

## Mobile games and learning interest: for fifth graders in mathematics

Iva Sarifah<sup>1</sup>, Ahmad Muhajir<sup>1</sup>, Arita Marini<sup>1</sup>, Gusti Yarmi<sup>1</sup>, Desy Safitri<sup>2</sup>, Leola Dewiyani<sup>3</sup>

<sup>1</sup>Department of Elementary School Teacher Education, Faculty of Education, Universitas Negeri Jakarta, Jakarta, Indonesia

<sup>2</sup>Department of Social Science Education, Faculty of Social Science, Universitas Negeri Jakarta, Jakarta, Indonesia

<sup>3</sup>Department of Industrial Engineering, Faculty of Engineering, Universitas Muhammadiyah Jakarta, Jakarta, Indonesia

### Article Info

#### Article history:

Received Jul 17, 2023

Revised Feb 25, 2024

Accepted Mar 27, 2024

#### Keywords:

Fifth graders

Learning interest

Mathematics

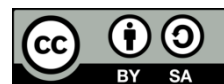
Mobile games

QuizWhizzer application

### ABSTRACT

This study aims to develop a mobile game using the QuizWhizzer application to improve fifth graders' learning interest in mathematics at Kalibata 04 Elementary School, South Jakarta, Indonesia. The contribution of this study is to enhance the interest in mathematics learning for students in all elementary schools in South Jakarta, Indonesia. This research used the analysis, design, development, implementation, and evaluation (ADDIE) model to develop the product as a systematic approach to instructional development. The experimental design, which helps collect data needed for better decision-making, was utilized for the effectiveness test for fifth graders at Kalibata 04 Elementary School, Jakarta, Indonesia. The results showed that sig (2-tailed) reached 0.000, less than 0.05, meaning there was a significant difference between schooling results in the pretest and posttest data. The N-gain score obtained in this study was 0.49, so the media developed in this research is compelling enough to increase learning interest in mathematics for fifth grade elementary school students.

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



### Corresponding Author:

Arita Marini

Department of Elementary School Teacher Education, Faculty of Education, Universitas Negeri Jakarta

Rawamangun Street No. 1, East Jakarta, Jakarta, Indonesia

Email: aritamarini@unj.ac.id

## 1. INTRODUCTION

Education is crucial for human life because, through education, humans can become good individuals and get happiness and a sense of security. At this time, technology has developed rapidly, even in some developed countries that have utilized technological developments to support the success of student learning in the classroom. However, there are still many schools in Indonesia that do not take advantage of technological advances to support the success of student learning.

The use of video games to enlarge decisiveness-building skills and improve thinking abilities, but this study, did not aim to increase students' interest in learning mathematics [1]. Games have also been researched to improve students' motivation for involvement in learning [2]. Games have been used to make learning fun, but more is needed to increase students' interest in learning [3]. Some teachers can also trust the use of video games to improve the learning process in students because usually, students will be more interested in learning with the help of media they often encounter [4]. Games are combined with stories, which later aim to improve students' computing skills [5]. From various kinds of research that relate the use of games to multiple aspects, no one has related the use of fun to the learning interest of elementary school students, especially fifth grade, in learning mathematics.

Therefore, the researcher aims to examine the use of games to increase the learning interest of fifth grade elementary school students in learning mathematics; according to the researcher, this is important to do

because students' interest in learning mathematics is lacking, so games might be a single of the media that strengthen students' attentiveness in learning elementary school mathematics.

Therefore, this study used mobile-based games to increase fifth grade students' interest in mathematics. The researcher focused on the central question in this study, namely: "Can the use of mobile-based media games increase the learning interest of fifth grade students in learning mathematics?" This research is an attempt to answer the questions as follows: i) how do we develop mobile-based games to increase fifth grade students' interest in learning math? and ii) is there a change in learning mathematics for fifth grade elementary school students after applying mobile-based games to their learning? This study uses mobile-based games to examine the development of the learning interest of grade five elementary school students in learning mathematics. Furthermore, the researcher will describe the benefits experienced after using mobile-based games in elementary school math learning.

