

Computational Thinking of Prospective Mathematics Teacher Viewed from Entrepreneur Character

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Article received: 2023-01-13, revised: 2023-04-19, published: 2023-04-30

Abstrak

Computational Thinking (CT) dan entrepreneurship membutuhkan pemikiran matematika, begitu pula pada pembelajaran matematika membutuhkan pola pikir CT dan karakter entrepreneurship. Penelitian ini bertujuan mengeksplorasi potensi CT dilihat dari karakter entrepreneur. Penelitian menggunakan pendekatan kualitatif deskriptif. Tiga mahasiswa calon guru Matematika menjadi subyek terpilih dari duapuluh subyek penelitian. Pengambilan data melalui data tes, angket dan wawancara. Hasil penelitian mengungkapkan bahwa aktivitas CT dari karakter entrepreneur tinggi dan sedang ditemukan aktivitas CT dengan komponen abstraksi, algoritma, kreativitas, dekomposisi, dan generalisasi. Kuatnya karakter enterpenur berupa kreativitas memunculkan komponen baru dalam menyelesaikan masalah matematika. Kreativitas direkomendasikan menjadi salah satu komponen CT dalam pembelajaran matematika.

Kata Kunci: Computational Thinking; Entrepreneur; Pembelajaran Matematika.

Abstract

Computational Thinking (CT) and entrepreneurship require mathematical thinking, as well as learning mathematics requires a CT mindset and entrepreneurial character. This research reports on an educational research study that explores the potential of CT in terms of entrepreneurial character. Research using a descriptive approach. Three prospective mathematics teacher students were selected from the twenty subjects of this study. Data collection through data tests, questionnaires and interviews. The results of the study revealed that CT activity had a high entrepreneurial character and moderate CT activity was found with components of abstraction, algorithm, creativity, decomposition, and generalization. The strong character of the entrepreneur in the form of creativity raises a new component in solving mathematical problems. Creativity is recommended to be a component of CT in learning mathematics.

Keywords: Computational Thinking; Entrepreneur; Mathematics; Mathematics Learning.

I. PENDAHULUAN

In 21st century, technology becomes unavoidable integration for teachers and students (Sari & Yulia, 2023). They indirectly need to keep up-to-date to the latest development of technology (Aminah & Wahyuni, 2018). Also, studying mathematics truly requires creative thinking and computational thinking skill (Faiziyah, Hanan, & Azizah, 2022). Moreover, prospective math teachers are required to think critically and creatively (Afriansyah et al., 2020). There have been great efforts from various elements to improve the progress of Indonesia education (Meilina, Mariana, & Rahmawati, 2023). In confronting the challenges of the times, the ability of prospective teachers must also be prepared as early as possible. To achieve this, the government is trying to design a good curriculum from elementary to higher education in order that students have good computational thinking (CT) skill and a creative attitude (Rozi & Afriansyah, 2022).

CT skill and creative attitude should not only be owned by the students, but also by the teachers (Sumartini, 2022). Therefore, institutions that prepare students to be prospective teachers must prepare for this (Aminah et al., 2020; Aminah & Wahyuni, 2019; Afriansyah Turmudi, 2022). These abilities, aside from the field of computers, can be used in other fields, one of which is in learning mathematics. CT and entrepreneurship require mathematical thinking (Palmér, 2018; Michael et al., 2016), we also think that learning mathematics requires a CT mindset and entrepreneurial character.

Universities are required to improve the curriculum, especially for study programs

that produce prospective teachers. This is due to in facing up the disruption of Society 5.0 era, a teacher is demanded to have a computational thinking skill, a thinking process in formulating problems, solving problems and expressing solutions (Angeli, et al., 2016; Bacconi, 2016; Barr & Stephenson, 2011). Computational Thinking (CT) is not only about solving problems, but also about formulating problems and solutions. Thus, the solutions represented in a form that can be implemented effectively (Bacconi, 2016; Angeli, et al., 2016). Fuber said that CT is the process of recognizing the computational aspects of the world that surrounds us, and applying tools and techniques from Computer Science to understand and provide reasoning about natural and artificial systems and processes (Fuber, 2012). Besides utilized in teaching math, CT also teaches students to think like an economist, a physicist, an artist, and to understand how to use computing to solve problems, create, and find new questions that can be useful and explored (Hemmendinger, 2010). CT is problem solving, seeing patterns and questioning evidence (Bowers Institute, 2022).

