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Does self-concept affect mathematics learning achievement?

Nia Kania[1,2], Dadang Juandi[2]
[1]Department Mathematics Education, Faculty of Teacher Training and Education, Universitas Majalengka, Majalengka, Indonesia
[2]Department of Mathematics Education, Faculty of Mathematics and Natural Sciences Education, Universitas Pendidikan Indonesia, Bandung, Indonesia

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ABSTRACT

Students who study at home certainly affect their self-concept. Their study found that knowledge of distance learning affects the perceived usefulness of this process. This study described self-concept has an influence on learning achievement in mathematics. The type of research used in this study was descriptive quantitative research to determine the relationship between students' self-concept and learning achievement in mathematics. This research was conducted in class VIII of State Junior High School (SMPN) 1 Palasah, Indonesia with 151 students as respondents. The self-concept data was obtained from a study questionnaire that had previously estimated its validity and reliability. This analysis is used to explain the data in the form of standard deviation, average, and low score. Self-concept is categorized into three categories (high, medium, and low). Self-concept is categorized into two kinds, namely positive self-concept, and negative self-concept. Categorization of self-concept can also be divided into three kinds. A high self-concept is also called a more positive self-concept, a moderate self-concept is also called a positive self-concept, and a low self-concept is also called a negative self-concept. Therefore, when students have a positive self-concept, it affects learning achievement positively as students needhaveaves to have a self-concept in learning mathematics.

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Corresponding Author:

Nia Kania
Department of Mathematics Education, Faculty of Mathematics and Natural Sciences Education
Universitas Pendidikan Indonesia
Dr. Setiabudi Street No. 229, Isola. Sukasari, Bandung, Indonesia
Email: niakania@upi.edu

1. INTRODUCTION

The COVID-19 pandemic is a situation affecting all sectors/areas [1], [2] including the education sector, economic sector, trade, industry, agriculture, and politics [3]. The COVID-19 pandemic is the biggest challenge and the education sector is one of the lines participating in the listing of physical distancing [4]–[7] COVID-19 and its constraints have compelled education stakeholders to move from face-to-face delivery to online delivery [8]–[10]. Because of this, the government is seriously considering developing a strategy between fighting COVID-19 and educating the country's children. Many institutions in the education sector, especially schools/universities, implement distance learning to ensure the safety of students.

Distance learning is very influential and has a huge impact on students. About 45 million students in Indonesia are affected by COVID-19, which is about 3% of the world's student population [11] doing online learning. Students' studying at home because of the pandemic [12] it is a process that not only uploads learning resources and makes them available to learners, but also provides them with autonomy, responsibility, flexibility, and choice [13]. Students are not familiar with this teaching method. The teachers who used to study at school gave the textbooks themselves, and now the students have to study on their own.

It is also difficult for teachers to plan for learning during this pandemic. How to deliver materials to students at home. Technology is also an effective way to deal with these situations. Therefore, teachers need to learn how to use technology when teaching classes. In particular, math teachers should use this technology to reduce or eliminate the abstract nature of math learning objects, making it easier for students to absorb or understand math lessons in school.

Students studying at home certainly affect students' self-concept. Research by Yildiz and Erdem [14] found in their study that knowledge about distance education influences the perception of benefits of this process. Students reported distance learning improved interaction and communication with teachface-to-faceed to facetoface classes [15]. Student self-concept is important [16], [17] determinant of well-being [18] learning math and science is one of the important issues [19]. During the pandemic, the majority of public elementary and junior high school children did not take math lessons for several months, except for self-study homework [20]. In any study students in the environment have to take responsibility for themselves, which can be considered important in the context of online and e-learning [21]. Because one of the factors that influence students' self-concept is the demands of the school. Schools want students to excel and have good grades, but students are not used to online learning. This affects students' self-concept. This seemingly endless pandemic can cause a mental burden on students. This mental burden is affecting student autonomy if he can not control it.

