Ritter, & Steenbergen, 2018](#)). Importantly, various behavioral studies have shown that creative thinking skills can be enhanced ([Baas et al, 2014](#); [Colzato et al, 2012, 2013, 2015](#); [De Bloom et al., 2014](#); [Ritter and Mostert, 2016](#); [Zabelina and Robinson, 2010](#)). Efforts made can be seen in terms of the material, the learning process, improvement, and support of infrastructure increasing the ability of teachers to teach through upgrading or training, reduction or distribution of materials into simpler parts (simplification of material content in the curriculum) or improved quality of input (students) in schools. Scientists, Teachers, and engineers cannot solely rely on their technical knowledge but will also be expected to have skills in areas such as problem-solving, creative thinking, written and oral communication and teamwork ([Passow & Passow, 2017](#); [Asrial et al, 2019](#); [Lynch et al, 2019](#)). Approach to overcome these problems, researchers put more emphasis on the learning process, because the process is the task and the professional responsibility of the teacher every day and will have an impact on the tasks in the next class. When referring to the identification of the causes of these weaknesses, the learning process requires ways that

encourage students to understand the problem enhance students' creative thinking skills in preparing a solution plan and actively involve students in finding their problems and encourage student-centered learning only as a facilitator.

The absence of critical and creative thinking in high school and the lack of motivation and interest to learn, especially in the subjects of science, is becoming a more common reality nowadays ([Rivas, 2017](#); [Asrial et al, 2019](#); [Syahiral et al, 2019](#)). In the context of learning, [Ruggiero & Ruggiero \(2004\)](#) states that the ability to think creatively is closely related to the way teachers teach in schools. In the sense that the teacher becomes the main character in the school and parents become the determinant in the home and environment in fostering children's creativity. However, the reality on the ground shows that learning is done by teachers, especially mathematics teachers, who still apply the old paradigm of the dimensions of cognitive processes. In this case in learning the teacher still relies on six processes namely: memory, understanding, application, analysis, synthesis, and evaluation. [Kim \(2011\)](#) argues that the definition of mathematical creativity that is built in the western world is a process that opens new doors, unusual and deep knowledge/understanding that is built through problem-solving, while according to views in the eastern world creativity focuses on re-interpretation of an issue which is viewed from a different angle. The definition of creativity proposed by [Chamberlin and Moon \(2005\)](#) is a particular domain of thought process used by mathematicians when they solve non-routine mathematical problems.

Creative thinking skills in all domains, including science, technology, medicine, and art emerged from the operation of the mental base on different things whose concepts are mixed because creative ideas are always a new combination of old ideas ([Ghonsooly & Showqi, 2012](#)). Cognitive abilities that include mastery of scientific concepts and facts in mathematics learning also need to be trained as a basis for training students' creative thinking skills ([Hadzigeorgiou, et al, 2012](#)). Thinking abilities are categorized as basic thinking skills and complex thinking abilities ([Costa, 1985](#)). Basic thinking ability includes basic processes (basic processes) which are a picture of rational thought processes that contain a set of mental processes from simple to complex. the basic thinking ability process includes causation, transformation, relationship, classifications, and qualifications. Complex thinking skills are thinking abilities that are based on basic thought processes. [Ristow, \(1988\)](#) mentions that there are at least four complex thinking processes that occur in a person, namely problem solving, decision making, critical thinking, and creative thinking. The ability to think is importantly possessed by every student, both at school and in everyday life. By having good thinking skills, students will have the capital to be able to solve problems that occur in their lives.

Therefore, this study aims to determine whether motivation has a relationship with students' creative thinking skills in mathematics, with the following research questions

1. What are the creative thinking skills of students in mathematics?
2. What motivation do students have in mathematics?
3. Is there a relationship between motivation and students' creative thinking skills in mathematics?

METHODOLOGY

The research design used in this study is the Associative Quantitative research method with a correlational research design. Associative quantitative research is research that aims to determine the relationship between two or more variables ([Cohen, Manion & Morrison, 2007](#)). Because the research is associative research, the researcher took a correlational research design. According to [Creswell \(2012\)](#) "Correlational Design is a procedure in quantitative research that is used by researchers to measure the degree of association (relationship) between two or more variables using statistical analysis correlation procedures".

The sample of this research was obtained from 125 students with Junior High School in Jambi students who were taken by purposive sampling technique with details of 75 female students and 50 male students with purposive sampling. Purposive sampling is a technique for sampling based on the criteria of the researcher ([Kerlinger, 2014](#)). The criteria in this study are students with the best 5 ranks.