The definitions described above focus on individual cognitive performance and processes which basically support the teaching process and improve cognitive processes (Cansu & Cansu, 2019; Barr & Stephenson, 2011; Fauzan, Kusnadi, & Sofyan, 2023). Researchers in the field has constantly continued to try to define CT in clear terms, but there are many distinctive opinions from previous researchers. There is no clear definition of the core competencies of CT. (Angeli et al., 2016; Yadav et al., 2016) argue that for the

purpose of conceptualizing CT and integrating it into education, providing a clear definition of CT is not truly essential. In fact, we would rather focus on finding relationships in discussions about CT.

While the general concept of computational thinking can be defined, the researchers offer some insight into how computational thinking should be applied in educational practice. CT and its constituents are needed before classroom learning activities. An activity rubric for CT has been made in 2011 (ISTE, 2011). Rubrics in learning include formulating, organizing, analyzing, modeling, abstraction, algorithmic thinking, automation, efficiency, generalization, transfer. In 2015, ISTE also reformulated the rubric for teaching in the form of creativity, algorithmic thinking, critical thinking, problem solving, collaboration. As time goes by, (ISTE, 2016) added data analysis rubrics, abstract thinking, algorithmic thinking, modeling, representing data, breaking problems into components, automation.

From the definition of CT that has been described above, we can conclude that CT is a thinking process that works like computer thinking that aims to formulate problems, solve problems, and find solutions. Activities based on computational thinking are basically intended to improve cognitive skills and support the teaching and learning process in individuals affected by technological advances (Aminah et al., 2022a, 2023), in this case we will discuss in CT used learning mathematics

The CT components from various researchers are sources in establishing the basis for analyzing further research (Cansu

& Cansu, 2019). CT components proposed by previous researchers include abstraction, algorithms, and decomposition (Barr & Stephenson, 2011; Lee et al., 2020; C. Selby, 2013; Wing, 2008). However, there are several additional components of their research results including automation, simulation (Barr & Stephenson, 2011), addition of parallelization (Lee et al., 2020), evaluation (Aminah et al., 2022b), and generalization (Angeli & Giannakos, 2020).

Even though the components are different, they have the same purpose, namely the ability to think computationally on the basis of a set of skills needed to transform complex problems in everyday problems into a form that can be solved easily (BCS, 2014).

Based on the similarities of the CT components found by previous researchers, we conclude that abstraction is the ability to interpret a problem to make it easily understood, and to lead to an easier solution (Bacconi, 2016). Then, the algorithm is the ability to assemble sequences of steps in a job, to make it easier and more organized. In addition, automation is the use of technology to make it easier to find solutions to the problems faced. Decomposition is the ability to break down complex problems into smaller, more detailed tasks. Debugging is the skill of removing, testing, and correcting errors from logical thinking to predicting and verifying results. Lastly, generalization is related to identifying patterns, similarities and connections, and exploiting those problems, to solve new problems based on previous solutions and building on previous experiences.

From the definition, computational thinking (CT) is very important to equip students to be independent learners, assessors, and designers of new technologies (Curzon et al., 2014). In studying computer science, students will not only gain knowledge but also get unique ways of thinking and solving problems (Pierre, 2017; Benton et al., 2017; Gadanidis et al., 2018). Not only CT skills, students must also be equipped with life skills and soft skills. One of them is through an entrepreneurial attitude, which enable students to have a flexible mindset and creativity to work hard, not give up easily, and uphold the value of honesty (Kusumawardani, 2020).