Several recent studies [6]–[12] found that game-based learning uses games as a medium to help students achieve these learning goals. Previous research shows that game-based learning helps students increase learning motivation, interest, and achievement inside and outside school. Generally, game-based learning is carried out by teachers with a competitive model in the game so that students' learning motivation will increase because there is competition in the learning [13]. Games for difficult and unpleasant learning, such as mathematics, help students during the learning process [14]. Safitri *et al.* [15] confirmed that with games, students could more easily grasp what is being taught, and learning is more fun than usual.

For some people, studying a subject may be an uninteresting and tedious activity, primarily when the subject being studied is a subject that is difficult to understand [16]. Interest in learning is one of the factors that can help students learn a subject well and achieve their learning goals because, with a high interest in education, students also have curiosity and high enthusiasm when learning a subject. The teacher must create a comfortable learning environment and be liked by students [17]. One way to create a relaxed and enjoyable learning environment is to utilize existing learning media [18].

## **2. METHOD**

### **2.1. Research design**

This study used an experimental design where initially, elementary school students are given a pretest to see how far their interest in learning mathematics is. After that, the students are provided learning with mobile-based media games to see how far their interest is and whether their appeal has increased after being given the media. Finally, the students are given a posttest to measure how effective the media the researcher has provided is on students' learning interests.

### **2.2. Population and sample**

The target population of this research is all elementary school students in the Pancoran District in South Jakarta, Indonesia. Meanwhile, the affordable population is 23 students. This study took a random sample from a population involving 23 students in grade 5B at Kalibata 4 Elementary School in Jakarta, Indonesia.

### **2.3. Research instruments**

The instrument used in this study was a pretest related to students' learning interests, which involved students' tendencies when learning, persistence, and student learning outcomes. After that, students are given media containing mobile-based games; the press serves to increase students' interest in learning mathematics. After the existence of the media, students were given a questionnaire that functioned to assess how much the effectiveness of the media used was to increase students' learning interest in learning mathematics. Then, after the students evaluated the media provided by the researcher, the students were given a posttest, which aimed to allow the researcher to see how effective the media was in increasing students' interest in learning mathematics.

### **2.4. Data analysis**

The Kolmogorov-Smirnov test was undertaken to test the normality of the data distribution. Then, Levene's test is used for data homogeneity. This study uses inferential statistics to test the hypothesis by applying the t-test. The hypothesis decision was made based on criteria with a significance level of 0.05. The null hypothesis is rejected if the statistical test is more extreme than the critical value. Conversely, the null hypothesis is only accepted if the test is less intense.

### 3. RESULTS AND DISCUSSION

#### 3.1. Analysis of students' interest in learning mathematics

The first stage with the analysis, design, development, implementation, and evaluation (ADDIE) model was carried out so that researchers could determine what was needed to increase students' interest in learning in grade 5 Kalibata 04 Elementary School. The researcher interviewed the homeroom teacher for class 5B to learn about this. The results of interviews with the homeroom teacher showed that grade 5 students' interest in learning mathematics was quite good. This is because the teacher creates a pleasant learning atmosphere so that students are pretty comfortable learning mathematics with the teacher.

The QuizWhizzer application has templates that make it easier for teachers to determine these elements. At this stage, the researcher also considers the media to be used; the media's provisions are easy to access, there are no obstacles such as bugs or errors, and they are manageable for the electronic device (mobile) used. This planning is also carried out to avoid difficulties for teachers, students, and parents in using the gamification media that will be used. From this plan, the gamification media is considered.

#### 3.2. Mobile-based game design (QuizWhizzer)

Based on the above analysis, the researcher proceeded to the second stage of the ADDIE model, namely design. At this stage, the researcher plans to develop and test mobile-based games (QuizWhizzer) for preparation carried out by researchers, namely determining the material to be set according to the needs of grade 5 students at Kalibata 04 Elementary School. For the material, the researcher chose the measurement of time and angles because the teacher taught the material in the previous semester so that students could understand the material's content in the learning media.