Although students' study at home, it is appropriate to take the opportunity to study mathematics seriously to achieve good and satisfactory results in their mathematics learning. Performance measures are essential to determining student achievement levels, diagnosing learning difficulties, and enabling students to achieve better outcomes. The total of 8 from 10 of online teacher answers related to teacher-student interactions: speak slowly, ask questions, monitor students during online lessons, and check emails regularly to help students understand lessons [22].

Self-assessment of students' academic ability is important for their efforts to adapt to their studies and responsibilities. This perception can affect the degree of student effort in school [23], [24]. In mathematics education and learning, students' perceptions of mathematics and their ability to learn independently have been found to have a significant impact on learning outcomes [25]. Researchers [26], [27] stated that cognitive factors have been found to affect school performance. Self-concept is useful for understanding the development of children's resilience, academic achievement, and social and emotional maturity. Based on this, self-concept and performance are interconnected. Unpleasant emotions hinder learning by not having a positive attitude and not maintaining interest in learning, making it difficult to develop motivation. One of the factors' affecting self-esteem is anxiety and low self-esteem, which can lower or worsen academic performance.

Measuring student performance during a pandemic is very difficult because you do not know exactly how students are doing. Are students really honest, or do they ask for help or find answers on the internet? This is a challenge for us. Therefore, knowing what the self-concept is is very important because it is a factor that affects the cognitive ability of students. Self-concept can be measured by giving a questionnaire to students. The results of this survey can reveal the self-concept of students. The results of the questionnaire were compared with the math scores in the form of a report card. This is to strengthen the relationship between students' self-concept and students' mathematics learning achievement.

2. RESEARCH METHOD

The type of research used in this research is descriptive quantitative research. It is intended to describe the relationship between students' self-concept and mathematics learning achievement. The empirical unraveling of the effects of self-concept and self-efficacy seems to be important for investigating the impact on mathematical performance, as the result is a clearer subject-specific relationship [28]. However, the results also showed that both student reference norms and teachers' perceived social reference norms are very important to the self-concept of mathematics for students in the highest grades. These two reference norms are significantly positively associated with mathematics. Self-concept at the class level [29].

This research was conducted in class VIII State Junior High School (SMPN) 1 Palasah, Indonesia as with 151 students as respondents. The sampling was done by purposive random sampling. Self-concept data were obtained from research questionnaires whose validity and reliability had been previously estimated. Before the instruments were made available to the general public, face-to-face validation was performed on specialists, specifically lecturers in mathematics education. This is to determine whether or not the instrument is appropriate for the research that is about to be done. This questionnaire was distributed using google form media because researchers could not go directly to the field related to social restrictions in schools. Meanwhile, research performance data were derived from the cost of transcripts during the online learning period. Based on theoretical research, the self-evaluation questionnaire consists of three aspects (a physical

aspect, a psychological aspect, and a social aspect), each of which is converted into several indicators. Then the indicators are formulated in the form of articles. The self-assessment questionnaire uses a Likert scale with four alternatives.

Research tools have been tested in VIII C class before taking research data. Self-reported data (X_1) was obtained from a 22-item questionnaire with four alternative responses. Where a score of 4 is the best possible and a score of 1 is the worst possible. The goal is to asses the accuracy and reliability of the device. The data of the instrument test result provides a valid and reliable device to provide students with research patterns. After receiving the results of the questionnaire and reporting card, the researcher analyzes data using the SPSS program.

This analysis is used to explain data in the form of perfect standard deviation, perfect average, perfect low score, perfect average, and perfect average, perfect standard deviation. Conceptual data of research myself. In addition to technical analysis, SPSS 25 for windows also analyzes the relationship/correlation with Pearson between self-concept and math learning achievement. This analysis is used in mathematics to determine how strong the relationship between a student's self-esteem and academic performance. Recommendations for evaluating whether a relationship is strong/dense are determined by the coefficient values shown in the Table 1.

Table 1. Correlation coefficient

No.	Coefficient interval	Relationship level
1.	≤0.199	Very weak
2.	0.20-0.399	Weak
3.	0.40-0.599	Medium
4.	0.60-0.799	Strong
5.	0.80-0.99	Very strong

3. RESULTS AND DISCUSSION

3.1. Results

Self-concept data (X_1) was obtained from questionnaire. A description of the self-assessment data can be found in the Table 2. The research hypothesis of this study is, there is a relationship between student self-esteem and mathematical performance. The results of the correlation analysis using the SPSS application are shown in the Table 3.