Researchers interpret the entrepreneurial context as the character and way of thinking of an entrepreneur, not just the ability to profit. With regard to mathematics, teaching with an entrepreneurial character implies practical and theoretical education on how to start teaching which encourages students to participate in social context activities that allow them to have influence and responsibility for the learning process (Sarasvathy & Venkataraman, 2011).

The government is promoting an entrepreneurial attitude in lectures across study programs on the independent campus curriculum (Kampus Merdeka Curriculum). Entrepreneurial competence has almost the same competencies as mathematical competence, namely (1) creativity, (2) ability to take responsibility, (3) courage, (4) ability to take initiative, (5) tolerance for ambiguity, and (6) ability to collaborate (Hanna Palmér, 2018).

Researchers has limited the components of entrepreneurial character that can be applied to teaching mathematics, namely: (1) Creativity, is the ability to find patterns of thinking and alternatives when experiencing obstacles (Dal et al., 2016; Henriksen, Gretter, & Richardson, 2020; Sari & Afriansyah, 2022), (2) Ability to take responsibility, students have fully control of learning (Bernstein, et al., 2015; Rafique et al., 2021; Permatasari & Afriansyah, 2022). (3) Dare to take risks in taking action to achieve the desired goals (Sundari, 2015; Bradbury et al., 2019).

In fact, however, there are still many students who give up easily when dealing with complex math problems. Also, when facing up non-routine problems, there are still many students who are unable to do abstractions at the beginning of solving mathematical problems. Therefore, it is clear that the character of entrepreneurship and CT is very necessary in solving mathematical problems. From the background above, it lead us to conduct a qualitative research with the aim of analyzing the CT component in terms of the character of the entrepreneur in learning mathematics. Previous research has found the CT component, but it is different from this study which analyzes the CT of prospective teachers; therefore, this study has the novelty of the CT component seen from the character of the entrepreneur.

II. METODE

This study used a qualitative descriptive approach, a research procedure that generates data from verbal and non-verbal words from the behavior of the sample observed (Sukestiyarno, 2020). The

population of this study was 120 third-grade students, majoring in mathematics education, who would take pre-service teaching. 20 students were selected as the research sample. This study used a purposive sampling technique, in which sampling is taken with certain considerations (Creswell, 2009). Based on the results of a questionnaire on entrepreneurial attitudes in each group level, three students were then selected. The researcher then analyzed their CT activities in solving math problems. The selected sample has been considered in accordance with the theory (Santrock, 2011) that the age of 21 years is considered to have a strong responsibility because this is related to the character of an entrepreneur. In addition, researchers considered samples with good communicative skill in order to get information easily.

The data was collected from the results of the entrepreneur questionnaire, questions and observation sheets. Students' CT was analyzed through test data with problem solving questions. The instruments in this study had previously been validated by mathematics education experts, with repeated assessments and revisions according to the research component. The instruments validated were research questionnaires, problem solving questions, CT assessment sheets, and observation sheets. A good instrument has been validated by experts according to the indicators used in the study (Anna L, 2014). The final assessment is presented in Table 1.






Table 1.
Instrument Validation

	V1	V2	V3	Skor total
N Valid	4	4	4	4
Missing	0	0	0	0
Mean	4.54	4.19	4.34	4.34
Median	4.52	4.10	4.35	4.32
Std. Deviation	.249	.493	.096	.302
Variance	.062	.244	.009	.091

From the table presented, the total average score of validation component was 4.34, with very good criteria. Because the standard deviation obtained was 0.30, this indicated that the instrument was homogeneous. Thus, all instruments can be used for research.

The collected data were analyzed by coding each answer and gave description. Each component was given a coding list to correct the answers. After that, in-depth interviews and complete documentation was carried out. The following Table 2 presents coding of the CT components.