Next, researchers look for more detailed theories regarding learning media through gamification. Then, determine the various elements, structure, audio, images, and typography appropriate for the class and subject; the good news is that the QuizWhizzer application has templates that make it easier for teachers to determine these elements. At this stage, the researcher also considers the media to be used; its provisions are easy to access, there are no obstacles such as bugs or errors, and they are not burdensome for the electronic device (mobile). This planning is also carried out to avoid difficulties for teachers, students, and parents in using the gamification media that will be used. From this plan, the gamification media is considered.

#### 3.3. Development of mobile-based games to increase student learning interest

Increasing interest in learning with mobile-based games designed using the QuizWhizzes application, which can be accessed anywhere. QuizWhizzer is an interactive game designed to enhance the teaching and learning experience in the classroom where the user makes a quiz with a race game model or Snakes and Ladders. In this interactive game, there are question numbers on the game board; each time the user answers one question correctly, the user's position will move to the following number, and if the answer is wrong, the user will remain in place. In this mobile-based game, ten questions contain material; when students want to access the game, the teacher will provide an access code so students can join and play the game.

#### 3.4. Implementation of mobile-based games to increase student learning interest in learning mathematics

The effectiveness test of mobile-based games in 2023 at Kalibata 04 Elementary School was conducted to enhance the students' learning interest in mathematics. This implementation used a pretest given before the treatment and a posttest after the treatment of applying mobile-based games in mathematics learning. The first step to test the effectiveness of the media used is to do a paired sample t-test, as shown in Tables 1-3. Table 1 shows that the pretest has a mean of 75.7130 from 23 data and a standard deviation of 9.6667 with a standard error mean of 2.0156. The posttest has a mean of 87.9348 from 23 data and a standard deviation of 4.3073 with a standard error mean of 0.8981. Table 2 shows that the correlation value between the two variables in paired samples, pretest, and posttest, arrives at 0.838 with sig (2-tailed) achieving 0.000. Table 3 indicates that based on the output of the independent sample t-test, sig (2-tailed) achieves  $0.000 < 0.05$ , showing that  $H_0$  is rejected, meaning that there is a difference between learning interest in the pretest and post-test data. This method assesses how significant changes in students' pretest scores are with students' posttest scores.

Table 1. Paired samples statistics

Pair 1	Mean	N	Std. deviation	Std. error mean
Pretest	75.7130	23	9.66669	2.01564
Posttest	87.9348	23	4.30725	0.89812

Table 2. Paired samples correlation

Pair 1	N	Correlation	Sig.
Pretest and posttest	23	0.838	0.000

Table 3. Independent samples test

Pair 1	Mean	Std. deviation	Std. error mean	95% confidence interval of the difference		t	df	Sig. (2-tailed)
				Lower	Upper			
Pretest-posttest	-1.22217	6.49545	1.35439	-15.03058	-9.41290	-9.024	22	0.000

### 3.5. Evaluation of mobile-based games to increase student learning interest in learning mathematics

Based on the assessment of the work accomplished at Kalibata 04 Elementary School, mobile-based games can be used to upgrade the learning interest of grade 5B students at Kalibata 04 Elementary School is good enough so that these students can maximize their ability to learn. Another study found that game-based education should be developed with suitable mobile technology to improve learning effectiveness [19]. The design of educational gamification should depend on the student's age group as users, and the teacher should give feedback directly. Implementing mobile-based gamification can positively influence the students' psychological well-being to a higher level [20]. These behavioral factors include the student's autonomy, flexibility, optimism, social relationships, perseverance to achieve goals, and self-realization. Mobile-based learning can also support the students' academic achievement [21]. The student's cognitive style simplicity can be upgraded, leading to learning effectiveness experienced.