In this study, this study used a questionnaire instrument. The creative thinking and motivation questionnaire has a valid statement with a reliability value of 0.72 for creative thinking and 0.75 for motivation using a Likert scale of 4 (five) for a positive statement Strongly Agree to have a score of 1, Disagree to have a score of 2, Agree to have a score 3 and Strongly Agree 4. For negative statements Strongly disagree has a score of 4, Disagree has a score of 3, a score of 2 and Strongly Agree has a score of 1 and uses structured interviews intended to strengthen quantitative data. Both instruments, both questionnaires, and interviews have been through the testing phase by experts in their fields, and it was stated that the instrument was valid and could be used. Data collection procedures for referring [Creswell \(2012\)](#), described in the figure below:

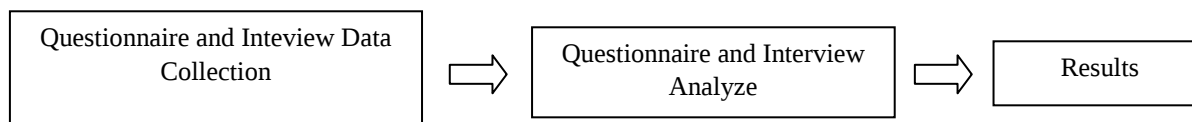


Figure 1: Research Procedure

The data used by the SPSS program to look for descriptive and inferential statistics. Descriptive statistics are presented in a summary frequency, for example, mode, mean, median, minimum, maximum and standard deviation (Cohen, Manion & Morrison, 2007). Statistical inference from mathematical procedures for using probabilities and information about samples to conclude the population from which the sample is presumably was drawn (Gall, 2003). In this study, there is a hypothesis test, the hypothesis using product-moment correlation.

The categories of essay questions and emotional questions include, very good, good, not good, and very not good, like table 1.

Table 1: Categories of Creative Thinking and Motivation

Category	Interval		
	Creative Thinking		Motivation
	Sensitivity	Elaboration	Motivation
Very Not Good	3.0 – 5.25	4.0 – 7.0	25.0 – 43.7
Not Good	5.26 – 7.5	7.1 – 10.0	43.8 – 62.5
Good	7.6 – 9.75	10.1 – 13.0	62.6 – 81.2
Very Good	9.76 – 12.0	13.1 – 16.0	81.3 – 100.0

All data obtained from students' motivation and creative thinking questionnaires were collected and calculated and assisted with the SPSS 21 application to obtain descriptive and inferential statistical results. Descriptive statistics are given to calculate frequency, percentage, average, median, min, and max sample (Creswell, 2012). In this study, quantitative data were analyzed using parametric statistics of product person moments. The correlation of product people's moments to determine whether there is a relationship between student motivation and students' creative thinking skills with a significance level of 0.05. And followed by interviews that are used to strengthen the results of quantitative data. Followed by interviews intended to strengthen the results of quantitative data. The steps in the interview can be seen as follows: (1) The ideas, themes, pieces of data and words. (2) Pay attention to patterns and themes. (3) Try to make good data, using intuition to reach a conclusion. (4) Is a group set items into categories, types, behavior, and classification? (5) Makes a metaphor that uses figurative language and connotative rather than literal and denotative language, animates data, reducing data, making patterns, aligning data, linking data with theory. (6) Separate variables to decipher, differentiate and 'unpack' ideas, i.e. move from drive to integration and obfuscate data. (7) Surrendered specifically into the general, large number of variables under a small number of (frequently) unobserved hypothetical variables. (8) Identifies and records relationships between variables. (9) finds an intervening variable: looks for another variable that seems to be a 'block' calculation for what is expected to be a strong relationship between variables. (10) the logical chain of evidence building: noting causality and making conclusions. (11) Creating conceptual/theoretical coherence: moving from a method to construct stories to explain phenomena (Cohen, Manion & Morrison, 2007).

RESULTS/FINDINGS

Students can be seen from the characteristics they have, feel happy, or just normal from students in solving problems when they study. Besides, it can also be seen from feeling happy, unhappy, like it or not, motivated or not motivated, interested or not from students. Motivation is an impulse that causes someone to do an action to achieve a certain goal (Astalini et al, 2019). And the motivation possessed by students can foster students' creative thinking skills. Because students' creative thinking skills are very important to have in all aspects of educational studies (Piaw, 2010). Where, in this study, what will be examined are student sensitivity, fluency, motivation and the relationship of motivation to students' creative thinking skills.

