



ESTABICAH: Relay of *Cacah* Numbers Games for Mathematics Skills in Early Elementary School

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ARTICLE INFO

Article history:

Received December 10, 2023

Accepted July 02, 2024

Available Online July 25, 2024

Kata Kunci:

Bilangan, Matematika, Estafet, Permainan, Sekolah Dasar

Keywords:

Numbers, Mathematics, Relay, Game, Primary School



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ABSTRAK

Penggunaan metode konvensional, monoton, dan minimnya media pembelajaran mengakibatkan kurangnya kemampuan siswa dalam memahami konsep bilangan. Hal ini tentu saja akan berdampak buruk jika dibiarkan terus menerus. Tujuan penelitian ini adalah menganalisis pelaksanaan permainan ESTABICAH pada siswa SD kelas awal. Penelitian ini menggunakan metode kualitatif dengan melibatkan siswa SD. Teknik pengumpulan data dalam penelitian ini dilakukan melalui tahap observasi dan dokumentasi. Teknik analisis data dilakukan melalui tiga tahap yaitu reduksi data, penyajian data, dan verifikasi data. Hasil penelitian menunjukkan bahwa permainan ESTABICAH membuat siswa tertarik dalam proses pembelajaran matematika. Hal ini menunjukkan bahwa 18 dari 20 siswa lebih memahami konsep bilangan setelah mengikuti permainan ESTABICAH. Permainan ESTABICAH dapat menunjang minat dan semangat siswa dalam kegiatan pembelajaran serta membuat pembelajaran menjadi lebih menyenangkan sehingga siswa tidak merasa bosan saat mengikuti pembelajaran matematika. Permainan ESTABICAH dapat diterapkan sebagai salah satu alternatif untuk membantu proses pembelajaran matematika pada keterampilan bilangan khususnya konsep bilangan.

ABSTRACT

The use of conventional methods, monotony, and lack of learning media results in students' lack of ability to understand the concept of numbers. The purpose of this study is to analyze the implementation of ESTABICAH games for early-grade elementary school students. This research uses a qualitative method involving students of elementary school. Data collection techniques in this study were carried out through the observation and documentation stages. Data analysis techniques are carried out in three stages, namely, data reduction, data presentation, and data verification. The results showed that ESTABICAH games made students interested in the process of learning mathematics. It was shown that 18 out of 20 students better understood the concept of numbers after participating in the ESTABICAH game. ESTABICAH game can support students' interest and enthusiasm in learning activities and make learning more fun so that students do not get bored when participating in mathematics learning. The ESTABICAH game can be applied as an alternative to help the process of learning mathematics in number skills, especially the concept of numbers.

1. INTRODUCTION

Early elementary school students need to have basic competencies, including understanding the concept of numbers up to 99, which is interpreted as the ability to explain the number of members of a set of objects (Rakhmawati & Mustadi, 2022; Torres-Gastelú & Kiss, 2016). Previous study suggests that in cognitive development, it is important to develop the ability to understand the concept of numbers (Rekysika & Haryanto, 2019). Other study emphasized the importance of the concept of numbers as a basis for further mathematical understanding (Khasawneh et al., 2021; Suryani & Haryono, 2018). Previous study highlights the need for hands-on activities in teaching maths at the primary level, which should be designed to help students understand math concepts well (Ekwueme et al., 2015). Teachers are expected to prepare students to be able to apply and utilize mathematics practically in their daily lives by thinking mathematically.

Observations made at SDN 16 Indralaya Utara show that many students still lack understanding about the concept of numbers, especially numerals. This is in line with the lack of tools or media used by educators during the learning process. Educators only use printed books and do practice questions, teachers also still use conventional methods and teaching activities that are less varied cause students to feel bored and less motivated (Panagouli et al., 2021; Rahiem, 2020). Previous study said that from the results of the analysis, the difficulty of students understanding numbers is due to the lack of educators who provide interesting, imaginative, and creative learning according to the times, so that it will affect students' interest and enthusiasm in learning mathematics influenced by their level of motivation (Izzuddin, 2021). One of them is the number of *cacah*.

From the explanation that has been conveyed before, innovations are needed through mathematical games that are able to help students understand the concept of numbers more easily and fun, such as relay games that can be used to introduce the concept of numbers to students. In line with the opinion relay running is a form of activity in which team members continuously or take turns running to complete a track (Boonchieng et al., 2018; Rusimamto et al., 2023). Each runner starts from their starting point, and the first to run carries a baton. As soon as the first runner reaches the second runner, the baton is handed over, and the second runner continues running with the baton. This process continues until the entire team completes the track. Other studies also explained that relay games are games that involve groups of players, where each group consists of several people who play together in a team. As stated by other study games are able to create a dynamic learning environment, igniting a sense of passion and enthusiasm (Melchor-Ferrer & Davia-Rodriguez, 2023; Wardani & Mundilarto, 2021).