Similar to the study, educational game learning media can raise students' learning outcomes [22], [23]. This media can encourage the students to learn and work together with others. It can assist the students in acquiring their accomplishments in material assimilation. It can also stimulate the students to study creatively and work autonomously. This gamified learning method can make the students vastly energetic and competitive. This is in line with the study that found that the application of game media in the teaching-learning process can boost the students' curiosity about the teaching material delivered [24]. This media can lessen the concept of abstraction so that it will be helpful for students to comprehend the material constructively. Game-based learning can also strengthen students' retention potential towards learning.

Implementation of game-based learning can promote the students' creative thinking skills [25], [26]. Classroom management using gamification can effectively influence a higher level of student engagement in education and raise their higher-order thinking skills. It can stimulate students' divergent thinking, and it leads to increasing student innovativeness. Gamification can also develop students' positive emotional feelings, allowing them to be involved in learning meaningfully. Further, the students can have opportunities to get constructive consciousness to perceive productive thinking in the teaching and learning process.

Game-based learning stimulates elementary school students' motivation [7], [9], [27]–[30]. Educational games can assist elementary school students in learning science-related concepts by increasing students' engagement in the teaching-learning process so that it can improve students' learning achievement. A game-based approach facilitates the students' learning more efficiently and provides entertaining learning practice. Game-based learning programs can integrate formative assessment into teaching-learning without disturbing the class. Further, the students confirmed higher positive attitudes towards learning the subjects they were taught.

## 4. CONCLUSION

Mobile-based games can increase fifth grade elementary school students' learning interest in mathematics. This research implies that elementary school teachers can apply mobile-based game-learning media in mathematics courses so that elementary school students show a higher positive attitude toward the subjects. This research has explored a comprehensive investigation related to the improvement of learning interest with mobile-based games in mathematics learning. However, further and in-depth studies may be needed to confirm the continued learning intention of the students, especially regarding all psychological dimensions. However, the limitation of this research is that this research only covers South Jakarta, a part of one province in Indonesia. It is recommended that further research be applied for a wider area surrounding more locations in other provinces in Indonesia to represent the fifth graders' needs in Indonesia.

## ACKNOWLEDGEMENTS




The author thanks the Postgraduate of Universitas Negeri Jakarta in Indonesia for supporting this research with research schemes of institutional assignments with the Grant ID of 11/ UN39.5/PEN/PS-UNJ/III/2023.