Sensitivity

The results of the creative thinking questionnaire provided and have been obtained and processed the results using the SPSS 21 application that we can see in the table below:

Table 2: The Result of Indicator Sensitivity

Range	Classification				Mean	Min	Max	%
	M	F	Interest	Total				
3.0 – 5.25	6	2	Not very good	8	8.4	4.00	11.00	6.4
5.26 – 7.5	8	9	Not good	17				13.6
7.6 – 9.25	26	52	Good	78				62.4

9.26 – 12.0	10	12	Very good	22	17.6
TOTAL	50	75		125	100

From table 2, which came from 125 respondents from students categorized both for men as many as 26 students and for women as many as 52 students in the good category, and after being processed and the results obtained using the SPSS 21 program application, it was found that sensitivity in creative thinking had a good category at 62.4% for 78 students out of 125 total students, not good at 13.6% for a total of 17 students out of 125 total students, very good 17.6% for 22 students out of 125 total students and very poor at 6.4% for 8 students out of 125 total students. Of the 125 students, the mean value was 8.4, the maximum score was 11, and the minimum value was 4.

Elaboration

The results of the creative thinking questionnaire provided and have been obtained and processed the results using the SPSS 21 application that we can see in the table below:

Table 3: The Result of Indicator Elaboration

Classification					Mean	Min	Max	%
Range	M	F	Interest	Total				
4.0 – 7.0	7	2	Not very good	9	12.5	6.00	15.00	7.2
8.0 – 10.0	9	7	Not good	16				12.8
11.0 – 13.0	25	52	Good	77				61.6
14.0 – 16.0	10	23	Very good	23				18.4
TOTAL	50	75		125				100

From table 3, which came from 125 respondents from students categorized both for men as many as 25 students and for women as many as 52 students with good categories, and after being processed and the results obtained using the SPSS 21 application program, it was found that elaboration in creative thinking had a good category at 61.6% for 77 students out of 125 total students, not good at 12.8% for a total of 16 students out of 125 total students, very good 18.4% for 23 students out of 125 total students and very poor at 7.2% for 9 students out of 125 total students. Of the 125 students, the mean value is 12.5, the maximum value is 15, and the minimum value is 6.

Motivation

The results of the motivation questionnaire provided and which have been obtained and processed using the SPSS 21 application that we can see in the table below:

Table 4: The Result of motivation students

Classification					Mean	Min	Max	%
Range	M	F	Interest	Total				
4.0 – 7.0	7	0	Not very good	7	12.0	6.00	15.00	5.6
8.0 – 10.0	13	2	Not good	15				12.0
11.0 – 13.0	20	63	Good	83				66.4
14.0 – 16.0	10	10	Very good	20				16.0
TOTAL	50	75		125				100

From table 4, which came from 125 respondents from students categorized as good for men as many as 20 students and for women as many as 63 students in the good category, and after being processed and the results obtained using the SPSS 21 application program, it was found for student motivation to have a good category of 66.4 % for 83 students out of 125 total students, not good at 12.0% for total 15 students out of 125 total students, very good 16.0% for 20 students out of 125 total students and not very good at 5.6% for 7 students out of 125 total students. Out of 125 students, the mean value is 12.0, the maximum value is 15, and the minimum value is 6.

The relationship between motivation and creative thinking

The results of the relationship between motivation and creative thinking, students can be seen in the table below.

Table 5: The Relationship Students Junior High School in Jambi

		Motivation	Creative Thinking
Motivation	Pearson Correlation	1	.742*
	Sig. (2-tailed)		.031
	N	125	125

Creative Thinking	Pearson Correlation	.742*	1
	Sig. (2-tailed)	.031	
	N	125	125

From table 5, we can see that the sig value of 0.031 is smaller than 0.05, it can be concluded that there is a relationship between student motivation and creative thinking of junior high school students in Jambi city with an R-value of 0.742 and positive. If the sig value <0.05 then there is a relationship (Cramer, 2003).

DISCUSSION/ANALYSIS

1. Sensitivity

The results of the questionnaire analysis in table 2, the sensitivity indicator in creative thinking has a good sensitivity ability. This ability is shown by being able to understand learning because it has good sensitivity. This can also be seen from the results of the interviews conducted.

"When learning mathematics is happening, what do you do?"

"I pay attention to what is explained in class"

"When you pay attention and are asked by the teacher what learning are you doing?"