Relay games are a type of group game that involves a series of tasks or challenges that each team member must complete in turn. Among elementary school children, relay games are often used in sports activities and interactive learning because of their various benefits. Relay games require each student to work together with other team members (Liu et al., 2021; Rahmanti et al., 2021). They learn the importance of collaboration, communication, and supporting each other to achieve a common goal. These games often involve physical movements such as running, jumping, or passing objects. This can help improve children's gross motor skills, which are important for their physical development. Each child on the team has the responsibility to complete their task well, so they learn that individual contributions are essential to the success of the team (Boonchieng et al., 2018; Rusimamto et al., 2023). In relay games, children interact with their peers, learn how to compete healthily, appreciate each other's roles, and share moments of joy and challenge together. When children successfully complete their tasks and help the team win, their self-confidence increases. They feel the positive impact of their efforts on the success of the group (Risfendra et al., 2023; Santoso et al., 2021).

Many studies that discuss the use of relay games that continue to be developed using diverse contexts, such as those conducted by previous study that focusing on the effectiveness of relay games in improving gross motor skills (Dere, 2019), have been investigated in other studies conducted other study which focus on paper ball relay games used to develop social-emotional aspects in early childhood (Kilis & Yildirim, 2019). Other study stated that relay games with puzzles can improve students' social skills, such as having the ability to collaborate in groups, mastering the skills of waiting their turn, and sharing responsibilities and tasks well with their friends (Fathimah & Ishartiwi, 2018). Similar to the opinion of state the implementation of early mathematics learning can increase a high sense of concern for their friends (Payu et al., 2022). Another study conducted stated that there was a significant increase in traditional craft skills with relay games (Vartiainen et al., 2016).

However, there still needs to be more research that discusses the use of the ESTABICAH (Relay of *Cacah* Numbers) game to help the ability to recognize numbers in early grade elementary school students. Therefore, the novelty of this research is a relay game used to strengthen students' ability to use numbers. Therefore, this study discusses the implementation of the ESTABICAH (Relay of *Cacah* Numbers) game on the ability of early grade elementary school students to recognize the concept of numbers. The purpose of this study is to analyze the implementation of ESTABICAH games for early-grade elementary school students.

2. METHOD

This study uses qualitative methods as its research approach, from this research related to the application of ESTABICAH games for number ability in early grade elementary school students. The subjects of this study were 20 students in grade 1 of SDN 16 North Indralaya. The research procedure used in this study is through data collection techniques, data analysis, and data interpretation. Data collection techniques in this study were carried out through the observation and documentation stages. Data analysis

techniques are carried out in three stages, namely, data reduction, data presentation, and data verification (Rijali, 2019).



Figure 1. Data Analysis Stage in Research

In [Figure 1](#), the data analysis stage that is first carried out is the data reduction process, which in this study involves selecting and emphasizing important aspects of data acquisition. The data analyzed came from observations of the implementation of ESTABICAH games in students. The presentation of data in this study is in the form of a description of the implementation of the ESTABICAH game for the ability of numbers in students. The conclusion or verification in this study is based on new findings or field conditions related to the application of ESTABICAH games to improve early elementary school student's ability to use numbers

3. RESULT AND DISCUSSION

Result

Based on the results of observations or observations that have been made in the field, it was revealed that there are still many students who need more skills that hinder student development. Therefore, researchers implement the ESTABICAH (Relay of *Cacah* Numbers) game with the hope that students' number abilities increase and hone their cognitive abilities, especially their mathematical abilities. This research was conducted on November 6, 2023, with one application of ESTABICAH games, where there are five stages of games for students' mathematical abilities in one game. The implementation of the ESTABICAH game is explained in the [Figure 2](#).



Figure 2. The First Activity in the Game ESTABICAH

In [Figure 2](#), the initial stage of the ESTABICAH game involves students throwing dice 1 meter high into the air with the aim of getting the dice to emit a certain number. This process not only emphasizes physical skills such as precision and coordination in throwing but also provides a dimension of prediction and expectation regarding the outcome of dice.

After the dice output, the numbers that the next challenge is that students who have obtained the results of the numbers from the dice must count and pick up concrete objects according to the number listed on the dice. The process of retrieving this object not only tests physical agility but also requires math skills, as students have to calculate quickly according to the numbers that appear. After successfully picking up and counting objects, the ESTABICAH game involves a team aspect with students running to pass the baton to their companion, who plays the role of the 2nd runner. The second activity in the game ESTABICAH is show in [Figure 3](#).



(a)

(b)

Figure 3. The Second Actiity in the Game ESTABICAH

It can be seen in Figure 3 that after the student receives the baton from the first runner, the student is required to choose a question from several types of questions that have been provided in the box. After selecting the problem, the child is required to complete the addition operation, which is visualized in the form of addition with pictures. The problem is presented in the form of pictures that students must solve. After the student answers correctly, he is required to run to pass the baton to his friend, who is the 3rd runner. The third activity in the game ESTABICAH is show in Figure 4.