## REFERENCES




- [1] C. Reynaldo, R. Christian, H. Hosea, and A. A. S. Gunawan, "Using video games to improve decision making and cognitive skill capabilities: A literature review," *Procedia Computer Science*, vol. 179, pp. 211–221, 2021, doi: 10.1016/j.procs.2020.12.027.
- [2] I. Aldalur and A. Perez, "Gamification and discovery learning: motivating and involving students in the learning process," *Heliyon*, vol. 9, no. 1, 2023, doi: 10.1016/j.heliyon.2023.e13135.
- [3] R. Wibawa, A. Lokacarya, F. Kurniawan, and Y. Udjaja, "Japanese language learning game 'Miryoku' using android-based speech recognizer API," *Procedia Computer Science*, vol. 216, pp. 547–556, 2022, doi: 10.1016/j.procs.2022.12.168.
- [4] J. I. Pozo, B. Cabellos, and D. L. Sánchez, "Do teachers believe that video games can improve learning?," *Heliyon*, vol. 8, no. 6, 2022, doi: 10.1016/j.heliyon.2022.e09798.
- [5] I. Vourletsis and P. Politis, "Exploring the effect of remixing stories and games on the development of students' computational thinking," *Computers and Education Open*, vol. 3, 2022, doi: 10.1016/j.caeo.2021.100069.
- [6] P. Juric, M. B. Bakaric, and M. Matetic, "Implementing m-learning system for learning mathematics through computer games and applying neural networks for content similarity analysis of an integrated social network," *International Journal of Interactive Mobile Technologies*, vol. 15, no. 13, pp. 145–164, 2021, doi: 10.3991/ijim.v15i13.22185.
- [7] M. Videnovik, A. M. Bogdanova, and V. Trajkovik, "Game-based learning approach in computer science in primary education: a systematic review," *Entertainment Computing*, vol. 48, 2024, doi: 10.1016/j.entcom.2023.100616.
- [8] L. Sun, M. Kangas, H. Ruokamo, and S. Siklander, "A systematic literature review of teacher scaffolding in game-based learning in primary education," *Educational Research Review*, vol. 40, 2023, doi: 10.1016/j.edurev.2023.100546.
- [9] Y. Zheng *et al.*, "Effects of digital game-based learning on students' digital etiquette literacy, learning motivations, and engagement," *Heliyon*, vol. 10, no. 1, 2024, doi: 10.1016/j.heliyon.2023.e23490.
- [10] M. Chowdhury *et al.*, "Digital game-based language learning for vocabulary development," *Computers and Education Open*, vol. 6, p. 100160, 2024, doi: 10.1016/j.caeo.2024.100160.
- [11] T. Saastamoinen, M. Elomaa-Krapu, M. Härkänen, A. Näslindh-Ylispangar, and K. Vehviläinen-Julkunen, "Students' experiences of a computer-based simulation game as a learning method for medication process: a qualitative study," *Teaching and Learning in Nursing*, 2024, doi: 10.1016/j.teln.2024.01.009.
- [12] R. Zhang, D. Zou, and G. Cheng, "Learner engagement in digital game-based vocabulary learning and its effects on EFL vocabulary development," *System*, vol. 119, 2023, doi: 10.1016/j.system.2023.103173.
- [13] Z. Zhan, L. He, Y. Tong, X. Liang, S. Guo, and X. Lan, "The effectiveness of gamification in programming education: Evidence from a meta-analysis," *Computers and Education: Artificial Intelligence*, vol. 3, 2022, doi: 10.1016/j.caeai.2022.100096.
- [14] W. Widayarsi, H. Sutopo, and M. Agustian, "QR code-based learning development: accessing math game for children learning enhancement," *International Journal of Interactive Mobile Technologies*, vol. 13, no. 11, pp. 111–124, 2019, doi: 10.3991/ijim.v13i11.10976.
- [15] D. Safitri *et al.*, "Improvement of student learning motivation through word-wall-based digital game media," *International Journal of Interactive Mobile Technologies*, vol. 16, no. 6, pp. 188–205, 2022, doi: 10.3991/ijim.v16i06.25729.
- [16] H. Pranoto and F. M. Panggabean, "Increase the interest in learning by implementing augmented reality: case studies studying rail transportation," *Procedia Computer Science*, vol. 157, pp. 506–513, 2019, doi: 10.1016/j.procs.2019.09.007.