Table 2.
Coding of CT Components

No	Coding	CT Components
1.		Abstraction
2.		Algorithm
3.		Decomposition
4.		Creativity
5.		Debugging

III. HASIL DAN PEMBAHASAN

Entrepreneur questionnaire was firstly distributed to the respondents. From this questionnaire, it was found that the average score of respondents were categorized moderate. The research samples were selected by some consideration. The Table 3 below displays grouping results of entrepreneur characters.

Table 3.
Analysis of Entrepreneur Characters

Sex	High	Moderate	Low	Total
Man	1	12	-	13
Woman	2	4	1	7
Total	3	16	1	20

The researcher chose S1 for the first sample, S2 for the second sample, and S3 for the third sample. The samples were taken from each level group of entrepreneur characters.

CT data of prospective teachers were taken directly and observed. The data collected was then analyzed by triangulation technique. The subjects were given problem-solving question related to everyday life. The result of question was then analyzed. After that, the subjects were interviewed based on the interview guidelines made. The following was the mathematical problem given to the subject.

Mathematical Problem:

A housewife wants to have extra income to cover her household needs. She intends to sell pastries. However, she only has a large circular and square cake mold. To get a small size of pastries, she makes her own mold from a long wire. She then cuts the wire into 2 parts. The first part is curved to form a square, and the other part forms a circle. Determine the length of each part so that the sum of the areas of the squares and circles is as small as possible.

Figure 1. Math Question.

Based on Figure 1, the analysis was carried out by researchers by coding the CT components that appeared. In its completion, it is hoped that the subjects were able to think abstractly, for example by abstracting the problem into a mathematical sentence such as making an example of the remaining squares = x and radius of circle = y, the perimeter of squares

$K_1=4x$, perimeter $K_2=2\pi y$, from this example, it applies the relationship that $4x + 2\pi y = p$ (length of wire) or $x = \frac{(p-2\pi r)}{4}$, Furthermore, students were expected to sequence steps to get a solution by making an algorithmic flow and decomposition. Here is a step that can be used. The number of squares and circles is $L = x^2 + \pi y^2$ and if x is replaced with $L = \frac{(p-2\pi)^2}{16} + \pi y^2$ and $\frac{dL}{dy} = -\frac{(p\pi-2\pi^2y)}{4} + 2\pi y = 0$, Then it would be obtained critical point of $y = \frac{p}{(2\pi+8)}$ dan $x = \frac{2p}{(2\pi+8)}$. After performing the algorithm, the subjects were expected to be able to perform debugging in verifying the results, namely determining the length required to produce the smallest possible area,

$$K_1(\text{squares}) = 4x = \frac{8p}{(2\pi+8)} \text{ Meanwhile}$$

$$K_2(\text{circles}) = 2\pi y = \frac{8\pi p}{(2\pi+8)}$$

The following is the answer results of samples.

1. First Subject (S1)

The first subject graduated from Vocational School (SMK) and had the character of a moderate entrepreneur. Based on the answers of S1, he was able to perform abstraction into mathematical sentences, along with pictures. The Figure 2 shows how S1 solves problems by thinking computationally. The components that appeared included certain codes according to the definition of each component. It can be seen that S1 showed the CT abstraction component, algorithm, decomposition, and generalization. To confirm the answers analyzed, the researcher conducted in-depth interviews to ensure the work completed by S1.

R: "What do you understand about the math problem above?"

S1: "Since we are looking for the minimum area. The first thing you can do is to determine the length of the wire and cut it into 2 parts. After that, determine the circumference and area of the circle, as well as the squares. Use the sum of the two areas and substitute the values to get the minimum area."

From the answers presented, it could be seen that S1 used the CT component, but the process was not said to fully perfect. The following Figure 2 presents S1 answer in solving math problems.