(a)

(b)

Figure 4. The Third Activity in the Game ESTABICAH

In Figure 4, it can be seen that after the student receives the baton from the previous runner, he is required to choose the subtraction operation problem in the form of image visualization available in the box, which must be solved. The form of the number subtraction operation with the picture that the student has completed. Then, he ran to pass the baton to his friend, who was the 4th runner. The fourth activity in the game ESTABICAH is show in Figure 5.



(a)

(b)

Figure 5. The Fourth Activity in the Game ESTABICAH

In [Figure 5](#), it can be seen that after the student receives the baton from the previous runner, he is required to choose the addition operation problem in the form of number symbols available in the box, which must be solved. The problem about addition operations with number symbols that students have solved. Then, the student is required to run to give the baton to his friend, who is the 5th runner. The fifth activity in the game ESTABICAH is show in [Figure 6](#).



Figure 6. The Fifth Activity in the Game ESTABICAH

In [Figure 6](#), it can be seen that the student is asked to answer the subtraction operation at random with a number symbol chosen from inside the box, and it must be completed correctly. The form of subtraction operation problem with number symbols that students must solve. After answering, the student runs again to his friend, who is the 4th runner, to pass the baton and the 4th runner is required to pass the baton to the 3rd runner, etc., until the baton returns to the student who is the first runner.

Based on observations, the implementation of the ESTABICAH (Relay of *Cacah* Numbers) game on November 6, 2023, shows that students have better abilities in numbers and cognition. In the early stages, students demonstrate their motor skills and math skills by rolling dice, counting dice, and doing physical activities such as running. In the next stage, they successfully answered the addition and subtraction of numbers using pictures and number symbols, demonstrating their understanding of mathematical concepts visually and symbolically. These games can help students' social development because they involve teamwork and coordination. As a result, ESTABICAH games have proven to be an effective tool for improving students' math skills while making learning more interactive and fun.

Discussion

At the first stage of the game, it is observed how students understand commands correctly. As conveyed by previous study students are required to master receptive language skills, namely hearing and understanding, including understanding the commands given ([Cordes et al., 2023](#)). Then, students are also able to roll dice as high as 1m. Previous study said that throwing is part of the ability of eye and hand coordination, which is important for students ([Jääskeläinen et al., 2021](#)). Furthermore, students can read the numbers that come out of the dice after being thrown and immediately collect and count concrete objects that have been provided according to the numbers that came out of the previous dice. Previous study said that using concrete objects in the learning process can provide a direct experience that can improve critical thinking skills ([Aunio & Räsänen, 2016](#)). After that, the student ran to the 2nd runner and handed over the baton. In the second game stage, the second student took the baton from the first student and then chose one of the questions from the box provided. Then, the student was asked to solve the problem from the number addition operation in the form of image visualization and add it precisely and quickly. Previous study argues that students are invited to participate directly in the process of learning mathematics and actively participate in the process of solving mathematical problems ([Nurhayati & Rahardi, 2021](#); [Pramitasari et al., 2019](#)). According to other study the ability to understand things, solve problems, and think logically are basic skills that are very important in mathematics ([Chukwuyenum, 2013](#)). Then, the student ran towards the third runner. In this stage, some male students find it difficult to add up. Other study said that one of the reasons students need help learning mathematics is that it is difficult to understand the meaning of a math problem ([Zhang et al., 2019](#)).

In the third stage of the game, what is observed is how the student takes the baton from the second student as the next runner. When taking the baton, students are very excited and enthusiastic. Previous study stated that game activities carried out by students are able to create a dynamic learning environment, sparking a sense of enthusiasm and enthusiasm (Agustini et al., 2020; Melchor-Ferrer & Davia-Rodriguez, 2023). Then, students must choose one of the questions from the box provided; then, students are asked to solve the problem using the number subtraction operation. When students understand the concept, elementary school students will be taught counting, starting from the most basic, addition and subtraction (Ivanović et al., 2013; Karaca-Atik et al., 2023). Then, the number reduction operation that students do is in the form of precise and quick image visualization. This fits with the stage of cognitive development of students, which is the iconic stage of image-based learning or visualization (Lampropoulos et al., 2019; Selivanova et al., 2018). Then, after writing the answer correctly, the student ran towards the fourth runner.

In the fourth stage of the game, what is observed is that students take the baton from the third student; the difference from the previous stage is that at this stage, the problem that students must solve is the problem of adding numbers. The student was excited when it was his turn to take the baton from his friend. Therefore, it is appropriate for the introduction of basic mathematical concepts to be carried out by paying attention to the unique nature of students, namely love to play, so that the learning carried out can attract students' interest in learning (Dewi & Ginanjar, 2019; Hasanah, 2020). The discussion of numbers is a basic thing that students should master because it is the first capital to learn more complex mathematics. In addition, the addition problem that students must do as the third runner is an addition problem with mathematical symbols with real number symbols, as in the symbolic stage (da Ponte & Quaresma, 2016; Henderson et al., 2020). So, students are required to perform addition operations and write down the number symbols of the addition operations. Then ran carrying the baton to the student who was at the last post.