Tabel 2. Self-concept research data description

Mean	Median	Modus	Std. Deviasion	Score max	Score min
67	67	63	7.48	83	44

Table 3. Correlation analysis results

Variable	Sig. (2-tailed)	Pearson correlation
Self concept and achievement learn mathematics	0.000	0.489**

From the outcomes of the correlation evaluation above, the correlation coefficient among self-idea and arithmetic gaining knowledge of success is 0.489. Its method that the connection among self-idea (X_1) and arithmetic gaining knowledge of success (Y) has a slight correlation to electricity criteria. This is because the cost of 0.488 is withinside the correlation coefficient c programming language of 0.40-0.599 with slight correlation criteria. The cost of the correlation coefficient is superb, so the correlation or courting among self-idea and arithmetic gaining knowledge of success is unidirectional. Thus, it may be stated that there may be a superb courting among self-idea (X_1) and arithmetic gaining knowledge of success (Y), this means that the higher your self-idea, the higher your arithmetic knowledge of success.

The outcomes of studies on the connection among self-idea and arithmetic gaining knowledge of success confirmed a superb and massive courting. It may be visible from the correlation coefficient cost of 0.488 with a massive degree of $0.000<0.050$. This is in keeping with the studies performed with the aid of with the outcomes of the calculation of the correlation coefficient of 0.116 with $p<0.05$ and comparable studies outcomes have been additionally received with the aid of with a correlation coefficient cost of 0.489 with $p<0.05$. In different words, from the outcomes of the studies that have been done, it may be concluded that the extent of gaining knowledge of success in arithmetic is associated with the extent of self-idea of college students.

3.2. Discussion

Self-concept is a person's description, assessment, and expectancies concerning his or her first-class withinside the shape of skills and shortcomings each in phrases of physical, mental, and social. In gaining knowledge of arithmetic, college students with excessive self-standards or who tend to be superb could have excessive self-assurance of their capacity to clear up mathematical problems, even as college students with low self-standards or who tend to be terrible will appear greater pessimistic approximately their capacity to clear up mathematical problems. That could purpose college students to be lazy to observe the manner of gaining knowledge of arithmetic. Self-concept is a prerequisite for positively respecting and respecting others. It is known that people with high self-esteem actively recognize and respect others [30]. Self-concept is a construct about one's perceptions of self [31]. Self-idea is an inner thing that impacts arithmetic gaining knowledge of success, due to the fact those elements come from inside college students. Students with self-standards that tend to be superb could have higher achievements than college students with self-standards that tend to be terrible. The condition of distance learning due to the COVID-19 pandemic provides an extraordinary challenge to build students' self-concepts. Abstract mathematical characteristics become the next challenge in conveying concepts correctly. The teacher loses the opportunity to interact significantly with students' self-concepts that have been good or not.

Mathematics is the queen of science because the development of other sciences, especially in the field of natural sciences, is based on the development of mathematical concepts [32]. Mathematics is the main way to understand and develop logic [33], [34] which is a way of solving everyday problems. People often assume that children who cannot do math are considered and labeled as stupid children. This given nickname will enter and permeate the child and will affect the child's personality development. As a result, children are afraid to ask questions, express opinions, try to be creative and innovative, and the self-concept that is formed will be negative. Though questions can make students think critically. If we want our students to become critical thinkers we have to provide time for them to think about what it is we are teaching and then give them more time to formulate their questions [35]. If the self-concept that is formed is negative, the behavior that appears will tend to be negative and productivity will decrease. Onder *et al*. [36] describe fear as an emotion caused by something in reality.