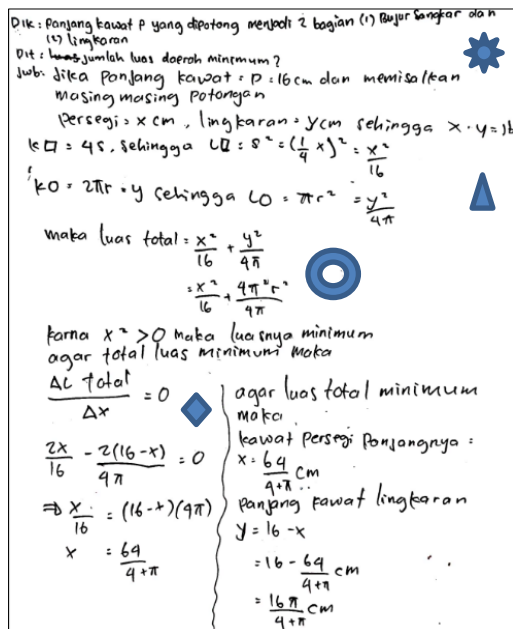


Figure 2. S1's Answers.

2. Second Subject (S2)

The second subject was Senior High School graduate (SMA). According to the result of entrepreneur questionnaire, this subject had a high entrepreneurial character. The following is the analysis of S2's CT answer sheet result as seen from Figure 3.

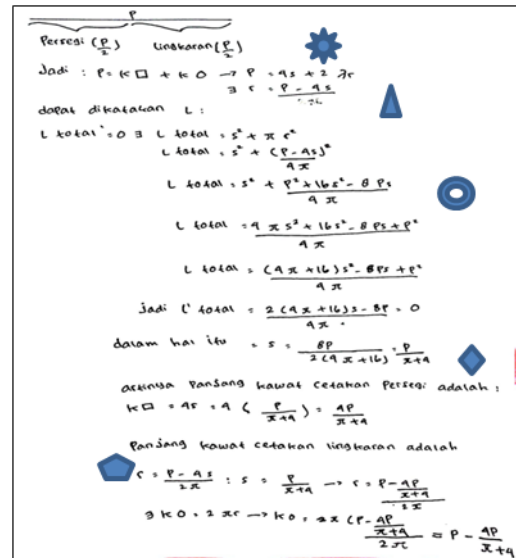


Figure 3. S2's Answers.

S2 answered the questions perfectly through certain coding. S2 brought up the CT component; abstract thinking by giving an example of the length of the wire divided to make squares and circles. S2 made problems easy by dividing problems into small problems. Then, S2 created the stages of completion well. To clarify his answers, the researcher confirmed through questions related to the CT questions given. Q: "What do you understand about the math problem above?"

S2: "For this problem, based on what I understand. The first thing to look for is the area of the square. I'm using the example, Mam. So, let say x is the first part and p is the length of the wire. The parts are formed squares and circles. Find the total area and derivative of the function of the total area. Then, continue to find the minimum function."

S2 had a strong character in solving problems. His logic also worked well. From the observation result, he seemed calm while answering the question. In a moment, he immediately looked wrinkled, meaning that he was working hard in solving the question. The result was all perfectly correct.

3. Third Subject (S3)

The next case study was taken from the sample with Islamic Senior High School graduate (*Madrasah Aliyah*). From the result of entrepreneurial character questionnaire, this subject had low entrepreneurial character. S3's CT thinking in solving the question would be discussed after this following Figure 4.

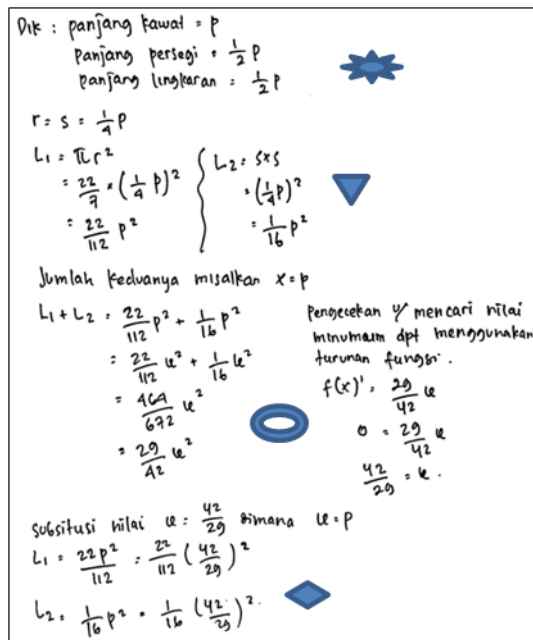


Figure 4. S3's Answers.