In the fifth game stage, what was observed was that students took the baton from the fourth runner, who said the relay game was changed for students to be able to complete tasks according to the stage of development and ability they had (Rusimamto et al., 2023; Urbach & Wildian, 2019). Then, students choose one of the questions from the box that has been provided about subtraction with visualization of mathematical symbols and number symbols, in line with research, every grade 1 student can also say the number correctly and correctly (Torres-Gastelú & Kiss, 2016). After the student performs the reduction surgery, he is required to carry the baton back to the fourth student. Similarly, there is study stated that the cognitive abilities of early elementary school students are in the concrete operational stage phase, where students already understand logical operations (Amanda et al., 2023).

ESTABICAH games can strengthen the ability to recognize mathematical concepts, especially numerals, more fun and interactive. This is in line with opinion state the game creates in a dynamic, passionate, and enthusiastic learning atmosphere, the characteristics of the game include the creation of a learning environment that is fun but still serious and relaxed (Neteria et al., 2020; Suryani & Haryono, 2018). The use of games aims to change the learning atmosphere from passive to active, from rigidity to movement, and from boredom to cheerfulness. According to previous study relay running is a continuous run, usually also called a turn-turn (Rusimamto et al., 2023). Relay running is a game consisting of 4 runners in each team, when the first runner carries a baton that must be given to runners 2, 3, and 4 by covering a predetermined distance and must work in teams. Other study also expressed the opinion that relay games are group activities where members be (Baydar, 2020).

The observed number ability is the cognitive development of students. The benefits of playing, according to previous study are that it can develop students' moral, motor, cognitive, language, and social development. Students are able to understand existing commands (Machay et al., 2022). Other study explained that students in this phase can complete tasks and think logically, which is replaced from thinking intuitively at the concrete level because students in this phase have cognitive abilities at the concrete operational stage, namely ages 7 to 11 years, at this point, children can perform tasks (Bjorklund, 2022). Logical reasoning replaces intuitive reasoning at the concrete level. The ability of students to do/complete the game along with the challenge of addition and subtraction problems contained in the ESTABICAH (Relay of *Cacah* Numbers) game, which is played outdoors. In line with the opinion of study state outdoor games provide an opportunity to develop responsibility and benefit from facing various challenges (Candra & Rahayu, 2021). At the time the study was conducted on 20 students of early elementary school, aged 6-8 years, five students did not understand the concept of numbers, and 15 students were good enough at understanding the concept of numbers. Most students who need more understanding of the concept of numbers are male students.

From the implementation of the ESTABICAH game (Relay of *Cacah* Numbers), it was observed that there was an improvement in the balance and motor skills of students. In accordance with the views of previous study it can be concluded that relay games have the potential to improve strength, coordination,

and balance between the eyes, hands, and feet, as well as contribute to the development of students' motor skills (Juniarti, 2019). Not only that, ESTABICAH games can also increase students' understanding of the concept of numbers, which is seen from the accuracy of students in solving games and challenge questions contained in the ESTABICAH game (Relay of *Cacah* Numbers). Namely, students are able to complete the game on time and are able to solve all addition and subtraction problems. According to other study a number is a collection of integers whose values are non-negative or can be explained as a set of natural numbers included with zeros so that the members of the group are 0 to 5 (Jordan et al., 2009).

Obstacles and inhibiting factors in the implementation of the ESTABICAH (Relay of *Cacah* Numbers) game take place because activities are carried out outdoors. In accordance with the views of study, the use of relay games in outdoor environments is considered an effective way to assist students in expressing themselves and acting spontaneously (Junaedah et al., 2020; Peper et al., 2021). Students from other classes watched this ESTABICAH (Relay of *Cacah* Numbers) game activity, and some students asked to participate in the game to cause disturbances. At first, the researcher found it difficult to supervise and motivate students, but in the end, the researcher was able to give directions to students. Another factor is that initially, some students need help understanding the commands given, such as forgetting to do the questions. However, after further explanation, students understand and are able to play correctly. In line with the opinion of study state the emerging mathematical process is a strategy to integrate various information to obtain solutions (Hasiru et al., 2021). The supporting factor is that students are very enthusiastic about participating in completing the ESTABICAH (Relay of *Cacah* Numbers) game so that the game can be carried out smoothly; the class teacher is also very helpful and conducive to the situation on the field when playing. Based on the analysis of the difficulty of numbers in elementary schools by study one of them is the need for more mastery of basic mathematical concepts, and teachers are less able to use active, innovative, credible, effective and fun learning techniques (Rintayati et al., 2020).

The results of the above research and discussion show that the application of the integration of number concept recognition through the number relay game has very positive implications. This approach covers aspects of the development of students' social-emotional, physical-motor, and cognitive abilities. This finding is in line with the view that state that paper ball relay games have a very meaningful impact in improving social-emotional skills because it has the potential to encourage students to work collaboratively in groups, interact with classmates, as well as develop (Ejin, 2017). This is in line with the opinion of who state that relay running games have the potential to develop students' gross motor skills by stimulating the coordination of muscles and the whole body (Saputra et al., 2021). This can be achieved through basic motion exercises found in relay games. Similarly, other study states that relay-running sports activities can improve students' cognitive abilities, one of which can develop students' numeracy skills because relay-running activities are continuous running carried out by each team with a total of 4 students can be trained to consider strategies using their reasoning (Saputra et al., 2021).