Learning mathematics requires three kinds of abilities, namely procedural, conceptual, and utilization abilities [37], [38]. Procedural ability through a series of action sequences. A very basic skill that students must have when learning math is the ability to understand concepts [39]. Conceptual ability includes understanding the principles that underlie these sequences of actions. Utilization is knowing the right circumstances to take action. So, the three abilities include knowledge of how to solve a problem, why it is solved that way, and when that problem-solving method should be used.

Procedural, conceptual, and utilization skills are not a simple process because they involve the ability to use symbols, abstractions, hypotheses, and analysis. This has an impact; a child is not easily skilled and mastered mathematics. To gain knowledge and develop skills a child must practice a lot to improve abstract thinking skills. In practice, children often experience failures and mistakes, so they will be increasingly frustrated, consider themselves incapable, and will tend to avoid math lessons.

The creation of a healthy atmosphere provides positive reinforcement for the development of a healthy child's self-concept [40]. People with positive self-concept know themselves very well. Unlike a self-concept that is too rigid or too loose, a positive self-concept is stable and variable. This concept contains various 'personality boxes' so that people can store information about themselves, both positive and negative information. So, with a positive self-concept, a person can understand and accept several very varied facts about himself.

According to Murdiyatmoko and Handayani [40] the formation and strengthening of a positive self-concept towards self-efficacy in mathematics can be done by: i) Provide a challenge that is to provide a problem that is quite difficult but can certainly be done by students; ii) Encourage children to continuously try to solve math problems without being haunted by feelings of anxiety for making mistakes; iii) Respect and trust students and avoid responses that are destructive to self-esteem and laugh, make fun of, and criticize; iv) Provide warmth to students in the form of understanding, understanding, friendly attitude, high tolerance for students, and acceptance. Teacher warmth is closely related to achievement, vocabulary, and arithmetic; v) Provide lessons according to the level of cognitive development of children; and vi) Avoid various forms of punishment, both physical and verbal.

The development of a positive self-concept is pursued through encouraging students to make choices and managing their learning process, maintaining a warm and interpersonal learning environment, encouraging students to work hard, showing students their emotions and feelings, developing positive feelings for students with providing a pleasant learning experience, students are given experiences that develop positive habits and attitudes, teachers are sensitive to the needs of students and teachers themselves

can provide examples of positive attitudes [41], are sensitive to the feelings of others, are tolerant, trustworthy, and punctual.

4. CONCLUSION

The process of forming a self-concept takes a long time. Self-concept is formed through a learning process that takes place from an early age. The creation of a positive atmosphere is more effective in increasing the desired behavior and reducing the undesirable behavior. In other words, the creation of a positive atmosphere is considered as reinforcement to improve self-concept so that it is expected to improve learning achievement. There are two distinct categories of self-concept (a positive self-concept and a negative self-concept). Within each of these categories, there are three levels of self-esteem, they are high, medium, and poor. Higher self-concepts are also called more positive self-concepts, moderate self-concepts are also called positive self-concepts, and lower self-concepts are also called negative self-concepts. Therefore, when students have a positive self-concept, it will affect learning achievement positively as well. So, it is important for students to have a self-concept in learning mathematics. However, in research on student achievement, it can be seen from the results of previous report cards. So that researchers can take directly the value of mathematics to measure mathematics learning achievement.

REFERENCES

[1] J. M. R. Asio, E. Gadia, E. Abarintos, D. Paguio, and M. Balce, "Internet Connection and Learning Device Availability of College Students: Basis for Institutionalizing Flexible Learning in the New Normal," *Studies in Humanities and Education*, vol. 2, no. 1, pp. 56–69, 2021, doi: 10.48185/she.v2i1.224.

[2] S. Damrongpanit, "Effects of mindset, democratic parenting, teaching, and school environment on global citizenship of ninth-grade students," *European Journal of Educational Research*, vol. 11, no. 1, pp. 217–230, Jan. 2022, doi: 10.12973/eu-jer.11.1.217.

[3] M. Mustajab, H. Baharun, and Z. Fawa'iedah, "Adapting to Teaching and Learning During Covid-19: A Case of Islamic School's Initiative of Self-regulated Learning," *Nadwa: Jurnal Pendidikan Islam*, vol. 14, no. 2, pp. 241–264, 2020, doi: 10.21580/nw.2020.14.2.6515.