To confirm S3's answers, the researcher conducted in-depth interview.

Q: "What do you understand about the math problem above?"

A: "To cut a square mold, we first find the circumference of the square and the circle, because the wire is divided into 2 to obtain $S=1/4p$ and $r=1/4p$."

The thinking process performed by S3 was starting from abstraction, followed by decomposition ability. S3 compared the available wire lengths to 1 and 2. S3 started to make a flow of how to complete the solution. Then, the algorithm process occurred, proceeded to the debugging process by evaluating, correcting the final part, trying to find a solution. From the

process stated, it was not fully perfect. Yet, there was still a process of hard work carried out by S3, so the questions were asked again in-depth as follows.

Q: "From the questions you have read, what material is this?"

S3: "minimum function material, ma'am."

Q: "what did you do to start working on the problem?"

S3: "Starting with changing it first into a mathematical sentence, then solving the problem, but I'm sorry madam at that time I wasn't confident because of time, but I've tried my best."

From the results of interviews, researcher have figured out some thinking processes. He had processed several elements of Computational Thinking (CT), including abstraction, algorithms, generalization and debugging.

IV. CONCLUSION

Computational Thinking (CT) is a process of solving problems through several thinking processes (Pei et al., 2018; Weintrop et al., 2016). The thinking process involves an abstraction process of knowledge that is in line with Bloom's taxonomy theory, as part of cognitive knowledge (C. C. Selby, 2015).

According to Pressley (Dorling & Ng, 2014; Phillips & Woollard, 2016), The key to education is to help students learn a series of strategies that can produce solutions over the problems. Understanding the time and the place to use strategies often arises from observing activities carried out by students in their learning situations. At the CT process stage, the respondents in this study carried out a strategy through a logarithmic process.

The next process is decomposition, the process of understanding complex

problems is simplified into details. Respondents in this research case only reached the last stage in the debugging process; the process of evaluating using testing, tracing, and logical thinking skills to verify results (Angeli, et al., 2016). The CT that occurred in this study was in accordance with the components developed, namely abstraction, generalization, decomposition, algorithms (Aminah et al., 2020, 2022b).

All subjects performed computational thinking processes in solving mathematical problems. Despite the use of different components of CT, the components used perfectly occurred in the components of abstraction, algorithms, decomposition, creativity and debugging. Therefore, the novelty in this study recommends that creativity be included in the CT component.

ACKNOWLEDGMENT

The researcher would like to thank Universitas Swadaya Gunung Jati for providing both moral and material support to the completion of this research through National and International Cooperation Research grants.