"I answered the teacher's question under what was asked"

Sensitivity skills are students' skills in detecting, recognizing, understanding and responding to a problem or phenomenon. Students who have this ability can identify, recognize and detect a phenomenon, find problems and patterns of problems produced. Also, students experience meaningful learning, by observing makes students feel very useful for the fulfillment of their curiosity (Ketchabaw, Kummenn & Thompson, 2010; Ekahitanond, 2013). So the learning process has high meaning. Where students are required to be sensitive to a phenomenon and find problems and ask questions of these problems which can later explain the meaning of the statement (Rad et al, 2010). When students are allowed to ask questions, student creativity will develop. In the trying stage, students experience a different process than usual. Namely, students are required to be able to design their experiments that they will do. Students are allowed to develop their creativity in designing experiments.

2. Elaboration

The results of the questionnaire analysis in table 3, indicators of elaboration in creative thinking have good elaboration skills. This ability is shown by explaining something in detail rather than others doing it because it has good elaboration skills. This can also be seen from the results of the interviews conducted.

"When your friend can't explain an issue, what do you do?"

"I will examine the problem in more detail than my friend did so that I get the answer I want"

"When your friend explains something from a problem he encounters, what will you do?"

"I will add, clarify or elaborate further so that the problem can be answered"

Detail/elaboration is the ability to explain, develop, enrich or elaborate in more detail the answers or ideas provided. By having this ability students can answer the problems that have been given (Scribner, 2015; Richards, 2013; Shahrebakbaki, 2015). Students who have this ability will also have good grades because it will help their friends enrich ideas that are owned by others.

3. Motivation

In table 4 shows that the motivation possessed by students is good. This shows that motivation provides encouragement and effort to fulfill or satisfy a need to achieve a goal. Every individual has the main motivation in the form of a tendency to believe in yourself, have a sense of freedom and creativity. This agrees with (Hong, O'Neil & Peng, 2016; Wolters, 2004) according to him, the important things that become human needs, namely: Need for achievement (the need for achievement). There is an association in the form of a positive interactive/reciprocal relationship between students 'learning motivation and students' creative thinking abilities, with the magnitude of the relationship. Because according to (Hong, Peng, & O'Neil, 2014; Mantzicopoulos et al, 2017) states that creative thinking involves many components including creative thinking depends more on intrinsic motivation rather than extrinsic. Someone who thinks creatively will do something because of an internal urge that will make a person proactive so that his mind can wander through boundaries (Lee & Reeve, 2012; Vansteenkiste et al, 2004).

According to the results in table 2, table 3, and table 4, all students showed satisfactory performance. However, according to the observations we made before conducting the study, we found that they had difficulty in solving the problem. That is caused by teachers who only use traditional methods during learning. Finally, we assume that students

who are taught using conventional methods tend to obtain less than optimal performance ([Duran & Dökme, 2016](#); [Wartono, Hudha & Batlolona, 2018](#)). If students have a good motivation, it will have a positive impact on the students' creative thinking. Where learning is a cognitive, affective and psychomotor characteristic, as an indicator that acts relatively stable for learning that is interconnected and reacts to the learning environment ([Keefe, 1990](#)). And attitudes especially motivation have factors that can influence social and internal conditions in themselves ([Astalini et al, 2019](#)).

Creative and critical thinking are both essential for students in all aspects of educational studies ([Piaw, 2010](#)). Being creative is a universal human attribute. However, the representation of creative abilities would have both local as well as global cultural influences ([Mpofu et al, 2006](#); [Humble, Dixon, & Mpofu, 2018](#)). Teaching design is to help students to obtain creative achievements through developing their integrative abilities of comparison, analysis, and imagination. The relationship between effective teaching evaluations and teaching activities is active. Evaluations on students' learning behaviors and learning results help to understand students' learning characteristics, interests, and learning achievements, to determine their learning effectiveness and to propose supplement teaching based on diagnosis, to develop creativity and encourage learning motivation ([Lin, 2012](#)).

CONCLUSION

It can be seen that the results of student motivation have a good category because, with students having good motivation, it will affect students in their learning. After all, motivation is one of the important factors that students must have. With students having good motivation so when the learning process students will have more attention in learning that will have an impact on the benefits to be received by students, one of them has creative thinking skills. This is also supported by the relationship between student motivation and creative thinking skills that have a significant relationship.

LIMITATION AND STUDY FORWARD

This research only investigates students' creative thinking skills and motivation in mathematics.