[4] I. Kadek Suartama *et al.*, "Development of E-learning oriented inquiry learning based on character education in multimedia course," *European Journal of Educational Research*, vol. 9, no. 4, pp. 1591–1603, 2020, doi: 10.12973/EU-JER.9.4.1591.

[5] A. D. Cobb, "Learning in Teams during a Pandemic," *Honors in Practice*, vol. 17, pp. 217–221, 2021.

[6] M. C. Maphalala, R. G. Mkhasibe, and D. W. Mncube, "Online Learning as a Catalyst for Self-directed Learning in Universities during the COVID-19 Pandemic," *Research in Social Sciences and Technology*, vol. 6, no. 2, pp. 233–248, 2021, doi: 10.46303/ressat.2021.25.

[7] T. W. Anggraini and A. Mahmudi, "Exploring the students' adversity quotient in online mathematics learning during the Covid-19 pandemic," *Journal of Research and Advances in Mathematics Education (JRAMathEdu)*, vol. 6, no. 3, pp. 221–238, 2021, doi: 10.23917/jramathedu.v6i3.13617.

[8] A. Khirwadkar, S. Ibrahim Khan, J. Mgombelo, S. Ratkovic, and W. Forbes, "Reimagining Mathematics Education During the COVID-19 Pandemic," *Brock Education Journal*, vol. 29, no. 2, p. 42, 2020, doi: 10.26522/brocked.v29i2.839.

[9] P. Pujiastuti, H. Herwin, and F. M. Firdaus, "Thematic learning during the pandemic: CIPP evaluation study," *Cypriot Journal of Educational Sciences*, vol. 16, no. 6, pp. 2970–3980, Dec. 2021, doi: 10.18844/cjes.v16i6.6481.

[10] O. Kilincer, "An Investigation of Pre-service Music Teachers' Attitudes towards Online Learning during the COVID-19 Pandemic," *International Journal of Technology in Education and Science*, vol. 5, no. 4, pp. 587–600, Sep. 2021, doi: 10.46328/ijtes.304.

[11] B. Batmang, M. Sultan, A. Azis, and F. Gunawan, "Perceptions of Pre-Service Teachers on Online Learning during the COVID-19 Pandemic," *International Journal of Education in Mathematics, Science and Technology*, vol. 9, no. 3, pp. 449–461, Apr. 2021, doi: 10.46328/ijemst.1595.

[12] Q. Kong, "Practical Exploration of Home Study Guidance for Students during the COVID-19 Pandemic: A Case Study of Hangzhou Liuxia Elementary School in Zhejiang Province, China," *Science Insights Education Frontiers*, vol. 5, no. 2, pp. 557–561, Mar. 2020, doi: 10.15354/sief.20.rp026.

[13] M. Sumer, T. Douglas, and K. N. Sim, "Academic development through a pandemic crisis: Lessons learnt from three cases incorporating technical, pedagogical and social support," *Journal of University Teaching and Learning Practice*, vol. 18, no. 5, pp. 2–16, Dec. 2021, doi: 10.53761/1.18.5.1.

[14] M. Yildiz and M. Erdem, "An Investigation on Instructors' Knowledge, Belief and Practices towards Distance Education," *Malaysian Online Journal of Educational Technology*, vol. 6, no. 2, pp. 1–20, Apr. 2018, doi: 10.17220/mojet.2018.02.001.

[15] A. Weldon, A. Weldon, and W. W. K. Ma, "Online learning during a global pandemic: Perceived benefits and issues in higher education," *Knowledge Management & E-Learning: An International Journal*, pp. 161–181, 2021, doi: 10.34105/j.kmel.2021.13.009.

[16] K. Vasalampi, E. Pakarinen, M. Torppa, J. Viljaranta, M. K. Lerkkanen, and A. M. Poikkeus, "Classroom effect on primary school students' self-concept in literacy and mathematics," *European Journal of Psychology of Education*, vol. 35, no. 3, pp. 625–646, 2020, doi: 10.1007/s10212-019-00439-3.