DAFTAR PUSTAKA

- Afriansyah, E. A., Herman, T., Turmudi, T., Dahlan, J. A. (2020) Mendesain Soal Berbasis Masalah untuk Kemampuan Berfikir Kritis Matematika Calon Guru. *Mosharafa: Jurnal Pendidikan Matematika*, 9(2), 239-250.
- Afriansyah, E. A., & Turmudi, T. (2022). Prospective teachers' thinking through realistic mathematics education based emergent modeling in fractions. *Jurnal Elemen*, 8(2), 605-618.
- Aminah, N., & Wahyuni, I. (2019). The Ability of Pedagogic Content Knowledge (PCK) of Mathematics Teacher Candidate Based on Multiple Intelegent. *Journal of Physics: Convergence Series*. 1280, hal. 306-316. Indonesia: IOP.
- Aminah, N., Sukestiyarno, Y., Wardono, & Cahyono, A. N. (2020). Analysis of Technology Pedagogic Content Knowledge Ability for Junior High School Teacher. *International Conference on Agriculture, Social Sciences, Education, Technology and Health (ICASSETH)* (hal. 245-259). Cirebon: Atlantic Perss.
- Aminah, N., Sukestiyarno, Y., Wardono, & Cahyono, A. N. (2022a). A teaching Practice Design Based on a Computational Thinking for Prospective Math Teacher Using Ed-Tech Apps. *International Journal Interactive Mobile Technology*. 16(14) 43-62.
- Aminah, N., Sukestiyarno, Y., Wardono, & Cahyono, A. N. (2022b). Computational Thinking Process of Prospective Matjematics Teacher in Solving Diophantine Linear Equation Problem. *European Journal of Education Research*. 11(2) 1495-1507.
- Angeli, C., Voogt, J., Fluck, A., Webb, M., Cox, M., Malyn Smit, J., & Zagami, J. (2016). Computational Thingking Framework: Implication for Teacher Knowledge. *Educational Technology & Society*, 19(3), 47-57.
- Anna L , F. (2014). Quality Criteria And Indicators For Responsible Research

- And Innovation. *Journal Of Responsible Innovation*, 120-125.
- Bacconi, e. (2016). Developing Computational Thinking in Compulsory Education. *Italian Journal Of Educational Teachnology*, 39-55.
- Barr, V., & Stephenson, C. (2011). Bringing computational thinking to K-12: what is Involved and what is the role of the computer science education community? *Acm Inroads*, 2(1), 48-54.
- Benton , L., Hoyles , C., Kalas, I., & Noss, R. (2017). Bridging Primary Programming And Mathematics. *Digital Experiences In Mathematics Education*, 115-138.
- Bernstein, A., Hadash, Y., Lichtash, Y., Tanay, G., Shepherd, K., & Fresco, D. (2015). Decentering and Related Constructs: A Critical Review and Metacognitive Processes Model. *Perspectives on Psychological Science*, 599-617.
- Bradbury, H., Waddell, S., O'Brien, K., Apgar, M., Teehanke, B., & Fazey, I. (2019). A call to action research for transformations: The times demand it. *Action Research*, 17(1), 3-10.
- Cansu, S. K., & Cansu, F. K. (2019). An Overview of Computational Thingking. *International Journal of Computer Science Education in Schools*, 3(1), 1-11.
- Creswell, J. (2009). *Research Design 3rd Ed.* New York, 260.
- Curzon, P., Dorling, M., Ng, T., Selby, C., & Woollard, J. (2014, March 2). *Developing Computational Thingking in the Classroom: a framework*. . Diambil kembali dari Commons Attribution-Non Commercial license;:
- Dal , M., Elo, J., Leffler, E., Svedberg, G., & Westerberg, M. (2016). Research On Pedagogical Entrepreneurship. *Education Inquiry*, 159-182.
- Faiziyah, N., Hanan, N. A., & Azizah, N. N. (2022). Kemampuan Berpikir Kreatif Siswa dalam Menyelesaikan Soal berbasis Etnomatematika Tipe Multiple Solutions Task. *Mosharafa: Jurnal Pendidikan Matematika*, 11(3), 495-506.
- Fauzan, B. A., Kusnadi, D., & Sofyan, A. (2023). Changes in Students' Cognitive Abilities through STEM-Based Learning in Elementary Schools. *Mosharafa: Jurnal Pendidikan Matematika*, 12(1), 89-100.
- Fuber, S. (2012). *Shut down or restart? The way forward for computing in UK schools* (1 ed.). London: The Royal Society.
- Gadanidis , G., Clements, E., & Yiu, C. (2018). Group Theory Computational Thinking And Young Mathematicians . *Mathematical Thinking And Learning*, 32-53.
- Hemmendinger, D. (2010). A Plea for Modesty. *Acm Inroads*, 1(2), 4-7.
- Henriksen, D., Gretter, S., & Richardson, C. (2020). Design thinking and the practicing teacher: Addressing problems of practice in teacher education. *Teaching Education*, 31(2), 209-229.
- ISTE. (2011). *Operational definitions of computational thinking*. Dipetik Marc 01, 2020, dari
- ISTE. (2016). *Standars for Students*. Dipetik March 08, 2021, dari
- Kusumawardani, S. (2020). Merdeka Belajar, Kampus Merdeka, dan MOOCs. . Yogyakarta, Jawa, Jawa Tengah.