This study provides several important implications related to the use of the ESTABICAH (Relay of *Cacah* Numbers) game to improve elementary school students' mathematics skills. First, the results of this study support a fun and interactive learning approach as a means to increase students' learning motivation. Through the ESTABICAH game, students can be more involved in the learning process because the game activities require active participation, thus strengthening the understanding of basic mathematical concepts such as whole number operations. Although this study shows the benefits of using the ESTABICAH game, there are some limitations that need to be considered. First, this study was only conducted on a group of students in one particular elementary school, so the results may not be fully generalizable to a wider population of students. Variations in the social, economic, and educational backgrounds of students in other schools may influence the results differently

4. CONCLUSION

The game ESTABICAH, which means Number Relay, can be used to help students' math skills. This ESTABICAH game can support students' interest and enthusiasm in learning activities and make learning more fun so that students do not get bored when participating in mathematics learning. Providing educational stimulation to students in a fun and not boring way will have an impact on the cognitive abilities of the students themselves, as well as on other abilities related to social and physical motor skills. ESTABICAH games can also help students learn to think critically and creatively, solve problems, and cooperate with their peers. This makes them more active in learning. Thus, the ESTABICAH game is a tool that can be used to assist students in learning mathematics, especially in the introduction of the concept of numerals.

5. REFERENCES

- Afrinanda Pratiwi, T., & Yanti Fitri. (2022). Pengaruh Model Kooperatif Tipe Think Pair Share (Tps) Terhadap Hasil Belajar Peserta Didik Pada Pembelajaran Tematik Terpadu Kelas IV SD. *Jurnal Cakrawala Pendas*, 8(4), 1256–1265. <https://doi.org/10.31949/jcp.v8i4.3087>.
- Aini, N., Salminawati, S., & Rambe, R. N. (2021). Pengaruh Model Pembelajaran Kooperatif Tipe Think Talk Write Terhadap Keterampilan Menulis Teks Narasi Pada Mata Pelajaran Bahasa Indonesia Di Kelas V Min 4 Kota Medan. *Nizhamiyah*, 11(1). <https://doi.org/10.30821/niz.v11i1.922>.
- Anggara, I. Agustini, K., Santyadiputra, G. S., & Sugihartini, N. (2020). Visualizing the stages of the educational research methodology into animation infographics for vocational students. *Jurnal Pendidikan Vokasi*, 9(3), 317–327. <https://doi.org/10.21831/jpv.v9i3.22017>.
- Amanda, N., Kanzunudin, M., & Fathurohman, I. (2023). Multiplication E-Module Media to Improve Cognitive Ability of First Grade Elementary School Students. *Jurnal Penelitian Dan Pengembangan Pendidikan*, 7(3), 494–502. <https://doi.org/10.23887/jppp.v7i3.67081>.
- Aunio, P., & Räsänen, P. (2016). Core numerical skills for learning mathematics in children aged five to eight years – a working model for educators. *European Early Childhood Education Research Journal*, 24(5), 684–704. <https://doi.org/10.1080/1350293X.2014.996424>.
- Baydar, A. (2020). Pre-Service Primary Teachers' Opinions on Team-Games-Tournaments. *International Education Studies*, 14(1), 86. <https://doi.org/10.5539/ies.v14n1p86>.