ACKNOWLEDGMENT

The researcher would like to thank the principal who has been willing to permit to research the managed school, as well as all students who have been respondents and the teacher council and all who have participated.

AUTHORS CONTRIBUTION

Syaful is a professor in the field of Higher Order Thinking Skills (HOTS) and chairman of HOTS (Higher Order Thinking Skills) in mathematics at the University of Jambi, as well as a lecturer in the teaching and education faculties, and the role in this article is to make articles.

Kamid is a lecturer in the faculty of education and education as well as a member of HOTS (Higher Order Thinking Skills), the role of this research is as a coordinator and data collector of students' motivation and thinking skills.

Muslim is a lecturer in the faculty of education and education and a member of HOTS (Higher Order Thinking Skills), the role of this research is to input and manage data for students' creative thinking skills in mathematics.

Nizlel Huda is a lecturer in the faculty of education and education and a member of HOTS (Higher Order Thinking Skills), the role of this research is to input and manage data for student motivation in mathematics.

REFERENCES

1. Astalini., Darmaji., Kurniawan, D. A., Melsayanti, R. (2019). E-Assessment of Student Perception of Natural Science-Based on Seska in Middle School Students in Indonesia. *International Journal of Scientific & Technology Research*, 8(9), 858-863.
2. Astalini., Kurniawan, D. A., Sulistiyo, U., Perdana, R., Susbiyanto, S. (2019). E-Assessment Motivation in Physics Subjects for Senior High School. *International Journal of Online and Biomedical Engineering (iJOE)*. 15(9), 4-15. <https://doi.org/10.3991/ijoe.v15i11.10843>
3. Astalini, Kurniawan, D. A., Darmaji., Sitorus, L. R., Perdana, R. (2019). Characteristic Of Students Attitude To Physics In Muaro Jambi High School. *Humanities & Social Science Reviews*. 7(2), 91-99. <https://doi.org/10.18510/hssr.2019.7210>
4. Astalini., Kurniawan, D. A., Kurniawan, N., Anggraini, L. (2019). Evaluation of Student's Attitude Toward Science in Indonesia. *Open Journal of Educational Research (OJER)*, 3(1), 1-12. <https://doi.org/10.32591/coas.ojer.0301.01001a>
5. Astalini., Darmaji., Kurniawan, W., Khairul, A., & Kurniawan, D. A. (2019) Effectiveness of Using E-module and E-Assessment. *International Journal of Interactive Mobile (IJIM)*, 13(9), 21-39. <https://doi.org/10.3991/ijim.v13i09.11016>
6. Astalini., Kurniawan, D. A., Perdana, R., Kurniasari, D. (2019). Identification of Student Attitudes toward Physics Learning at Batanghari District High School. *The Educational Review*, 2(9), 475-484. <https://doi.org/10.26855/er.2018.09.003>