- [17] H. T. T. Nguyen, "Boosting motivation to help students to overcome online learning barriers in COVID-19 pandemic: a case study," *International Journal of Interactive Mobile Technologies*, vol. 15, no. 10, pp. 4–20, 2021, doi: 10.3991/ijim.v15i10.20319.
- [18] C. H. Lai, B. S. Jong, Y. T. Hsia, and T. W. Lin, "Using reminder tools to increase learning motivation: a comparison of mobile devices, email and e-learning platforms," *International Journal of Interactive Mobile Technologies*, vol. 14, no. 19, pp. 82–96, 2020, doi: 10.3991/ijim.v14i19.12519.
- [19] Y. Li, Z. Xu, Y. Hao, P. Xiao, and J. Liu, "Psychosocial impacts of mobile game on k12 students and trend exploration for future educational mobile games," *Frontiers in Education*, vol. 7, 2022, doi: 10.3389/educ.2022.843090.
- [20] W. S. Alhalafawy and M. Z. T. Zaki, "The effect of mobile digital content applications based on gamification in the development of psychological well-being," *International Journal of Interactive Mobile Technologies*, vol. 13, no. 8, pp. 107–123, 2019, doi: 10.3991/ijim.v13i08.10725.
- [21] W. S. Alhalafawy, A. H. Najmi, M. Z. T. Zaki, and M. A. Alharthi, "Design an adaptive mobile scaffolding system according to students' cognitive style simplicity vs complexity for enhancing digital well-being," *International Journal of Interactive Mobile Technologies*, vol. 15, no. 13, pp. 108–127, 2021, doi: 10.3991/ijim.v15i13.21253.
- [22] S. J. Litaly, H. Serpara, and E. C. Wenno, "The effect of Kahoot! Learning media on learning outcomes of German language students," *Journal of Education and Learning (EduLearn)*, vol. 16, no. 2, pp. 254–261, May 2022, doi: 10.11591/edulearn.v16i2.20458.
- [23] T. Uiphanit *et al.*, "Code adventure: an educational game for learning JAVA Programming," *International Journal of Interactive Mobile Technologies*, vol. 17, no. 22, pp. 26–37, 2023, doi: 10.3991/IJIM.V17I22.42307.
- [24] A. A. Inayah and E. Zubaidah, "Implementation of Dakon-themed game media: encourage curiosity 21st century in primary school," *Journal of Education and Learning (EduLearn)*, vol. 14, no. 4, pp. 609–616, 2020, doi: 10.11591/edulearn.v14i4.15091.
- [25] S. Nuraini *et al.*, "Games-based interactive multimedia to increase student creativity in physical education course," *Eurasian Journal of Educational Research*, vol. 2023, no. 104, pp. 73–86, 2023, doi: 10.14689/ejer.2023.104.005.
- [26] O. A. Hong, N. D. A. Halim, N. N. Zulkifli, N. F. Jumaat, N. M. Zaid, and M. Mokhtar, "Designing game-based learning kit with integration of augmented reality for learning geography," *International Journal of Interactive Mobile Technologies*, vol. 16, no. 2, pp. 4–16, 2022, doi: 10.3991/ijim.v16i02.27377.
- [27] T. Partovi and M. R. Razavi, "The effect of game-based learning on academic achievement motivation of elementary school students," *Learning and Motivation*, vol. 68, 2019, doi: 10.1016/j.lmot.2019.101592.
- [28] E. Z. F. Liu and P.-K. Chen, "The effect of game-based learning on students' learning performance in science learning – a case of conveyance go," *Procedia - Social and Behavioral Sciences*, vol. 103, pp. 1044–1051, 2013, doi: 10.1016/j.sbspro.2013.10.430.
- [29] M. M. Rezapour, A. Fatemi, and M. A. Nematbakhsh, "Learning experience assessment through players chat content in multiplayer online games," *Computers in Human Behavior*, vol. 151, 2024, doi: 10.1016/j.chb.2023.108003.
- [30] Y. Liu, J. T. D. Ng, X. Hu, Z. Ma, and X. Lai, "Adopt or abandon: facilitators and barriers of in-service teachers' integration of game learning analytics in K–12 classrooms?," *Computers and Education*, vol. 209, 2024, doi: 10.1016/j.compedu.2023.104951.