- Bjorklund, D. F. (2022). Children's Evolved Learning Abilities and Their Implications for Education. In *Educational Psychology Review* (Vol. 34, Issue 4). Springer US. <https://doi.org/10.1007/s10648-022-09688-z>.
- Boonchieng, E., Chieochan, O., & Saokaew, A. (2018). Smart farm: Applying the Use of NodeMCU, IOT, NETPIE and LINE API for a lingzhi mushroom farm in Thailand. *IEICE Transactions on Communications*, E101B(1), 16–23. <https://doi.org/10.1587/transcom.2017ITI0002>.
- Candra, A. M., & Rahayu, T. S. (2021). Pengembangan Media Pembelajaran Berbasis Game Interaktif untuk Meningkatkan Kemampuan Pemecahan Masalah Tematik di Sekolah Dasar. *Jurnal Basicedu*, 5(4), 2311–2321. <https://doi.org/10.31004/basicedu.v5i4.1212>.
- Chukwuyenum, A. N. (2013). Impact of Critical thinking on Performance in Mathematics among Senior Secondary School Students in Lagos State. *IOSR Journal of Research & Method in Education (IOSRJRME)*, 3(5), 18–25. <https://doi.org/10.9790/7388-0351825>.
- Cordes, A.-K., Egert, F., & Hartig, F. (2023). Fostering Child Language with Short-Term Digital Storybook Interventions. *Zeitschrift Für Entwicklungspsychologie Und Pädagogische Psychologie*, 0. <https://doi.org/10.1026/0049-8637/a000264>.
- da Ponte, J. P., & Quaresma, M. (2016). Teachers' professional practice conducting mathematical discussions. *Educational Studies in Mathematics*, 93(1), 51–66. <https://doi.org/10.1007/s10649-016-9681-z>.
- Dere, Z. (2019). Analyzing the Early Literacy Skills and Visual Motor Integration Levels of Kindergarten Students. *Journal of Education and Learning*, 8(2), 176. <https://doi.org/10.5539/jel.v8n2p176>.
- Dewi, K. S., & Ginanjar, A. S. (2019). Peranan Faktor-Faktor Interaksional Dalam Perspektif Teori Sistem Keluarga Terhadap Kesejahteraan Keluarga. *Jurnal Psikologi*, 18(2), 245–263. <https://doi.org/10.14710/jp.18.2.245-263>.
- Ejin, S. (2017). Pengaruh Model Problem Based Learning (PBL) Terhadap Pemahaman Konsep dan Keterampilan Berpikir Kritis Siswa Kelas IV SDN Jambu Hilir Baluti 2 Pada Mata Pelajaran Ilmu Pengetahuan Alam. *Jurnal Pendidikan (Teori Dan Praktik)*, 1(1), 66. <https://doi.org/10.26740/jp.v1n1.p66-72>.
- Ekwueme, C. O., Ekon, E. E., & Ezenwa-Nebife, D. C. (2015). The Impact of Hands-On-Approach on Student Academic Performance in Basic Science and Mathematics. *Higher Education Studies*, 5(6), 47. <https://doi.org/10.5539/hes.v5n6p47>.
- Fathimah, N. S., & Ishartiwi, I. (2018). Pengembangan Multimedia Permainan Interaktif Pembelajaran Berhitung Bagi Anak Diskalkulia Usia Prasekolah. *Jurnal Inovasi Teknologi Pendidikan*, 5(2), 115–128. <https://doi.org/10.21831/jitp.v5i2.15541>.
- Hasanah, A. (2020). Perbedaan Perkembangan Moral Anak Laki-Laki dan Anak Perempuan pada Usia Sekolah Dasar. *Yinyang: Jurnal Studi Islam Gender Dan Anak*, 15(1), 41–58. <https://doi.org/10.24090/yinyang.v15i1.3442>.
- Hasiru, D., Badu, S. Q., & Uno, H. B. (2021). Media-Media Pembelajaran Efektif dalam Membantu Pembelajaran Matematika Jarak Jauh. *Jambura Journal of Mathematics Education*, 2(2), 59–69. <https://doi.org/10.34312/jmathedu.v2i2.10587>.
- Henderson, D., Woodcock, H., Mehta, J., Khan, N., Shivji, V., Richardson, C., Aya, H., Ziser, S., Pollara, G., & Burns, A. (2020). Keep calm and carry on learning: using Microsoft Teams to deliver a medical education programme during the COVID-19 pandemic. *Future Healthcare Journal*, 7(3), e67–e70.