[17] J. Palacios-Garay and J. Coveñas-Lalupú, "Predominance of Self-Concept in Students with Antisocial Behavior of Callao," *Journal of Educational Psychology - Propositos y Representaciones*, vol. 7, no. 2, pp. 339–352, 2019.

[18] L. Kavanagh, "Academic self-concept formation: testing the internal/external frame of reference model, big-fish-little-pond model, and an integrated model at the end of primary school," *European Journal of Psychology of Education*, vol. 35, no. 1, pp. 93–109, Mar. 2020, doi: 10.1007/s10212-019-00416-w.

[19] P.-Y. Liou, "Investigation of the big-fish-little-pond effect on students' self-concept of learning mathematics and science in Taiwan: results from TIMSS 2011," *The Asia-Pacific Education Researcher*, vol. 23, no. 3, pp. 769–778, Sep. 2014, doi: 10.1007/s40299-013-0152-3.

[20] Y. Uegatani, N. Nakawa, and M. Kosaka, "Changes to Tenth-Grade Japanese Students' Identities in Mathematics Learning During the COVID-19 Pandemic," *International Electronic Journal of Mathematics Education*, vol. 16, no. 2, p. em0638, 2021, doi: 10.29333/iejme/10905.
[21] M. Bulić and Vesna Kostović-Vranješ, "The impact of e-learning on student selfresponsibility in doing their homework," *RASPRAVE I ČLANCI*, vol. 68, no. 1, pp. 127–140, 2019, [Online]. Available: https://hrcak.srce.hr/file/335247
[22] M. Kang and A. Duong, "Student Perceptions of First-time Online Learning During the COVID-19 Pandemic in Vietnam," *Ie: Inquiry in Education*, vol. 13, no. 1, pp. 1–17, 2021.
[23] E. Peteros, A. Gamboa, J. O. Etcuban, A. Dinauanao, R. Sitoy, and R. Arcadio, "Factors Affecting Mathematics Performance of Junior High School Students," *International Electronic Journal of Mathematics Education*, vol. 15, no. 1, pp. 1–13, 2019, doi: 10.29333/iejme/5938.
[24] N. Ratnawulan and N. Kania, "Implementation of Cooperative Learning Model Numbered Head Together (Nht) Type To Improve Learning Activities," *The Original Research of Mathematics (THEOREMS)*, vol. 4, no. 2, pp. 161–168, 2020.
[25] K. Alotaibi and S. Alanazi, "The influences of conceptions of mathematics and self-directed learning skills on university students' achievement in mathematics," *European Journal of Education*, vol. 56, no. 1, pp. 117–132, Mar. 2021, doi: 10.1111/ejed.12428.
[26] M. M. Abu-Hilal, F. A. Abdelfattah, S. A. Alshumrani, A. S. Abduljabbar, and H. W. Marsh, "Construct validity of self-concept in TIMSS's student background questionnaire: A test of separation and conflation of cognitive and affective dimensions of self-concept among Saudi eighth graders," *European Journal of Psychology of Education*, vol. 28, no. 4, pp. 1201–1220, 2013, doi: 10.1007/s10212-012-0162-1.
[27] A. K. Arens, A. S. Yeung, R. G. Craven, and M. Hasselhorn, "The Twofold Multidimensionality of Academic Self-Concept: Domain Specificity and Separation Between Competence and Affect Components," *Journal of Educational Psychology*, vol. 103, no. 4, pp. 970–981, 2011, doi: 10.1037/a0025047.
[28] R. A. Burns, D. A. Crisp, and R. B. Burns, "Re-examining the reciprocal effects model of self-concept, self-efficacy, and academic achievement in a comparison of the Cross-Lagged Panel and Random-Intercept Cross-Lagged Panel frameworks," *British Journal of Educational Psychology*, vol. 90, no. 1, pp. 77–91, 2020, doi: 10.1111/bjep.12265.
[29] A. Lohbeck and P. A. Freund, "Students' own and perceived teacher reference norms: how are they interrelated and linked to academic self-concept?," *Educational Psychology*, vol. 41, no. 5, pp. 640–657, 2021, doi: 10.1080/01443410.2020.1746239.