7. Asrial., Syahrial., Kurniawan, D. A., Perdana, R., Nugroho, P.(2019). Supporting Technology 4.0: Ethnoconstructivist Multimedia for Elementary Schools. *International Journal of Online and Biomedical Engineering (iJOE)*. 15(9), 4-15. <https://doi.org/10.3991/ijoe.v15i14.11365>
8. Asrial, Syahrial, Kurniawan, D. A, Chan, F., Nugroho, P., Pratama, R. A., Septiasari, R. (2019). Identification: The Effect Of Mathematical Competence On Pedagogic Competency Of Prospective Teacher. *Humanities & Social Science Reviews (HSSR)*. 7(4), 85-92
9. Asrial., Syahrial., Kurniawan, D. A., Chan, F., Septianingsih, R., Perdana, R. (2019). Multimedia Innovation 4.0 in Education: E-Modul Ethnoconstructivism. *Universal Journal of Educational Research*. 7(10), 2098-2107. <https://doi.org/10.13189/ujer.2019.071007>
10. Bacanlı, H., Dombayci, M. A., Demir, M., & Tarhan, S. (2011). Quadruple Thinking: Creative Thinking. *Procedia Social and Behavioral Science*. 12, 536-544. <https://doi.org/10.1016/j.sbspro.2011.02.065>
11. Baas, M., Nevecka, B., & Ten Velden, F. S. 2014. Specific mindfulness skills differentially predict creative performance. *Personal. Social. Psychol. Bull.* 40(9), 1092–1106. <https://doi.org/10.1177/0146167214535813>
12. Bulunuz, N., Bulunuz, M., Orbak, A. Y., Mulu, N., & Tavşanlı, Ö. F. (2017). Evaluation of primary school students' views about noise levels in school. *International Electronic Journal of Elementary Education*, 9(4), 725-740.
13. Creswell, John W. (2012). *Educational Research: Planning, Conducting, And Evaluating Quantitative And Qualitative Research*. New York: Pearson.
14. Chamberlin, S. A., & Moon, S. M. (2005). Model-eliciting activities as a tool to develop and identify creatively gifted mathematicians. *Journal of Secondary Gifted Education*, 17(1), 37-47. <https://doi.org/10.4219/jsge-2005-393>
15. Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods In Education*: Routledge.
16. Colzato, L. S., Ritter, S. M., & Steenbergen, L. (2018). Transcutaneous Vagus nerve stimulation (tVNS) enhances divergent thinking. *Neuropsychologia*, 111, 72-76. <https://doi.org/10.1016/j.neuropsychologia.2018.01.003>
17. Colzato, L.S., Ozturk, A., & Hommel, B., (2012). Meditate to create: the impact of focused-attention and open-monitoring training on convergent and divergent thinking. *Front. Psychol.* 3, 116. <https://doi.org/10.3389/fpsyg.2012.00116>
18. Colzato, L.S., Szapora Ozturk, A., Pannekoek, J.N., & Hommel, B., (2013). The impact of physical exercise on convergent and divergent thinking. *Front. Human. Neurosci.* 7, 824. <https://doi.org/10.3389/fnhum.2013.00824>
19. Colzato, L.S., de Haan, A.M., & Hommel, B., (2015). Food for creativity: tyrosine promotes deep thinking. *Psychol. Res.* 79(5), 709–714. <https://doi.org/10.1007/s00426-014-0610-4>
20. Costa, A. L. (1985). *Developing minds: A resource book for teaching thinking*. Association for Supervision and Curriculum Development, 225 N. Washington St., Alexandria, VA 22314.
21. Cramer, D. (2003). *Advanced quantitative data analysis*. McGraw-Hill Education (UK).
22. De Bloom, J., Ritter, S., Kühnel, J., Reinders, J., & Geurts, S., (2014). Vacation from work: a ‘ticket to creativity’?: the effects of recreational travel on cognitive flexibility and originality. *Tour. Manag.* 44, 164–171. <https://doi.org/10.1016/j.tourman.2014.03.013>
23. Duran, M., & Dökme, İ. (2016). The effect of the inquiry-based learning approach on student’s critical-thinking skills. *Eurasia Journal of Mathematics, Science & Technology Education*, 12(12), 2887-2908. <https://doi.org/10.12973/eurasia.2016.02311a>
24. Ekahitanond, Visara. (2013). Promoting university students’ critical thinking skills through peer feedback activity in an online discussion forum. *Alberta Journal of Educational Research*, 59(2), 247-265.
25. Gall, D.M et al. (2003). *Education Research an introduction seventh edition*. USA: Pearson Education Inc.
26. Ghonsooly, B., & Showqi, S. (2012). The Effects of Foreign Language Learning on Creativity. *English Language Teaching*, 5(4), 161-167. <https://doi.org/10.5539/elt.v5n4p161>
27. Haryanto., Maisson., Suryani, A., Lumbantoruan, A., Dewi, U. P., Samosir, S. C., Wiza, A. H. (2019). Science Process Skills: Basic and Integrated into Equilibrium Practicum. *International Journal of Scientific & Technology Research*, 8(12), 1421-1428.
28. Hadzigeorgiou, Y., Fokialis, P., & Kabouropoulou, M. (2012). Thinking about creativity in science education. *Creative Education*, 3(05), 603. <https://doi.org/10.4236/ce.2012.35089>
29. 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>
30. Hong, E., Peng, Y., & O’Neil, H. F. (2014). Activities and Accomplishments in Various Domains: Relationships With Creative Personality and Creative Motivation in Adolescence. *Roeper Review*, 36(2), 92–103. <https://doi.org/10.1080/02783193.2014.884199>
31. Hong, E., O’Neil, H. F., & Peng, Y. (2016). Effects of Explicit Instructions, Metacognition, and Motivation on Creative Performance. *Creativity Research Journal*, 28(1), 33–45. <https://doi.org/10.1080/10400419.2016.1125252>