- <https://doi.org/10.7861/fhj.2020-0071>.
- Ivanović, M., Putnik, Z., Komlenov, Ž., Welzer, T., Hölbl, M., & Schweighofer, T. (2013). Usability and privacy aspects of moodle: Students' and teachers' perspective. *Informatica (Slovenia)*, 37(3), 221–230. <https://www.informatica.si/index.php/informatica/article/download/451/455>.
- Izzuddin, A. (2021). Implementasi Pendekatan Saintifik pada Pembelajaran Daring Selama Masa Pandemi Covid-19 di Lembaga Pendidikan Dasar. *As-Sabiqun*, 3(1), 45–63. <https://doi.org/10.36088/assabiqun.v3i1.1313>.
- Jääskeläinen, I. P., Sams, M., Glerean, E., & Ahveninen, J. (2021). Movies and narratives as naturalistic stimuli in neuroimaging. *NeuroImage*, 224(October 2020), 1–14. <https://doi.org/10.1016/j.neuroimage.2020.117445>.
- Jordan, N. C., Kaplan, D., Ramineni, C., & Locuniak, M. N. (2009). Early Math Matters: Kindergarten Number Competence and Later Mathematics Outcomes. *Developmental Psychology*, 45(3), 850–867.
- Junaedah, J., Thalib, S. B., & Ahmad, M. A. (2020). The Outdoor Learning Modules Based on Traditional Games in Improving Prosocial Behaviour of Early Childhood. *International Education Studies*, 13(10), 88. <https://doi.org/10.5539/ies.v13n10p88>.
- Juniarti, Y. (2019). Pengembangan Media Ludo Geometri (DORI) Pada Fisik Motorik Anak Usia Dini. *Al-Athfal : Jurnal Pendidikan Anak*, 5(2), 169–182. <https://doi.org/10.14421/al-athfal.2019.52-04>.
- Karaca-Atik, A., Meeuwisse, M., Gorgievski, M., & Smeets, G. (2023). Uncovering important 21st-century skills for sustainable career development of social sciences graduates: A systematic review. *Educational Research Review*, 39, 100528. <https://doi.org/10.1016/j.edurev.2023.100528>.
- Khasawneh, E., Gosling, C., & Williams, B. (2021). What impact does maths anxiety have on university students? *BMC Psychology*, 9(1), 1–9. <https://doi.org/10.1186/s40359-021-00537-2>.
- Kilis, S., & Yildirim, Z. (2019). Posting Patterns of Students' Social Presence, Cognitive Presence, and Teaching Presence in Online Learning ONLINE LEARNING. *Online Learning*, 23(2), 179–195. <https://avesis.metu.edu.tr/yayin/c602500e-43ee-41cb-8d82-1240bba9f249/posting-patterns-of-students-social-presence-cognitive-presence-and-teaching-presence-in-online-learning>.
- Lampropoulos, G., Siakas, K., & Anastasiadis, T. (2019). Internet of Things in the Context of Industry 4.0: An Overview. *International Journal of Entrepreneurial Knowledge*, 7(1), 4–19. <https://doi.org/10.2478/ijek-2019-0001>.
- Liu, S., Sun, Y., Zhang, L., & Su, P. (2021). Fault diagnosis of shipboard medium-voltage DC power system based on machine learning. *International Journal of Electrical Power and Energy Systems*, 124. <https://doi.org/10.1016/j.ijepes.2020.106399>.
- Machay, B., Ruiz, C., Contero, N., & Nogales, D. (2022). Assisted Pedagogy: Robot Alpha for Gross Motor Learning in Sublevel I. *International Conference on Innovation and Research*, 203–215. https://link.springer.com/chapter/10.1007/978-3-031-11438-0_17.
- Melchor-Ferrer, E., & Davia-Rodriguez, M. A. (2023). Computer games and the study of terminology: An application to national accounts. *Education and Information Technologies*, 28(1), 135–153. <https://doi.org/10.1007/s10639-022-11138-w>.
- Neteria, F., Mulyadiprana, A., & Respati, R. (2020). Puzzle sebagai Media Pembelajaran Inovatif dalam Mata Pelajaran IPS Bagi Guru di Sekolah Dasar. *PEDADIDAKTIKA: Jurnal Ilmiah Pendidikan Guru Sekolah Dasar*, 7(4), 82–90. <https://doi.org/10.17509/pedadidaktika.v7i4.25809>.
- Nurhayati, N., & Rahardi, R. (2021). Kemampuan Berpikir Kreatif Mahasiswa Dalam Mengembangkan Media Pembelajaran Matematika Saat Pandemi Covid-19. *Pembelajaran Matematika Inovatif*, 4(2), 331–342. <https://doi.org/10.22460/jpmi.v4i2.331-342>.
- Panagouli, E., Stavridou, A., Savvidi, C., Kourti, A., Psaltopoulou, T., Sergeantanis, T. N., & Tsitsika, A. (2021). School performance among children and adolescents during covid-19 pandemic: A systematic review. *Children*, 8(12), 1–12. <https://doi.org/10.3390/children8121134>.
- Payu, C. S., Mursalin, M., Abbas, N., Umar, M. K., Yusuf, F. M., & Odja, A. H. (2022). Development of Guided Inquiry Learning Model Based on Critical Questions to Improve Critical Thinking on the Concept of Temperature and Heat. *Journal of Humanities and Social Sciences Studies*, 4(2), 174–180. <https://doi.org/10.32996/jhsss.2022.4.2.21>.
- Peper, E., Wilson, V., Martin, M., Rosegard, E., & Harvey, R. (2021). Avoid zoom fatigue, be present and learn. *NeuroRegulation*, 8(1), 47–56. <https://doi.org/10.15540/NR.8.1.47>.
- Pramitasari, K., Usodo, B., Subanti, S., Magister, P., Matematika, P., Sebelas, U., & Surakarta, M. (2019). Proses Pembelajaran Matematika Untuk Siswa Slow Learner Di Kelas Inklusi Smp Negeri 7 Klaten Kelas Viii. *Jurnal Elektronik Pendidikan Matematika*, 3(7), 777–786. <https://jurnal.fkip.uns.ac.id/index.php/s2math/article/view/6494>.
- Rahiem, M. D. H. (2020). The emergency remote learning experience of university students in Indonesia amidst the COVID-19 crisis. *International Journal of Learning, Teaching and Educational Research*,