- Meilina, A., Mariana, N., & Rahmawati, I. (2023). Implementasi lkpd pmri dalam materi membilang sampai 20 untuk siswa fase a sekolah dasar. *Jurnal Inovasi Pembelajaran Matematika: PowerMathEdu*, 2(1), 45-54.
- Michael, D., Janne, E., Eva, L., Gudrun, S., & Mats, W. (2016). Research on pedagogical entrepreneurship – a literature review based on studies from Finland, Iceland and Sweden. *Education Inquiry*, 30-45.
- Palmér, M. J. (2018). Teaching for Entrepreneurial and Mathematical Competences: Teaching Stepping Out of Their Comfort Zone. *Spinger International Publishing*, 14-32.
- Permatasari, R. P. D., & Afriansyah, E. A. (2022). Kendala orang tua dalam mendampingi siswa ditinjau dari hasil belajar matematika secara online. *Jurnal Inovasi Pembelajaran Matematika: PowerMathEdu*, 1(1), 27-36.
- Pierre, B., J., H., T. (2017). Innovation As a Critique Of Technology Assesment. *Journal Of Responsible Innovation*, 240-250.
- Rafique, G. M., Mahmood, K., Warraich, N. F., & Rehman, S. U. (2021). Readiness for Online Learning during COVID-19 pandemic: A survey of Pakistani LIS students. *The Journal of Academic Librarianship*, 47(3), 102346.
- Rozi, F. A., & Afriansyah, E. A. (2022). Analisis kemampuan berpikir kreatif matematis berdasarkan disposisi matematis siswa. *Journal of Authentic Research on Mathematics Education (JARME)*, 4(2), 172-185.
- Santrock, J. (2011) *Life-span development*. Jakarta, Erlangga.
- Sarasvathy, S., & Venkataraman, S. (2011). Entrepreneurship as method: Open questions for an entrepreneurial future. *Entrepreneurship. Theory and Practice*, 113-135.
- Sari, R. F., & Afriansyah, E. A. (2022). Kemampuan berpikir kreatif matematis dan belief siswa pada materi persamaan dan pertidaksamaan linear. *Plusminus: Jurnal Pendidikan Matematika*, 2(2), 275-288.
- Sari, N. M., & Yulia, P. (2023). Kompetensi Kepribadian Guru Matematika di Madrasah Tsanawiyah. *Plusminus: Jurnal Pendidikan Matematika*, 3(1), 73-82.
- Sumartini, T. S. (2022). Pengaruh Habit of Mind terhadap Kemampuan Berpikir Kreatif Matematis melalui Metode Pembelajaran Improve. *Mosharafa: Jurnal Pendidikan Matematika*, 11(1), 167-178.
- Sundari. (2015). Pengaruh Kreativitas dan kecerdasan Spiritual terhadap Efikasi Diri dan Kemandirian Mahasiswa Jurusan Manajemen Fakultas Ekonomi Universitas Islam Majapahit Mojokerto. *Jurnal Ekonomi Pendidikan dan Kewirausahaan*, 64-76.
- Weintrop, D. (2016). Defining Computational Thinking for Mathematics and Science Classroom. *J Sci Educ Technol*, 127-147.
- Wing, J. (2008). Computational Thingking and Thingking about Computing. *Philosophical Transaction of the Royal Society of London A: Mathematical*,

physical and Engineering Science,
366(1881), 23-32.

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