32. Keefe, J. W., & Walberg, H. J. (1992). *Teaching for Thinking*. National Association of Secondary School Principals, 1904 Association Drive, Reston, VA 22091-1537.
33. Kerlinger, F. N. (2014). *Foundations of behavioral research*. Yogyakarta: Gadjah Mada University Press.
34. Ketchabaw, V. P., Kummen, K., & Thompson, D. (2010). Becoming Intimate With Developmental Knowledge: Pedagogical Explorations With Collective Biography. *The Alberta Journal of Education Research*, 56(3), 335-354.
35. Kim, K. H. (2011). The creativity crisis: The decrease in creative thinking scores on the Torrance Tests of Creative Thinking. *Creativity Research Journal*, 23(4), 285-295. <https://doi.org/10.1080/10400419.2011.627805>
36. Kurniawan, D. A., Astalini., & Anggraini, L. (2018). Evaluasi Sikap SMP Terhadap IPA di Kabupaten Muaro Jambi. *Jurnal Ilmiah Didaktika: Media Ilmiah Pendidikan dan Pengajaran*. 19(1), 123-139.
37. Kurniawan, D. A., Darmaji., Astalini., Sefiah, P. (2019). Description of Science Process Skills for Physics Teacher's Candidate. *Azerbaijan Journal of Educational Studies*. 684(3), 71-85.
38. Lee, W., & Reeve, J. (2012). Teachers' estimates of their students' motivation and engagement: being in synch with students. *Educational Psychology*, 32(6), 727-747. <https://doi.org/10.1080/01443410.2012.732385>
39. Lin, Ruilin. (2012). A Study of Curriculum Innovation Teaching and Creative Thinking for Picture Book Creation. *IERI Procedia*, 2, 30-35. <https://doi.org/10.1016/j.ieri.2012.06.047>
40. Liu, G., Zhang, S., Zhang, J., Lee, C., Wang, Y., & Brownell, M. (2013). Autonomous Motivation and Chinese Adolescents' Creative Thinking: The Moderating Role of Parental Involvement. *Creativity Research Journal*, 25(4), 446-456. <https://doi.org/10.1080/10400419.2013.843401>
41. Lynch, M., Kamovich, U., Longva, K. K., & Steinert, M. (2019). Combining technology and entrepreneurial education through design thinking: Students' reflection on the learning process. *Technological Forecasting & Social Change*. <https://doi.org/10.1016/j.techfore.2019.06.015>
42. Maison, Darmaji, Astalini, Dwi Agus Kurniawan, Peni Sefiah Indrawati. (2019). Science Process Skills And Motivation. *Humanities & Social Science Reviews (HSSR)*, 7(5), 48-56. <https://doi.org/10.18510/hssr.2019.756>
43. Maison., Astalini., Kurniawan, D. A., Perdana, R., Anggraini, L. (2019). The Phenomenon of Physiology Senior High School Education: Relationship of Students' Attitudes towards Physics, Learning Style, Motivation. *Universal Journal of Educational Research*. 7(10), 2199-2207. <https://doi.org/10.13189/ujer.2019.071018>
44. Maison., Ernawati, M, D. W., Budiarti, R. S., Kurniawan, W., Ningsih, Y., Puspitasari, T. O., Jannah, N., Putra, D. S. (2019), Learning in Nature Science: Social Implication, Normality of Scientist, Attitude Towards Investigation of Nature Science, and Interest Adds To Science Learning Time, *International Journal of Scientific & Technology Research*, 8(12), 1476-1484.
45. Maison., Darmaji., Astalini., Kurniawan, D. A., Sumaryanti., Perdana. R. (2020). Supporting Assessment in Education: E-Assessment Interest in Physics. *Universal Journal of Educational Research*, 8(1), 89-97. <https://doi.org/10.13189/ujer.2020.080110>
46. Mantzicopoulos, P., Patrick, H., Strati, A., & Watson, J. S. (2017). Predicting Kindergarten's Achievement and Motivation From Observational Measures of Teaching Effectiveness. *The Journal of Experimental Education*, 86(2), 214-232. <https://doi.org/10.1080/00220973.2016.1277338>
47. Mpofu, E., Myambo, K., Mogaji, A. A., Mashego, T.-A., & Khaleefa, O. H. (2006). *African perspectives on creativity*. In J. C. Kaufman, & R. J. Sternberg (Eds.). *The international handbook of creativity*. Cambridge: Cambridge University Press.
48. Passow, H.J., & Passow, C.H., (2017). What competencies should undergraduate engineering programs emphasize? A systematic review. *J. Eng. Educ.* 106(3), 475-526. <https://doi.org/10.1002/jee.20171>
49. Piaw, C. Y. (2010). Building a test to assess creative and critical thinking simultaneously. *Procedia Social and Behavioral Sciences*, 2, 551-559. <https://doi.org/10.1016/j.sbspro.2010.03.062>
50. Rad, I. S., Karimini, L., Ramezani, V., Ahmadi, M., Heshmati, R., & Jafar, E. (2010). *Procedia-Social and Behavioral Sciences*, 5, 1429-1433. <https://doi.org/10.1016/j.sbspro.2010.07.301>
51. Richards, J. C. (2013). Creativity in language teaching. *Iranian Journal of Language Teaching Research*, 1(3), 19-43. <https://files.eric.ed.gov/fulltext/EJ1127396.pdf>
52. Ritter, S.M., & Mostart, N., (2016). Enhancement of creative thinking skills using cognitive-based creativity training. *J. Cogn. Enhanc.* 1, 1-11. <https://doi.org/10.1007/s41465-016-0002-3>
53. Ristow, R. S. (1988). The Teaching of Thinking Skills: Does It Improve Creativity?. *Gifted Child Today Magazine*, 11(2), 44-46. <https://doi.org/10.1177/107621758801100219>
54. Rivas, P. G. (2017). Strategies for teaching and dissemination of artistic heritage by promoting critical and creative thinking among future Primary Education teachers. *Procedia – Social and Behavioral Science*, 237, 717-722. <https://doi.org/10.1016/j.sbspro.2017.02.112>
55. Ruggiero, V. R., & Ruggiero, V. R. (2004). *The art of thinking: A guide to critical and creative thought*. Pearson/Longman.
56. Schunk, D.H., Pintrich, P.R., & Meece, J. (2008). *Motivation in education: Theory, research, and applications* (3e.). Englewood Cliffs, NJ: Prentice-Hall.