- 19(6), 1–26. <https://doi.org/10.26803/ijlter.19.6.1>.
- Rahmanti, A. R., Ningrum, D. N. A., Lazuardi, L., Yang, H. C., & Li, Y. C. (2021). Social Media Data Analytics for Outbreak Risk Communication: Public Attention on the “New Normal” During the COVID-19 Pandemic in Indonesia. *Computer Methods and Programs in Biomedicine*, 205, 106083. <https://doi.org/10.1016/j.cmpb.2021.106083>.
- Rakhmawati, Y., & Mustadi, A. (2022). The circumstances of literacy numeracy skill: Between notion and fact from elementary school students. *Jurnal Prima Edukasia*, 10(1), 9–18. <https://doi.org/10.21831/jpe.v10i1.36427>.
- Rekysika, N. S., & Haryanto, H. (2019). Media Pembelajaran Ular Tangga Bilangan Untuk Meningkatkan Kemampuan Kognitif Anak Usia 5-6 Tahun. *Cakrawala Dini: Jurnal Pendidikan Anak Usia Dini*, 10(1), 56–61. <https://doi.org/10.17509/cd.v10i1.16000>.
- Rijali, A. (2019). Analisis Data Kualitatif (Qualitative Data Analysis). *Alhadharah: Jurnal Ilmu Dakwah*, 17(33). <http://jurnal.uin-antasari.ac.id/index.php/alhadharah/article/view/2374>.
- Rintayati, P., Lukitasari, H., & Syawaludin, A. (2020). Development of Two-Tier Multiple Choice Test to Assess Indonesian Elementary Students’ Higher-Order Thinking Skills. *International Journal of Instruction*, 14(1), 555–566. <https://doi.org/10.29333/IJI.2021.14133A>.
- Risfendra, Yoga Maulana Putra, Setyawan, H., & Yuhendri, M. (2023). Development of Outseal PLC-Based HMI as Learning Training Kits for Programmed Control Systems Subject in Vocational Schools. *Jurnal Pendidikan Tambusai*, 7(1), 4397–4406. <https://proceeding.unnes.ac.id/veic/article/view/2883>.
- Rusimanto, P. W., Endryansyah, E., Haryudo, S. I., Isnanda, F. A., & Rozaq, C. (2023). Zen Programmable Relay PLC Training Kit to Improve Programming Skill of Electrical Engineering Education Students. *Proceedings of the 4th Annual Conference of Engineering and Implementation on Vocational Education, ACEIVE 2022, 20 October 2022, Medan, North Sumatra, Indonesia*, 1–8. <https://doi.org/10.4108/eai.20-10-2022.2328843>.
- Santoso, Y. K., Jonatan, J. J., Millenika, P., Fernanda, D. A., Setyawan, I., & Susilo, D. (2021). Rancang Bangun Alat Pintar Protokol Kesehatan Covid-19 Terintegrasi. *JST (Jurnal Sains Dan Teknologi)*, 10(2), 252–263. <https://doi.org/10.23887/jstundiksha.v10i2.39504>.
- Saputra, H., Hanif, A. S., Sulaiman, I., & Ningrum, D. T. M. (2021). The effect of traditional games and drill with motor ability on skills (Running, jumping, overhand throw and catching) at elementary school. *International Journal of Human Movement and Sports Sciences*, 9(6), 1097–1103. <https://doi.org/10.13189/saj.2021.090603>.
- Selivanova, O. G., Gromova, C. R., & Mashkin, N. A. (2018). Improving student motivation for learning the second foreign language. *XLinguae*, 11(1), 218–229. <https://doi.org/10.18355/XL.2018.11.01.18>.
- Suryani, N. A., & Haryono, M. (2018). Improvement of the Logical Intelligence Through Media Kolak (Collage Numbers) Based on Local Wisdom on Early Childhood. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, 2(2), 253. <https://doi.org/10.31004/obsesi.v2i2.90>.
- Torres-Gastelú, C. A., & Kiss, G. (2016). Perceptions of students towards ICT competencies at the University. *Informatics in Education*, 15(2), 319–338. <https://doi.org/10.15388/infedu.2016.16>.
- Urbach, T. U., & Wildian, W. (2019). Rancang Bangun Sistem Monitoring dan Kontrol Temperatur Pemanasan Zat Cair Menggunakan Sensor Inframerah MLX90614. *Jurnal Fisika Unand*, 8(3), 273–280. <https://doi.org/10.25077/jfu.8.3.273-280.2019>.
- Vartiainen, H., Pöllänen, S., & Liljeström, A. (2016). Designing Connected Learning: Emerging learning systems in a craft teacher education course. *Design And*, 21(2), 32–40. <https://ojs.lboro.ac.uk/DATE/article/download/2115/2281>.
- Wardani, Y. R., & Mundilarto. (2021). Development of Android-based physics e-book to local Wisdom of traditional games Nekeran. *AIP Conference Proceedings*, 2330. <https://doi.org/10.1063/5.0043767>
- Zhang, J., Zhao, N., & Kong, Q. P. (2019). The relationship between math anxiety and math performance: a meta-analytic investigation. *Frontiers in Psychology*, 10(AUG), 1–17. <https://doi.org/10.3389/fpsyg.2019.01613C>.
- Ardana, I. K., & Darsana, I. W. (2018). Pengaruh Model Pembelajaran Kooperatif Tipe TPS Berbantuan Peta Konsep terhadap Penguasaan Kompetensi Pengetahuan IPA. *International Journal of Elementary Education*, 2(2), 72–80. <https://doi.org/10.23887/ijee.v2i2.14407>.