## BIOGRAPHIES OF AUTHORS






**Iva Sarifah**    is a professor at the Department of Elementary School Teacher Education at Universitas Negeri Jakarta, Indonesia. She received her doctoral degree from Universitas Negeri Jakarta, Indonesia, her master's degree from Universitas Negeri Jakarta, Indonesia, and her bachelor's degree from IKIP Bandung, Indonesia. In 1993, she joined the Department of Elementary School Teacher Education in the Faculty of Education of the University Negeri Jakarta, Indonesia. She has written several papers in education and training, evaluation and assessment of learning, and innovation in teaching and learning activities. She actively disseminates her research in some international conferences. She can be contacted at email: [ivasarifah@unj.ac.id](mailto:ivasarifah@unj.ac.id).






**Ahmad Muhajir**    is a student in a bachelor's degree at the Department of Elementary School Teacher Education at Universitas Negeri Jakarta, Indonesia. His research interests include innovative teaching and learning, elementary school student learning styles, improvement of student learning outcomes, enhancement of learning quality at elementary schools, and implementation of technological, pedagogical, and content knowledge at elementary schools. He is a deputy head of the Interest and Talent Department of the Student Executive Board at the Elementary School Teacher Education Department at the University Negeri Jakarta, Indonesia. He can be contacted at email: [muhajir2821@gmail.com](mailto:muhajir2821@gmail.com).






**Arita Marini**    is a professor at the Department of Elementary School Teacher Education at Universitas Negeri Jakarta, Indonesia. Arita Marini received her doctorate in educational management from the University of Negeri Jakarta, Indonesia, her master's degree in management science from the University of Indonesia, Indonesia, and her bachelor's degree in social economics from Institut Pertanian Bogor, Indonesia. In 1992, she joined the Department of Elementary School Teacher Education at the University Negeri Jakarta, Indonesia. She has written many articles in education, learning media, and IT for learning. Her research interests also include innovative teaching and learning, etc. She is currently the center coordinator of the collaboration and development center at Graduate School, University Negeri Jakarta, Indonesia. At the international level, she is an active member of NAFSA: Association of International Educators having headquarters in Washington, DC in the United States. She can be contacted at email: [aritamari@unj.ac.id](mailto:aritamari@unj.ac.id).






**Gusti Yarmi**    is a senior lecturer at the Department of Elementary School Teacher Education at Universitas Negeri Jakarta, Indonesia. She received her doctorate in educational language from the University of Negeri Jakarta, Indonesia, her master's degree in education language from the University Negeri Jakarta, and her bachelor's degree in education language from the University Negeri Padang. In 1993, she joined the Department of Elementary School Teacher Education at the University Negeri Jakarta, Indonesia. She has written some articles related to education, language learning and teaching, and innovative learning media. Her research interests also include innovative teaching and learning. She is currently head of the study program at Elementary School Teacher Education, University Negeri Jakarta, Indonesia. She is an active member of the Association of International Educators. She can be contacted at email: [gyarmi@unj.ac.id](mailto:gyarmi@unj.ac.id).



**Desy Safitri**    is a professor at the Department of Social Science Education at Universitas Negeri Jakarta, Indonesia. She received her doctorate in environmental science from the University of Indonesia, her master's degree in environmental science from the University of Indonesia, and her bachelor's degree in biology education from the Jakarta Institute of Teacher Training and Education, Indonesia. In 2007, she joined the Department of Social Science Education at the University Negeri Jakarta, Indonesia. She has written many articles in education, environmental, learning media, and IT for learning. Her research interests also include innovative teaching and learning, and environmental education. She is currently head of the study program at Social Studies Education in 2023-2027, University Negeri Jakarta, Indonesia. She can be contacted at email: [desysafitri@unj.ac.id](mailto:desysafitri@unj.ac.id).



**Leola Dewiyani**    is a senior lecturer in the Department of Industrial Engineering at Universitas Muhammadiyah Jakarta, Indonesia in the field of industrial management. Her master's degree in management science was obtained from the University of Indonesia, Indonesia, and her bachelor's degree in gas and petrochemical engineering from the University of Indonesia, Indonesia. In 1991, he joined the Department of Chemical Engineering at Sriwijaya University Palembang, Indonesia. Subsequently, in early 2005, she joined the Department of Industrial Engineering at Muhammadiyah University Jakarta, Indonesia. She has written articles on industrial engineering and management, learning media, and information technology for learning. She is currently the Vice Dean for Finance at the Faculty of Engineering, Universitas Muhammadiyah Jakarta, Indonesia. She can be contacted at email: [leola.dewiyani@umj.ac.id](mailto:leola.dewiyani@umj.ac.id).