57. Scribner, J. P. (2015). The Problems of Practice: Bricolage as a Metaphor for Teachers' Work and Learning. *The Alberta Journal of Educational Research*, 51(4), 295-310.
58. Shahrebakbaki, M. M. (2015). Relationships between Language Teachers' Time-management Skills, Creativity, and Burnout: A Mediation Analysis. *Alberta Journal of Education Research*, 61(1), 20-39.
59. Syahrial., Asrial., Kurniawan, D. A., Chan, F., Hariandi. A., Pratama, R. A., Nugroho. P., Septiasari. R (2019). The Impact of Ethnoconstructivism in Social Affairs on Pedagogic Competences. *International Journal of Evaluation and Research in Education (IJERE)*. 8(3), 409-416.
60. Syahrial., Asrial., Kurniawan, D. A., Nugroho, P., Septiasari, R., Pratama, R. A., Perdana. R (2019). Increased Behavior of Students' Attitudes to Cultural Values using the Inquiry Learning Model Assisted by Ethnoconstructivism. *Journal of Educational Science and Technology*. 5(2), 176-188..
<https://doi.org/10.26858/est.v5i2.9670>
61. Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K., & Deci, E.L. (2004). Motivating learning, performance, and persistence. The synergistic effects of intrinsic goal contents and autonomy-supportive contexts. *Journal of Personality and Social Psychology*, 87, 246–260. <https://doi.org/10.1037/0022-3514.87.2.246>
62. Ward, T.B., Smith, S.M., Finke, R.A., (1999). *Creative cognition*. In: Sternberg, R.J. (Ed.), *Handbook of Creativity*. Cambridge University Press, Cambridge, pp. 189–212.
<https://doi.org/10.1017/CBO9780511807916.012>
63. Wartono, W., Hudha, M. N., & Batlolona, J. R. (2018). How are the physics critical thinking skills of the students taught by using inquiry-discovery through empirical and theoretical overview? *Eurasia Journal of Mathematics, Science and Technology Education*, 14(2), 691-697. <https://doi.org/10.12973/ejmste/80632>
64. Wolters, C.A. (2004). Advancing achievement goal theory: Using goal structures and goal orientations to predict students' motivation, cognition, and achievement. *Journal of Educational Psychology*, 96, 236–250.
<https://doi.org/10.1037/0022-0663.96.2.236>
65. Zabelina, D.L., & Robinson, M.D., (2010). Child's play: facilitating the originality of creative output by a priming manipulation. *Psychol Aesthet. Creat. Arts*, 4(1), 57. <https://doi.org/10.1037/a0015644>