[30] C. Eun-Ju and L. Kyung-Hwa, "Analysis of longitudinal relationship among elementary and middle school students' multicultural acceptance, self-concept, and community consciousness using the latent growth model," *International Electronic Journal of Elementary Education*, vol. 13, no. 4, pp. 565–575, 2020, doi: 10.26822/iejee.2021.212.
[31] E. L. Low, P. T. Ng, C. Hui, and L. Cai, "How do teacher affective and cognitive self-concepts predict their willingness to teach challenging students?," *Australian Journal of Teacher Education*, vol. 44, no. 10, pp. 18–34, 2019, doi: 10.14221/ajte.2019v44n10.2.
[32] L. Ndia, E. Solihatin, and Z. Syahrial, "The effect of learning models and multiple intelligences on mathematics achievement," *International Journal of Instruction*, vol. 13, no. 2, pp. 285–302, 2020, doi: 10.29333/iji.2020.13220a.
[33] K. Ahn, "A teaching model for undergraduate students," *International Journal of Higher Education*, vol. 8, no. 3, pp. 29–35, 2019, doi: 10.5430/ijhe.v8n3p29.
[34] M. Aristidou, "Is mathematical logic really necessary in teaching mathematical proofs?," *Athens Journal of Education*, vol. 7, no. 1, pp. 99–122, 2020, doi: 10.30958/aje.7-1-5.
[35] K. Soiferman, "The Art of Asking Questions: What Lessons We Can Teach Our Students," Winnipeg, 2019. [Online]. Available: https://files.eric.ed.gov/fulltext/ED594309.pdf
[36] A. Onder, G. I. Kusmus, and O. Cengiz, "Investigating childhood fears during preschool period in terms of child, mother and teacher opinions," *European Journal of Educational Research*, vol. 7, no. 4, pp. 973–983, 2018, doi: 10.12973/eu-jer.7.4.973.
[37] D. Yanti and S. Haji, "A study of the concepts of geometry transformation in Bengkulu Besurek fabric (in Indonesian)," *Jurnal Nasional Pendidikan Matematika (JNPM)*, vol. 3, no. 2, pp. 265–280, 2019.
[38] N. Kania, I. Nurhikmayati, and V. Suciawati, "Pre-service mathematics teachers' experiences of teaching practice in function composition," *Journal of Physics: Conference Series*, vol. 1613, no. 1, pp. 1–7, Aug. 2020, doi: 10.1088/1742-6596/1613/1/012013.
[39] Nurjanah, J. A. Dahlan, and Y. Wibisono, "The Effect of Hands-On and Computer-Based Learning Activities on Conceptual Understanding and Mathematical Reasoning," *International Journal of Instruction*, vol. 14, no. 1, pp. 143–160, 2020, doi: 10.29333/IJI.2021.1419A.
[40] J. Murdiyatmoko and C. Handayani, *Sociology 1 (in Indonesian)*. Jakarta: Grafindo Media, 2004.
[41] E. Ibanez and J. T. Pentang, "Socio-Constructivist Learning and Teacher Education Students' Conceptual Understanding and Attitude toward Fractions," *Indonesian Research Journal in Education (IRJE)*, vol. 5, no. 1, pp. 23–44, 2021, doi: 10.22437/irje.v5i1.12187.

BIOGRAPHIES OF AUTHORS

Nia Kania is a lecturer in Mathematics Education at Majalengka University. She has researched extensively and has published extensively in the field of mathematics education. She has held an administrative position as head of the study program for two terms between 2014-2022. She is currently pursuing a doctoral education at the Indonesian Education University. She can be contacted at email: niakania@unma.ac.id.

Dadang Juandi is lecturer in the Department of Mathematics Education, Faculty of Teacher Training and Education, Universitas Pendidikan Indonesia. He currently serves as the head of the department. He has published many statistics related to education. He can be contacted at email: dadang.juandi@upi.edu.