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Improving Elementary Students' Science Literacy Through Game-Based Learning Supported By Baamboozle Media

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ABSTRACT: *The aim of this research is to analyze the effectiveness of using Baamboozle media in increasing the scientific literacy of fifth grade students on the structure of the earth's layers. This research uses a one group pretest-posttest design in a quantitative approach. The research participants were 29 fifth grade students at an elementary school. Data was collected using essay-based instruments that have been validated and tested for reliability. The results of the analysis showed a significant increase in the average student score, from 48.65 on the pretest to 80.44 on the posttest. Paired samples t-test analysis indicated that the use of Baamboozle significantly increased students' understanding of scientific concepts. Apart from improving learning outcomes, this media has also been proven to make learning more interesting, encourage teamwork, and increase student motivation in participating in the learning process. This research provides a new perspective on the effectiveness of Baamboozle in science education, while strengthening previous findings about the benefits of game-based learning in the classroom.*

Abstrak: Tujuan penelitian ini adalah untuk menganalisis efektivitas penggunaan media Baamboozle dalam meningkatkan literasi sains siswa kelas V pada materi struktur lapisan bumi. Penelitian ini menggunakan desain one group *pretest-posttest* dalam pendekatan kuantitatif. Partisipan penelitian adalah 29 siswa kelas V di sebuah sekolah dasar. Data dikumpulkan menggunakan instrumen berbasis esai yang telah divalidasi dan diuji reliabilitasnya. Hasil analisis menunjukkan adanya peningkatan signifikan pada rata-rata nilai siswa, dari 48,65 pada pretest menjadi 80,44 pada posttest. Analisis uji-t sampel berpasangan mengindikasikan bahwa penggunaan Baamboozle secara signifikan meningkatkan pemahaman siswa terhadap konsep-konsep ilmiah. Selain meningkatkan hasil belajar, media ini juga terbukti membuat pembelajaran lebih menarik, mendorong kerja sama tim, serta meningkatkan motivasi siswa dalam mengikuti proses pembelajaran. Penelitian ini memberikan perspektif baru tentang efektivitas Baamboozle dalam pendidikan sains, sekaligus memperkuat temuan sebelumnya tentang manfaat pembelajaran berbasis permainan di kelas.

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INTRODUCTION

Science education in elementary schools plays a crucial role in developing children's critical, analytical, and creative thinking skills at a young age. As a key metric in science education, science literacy not only encompasses understanding scientific concepts but also includes the ability to analyze and apply data in real-world situations. The demand for science literacy is increasingly significant in this digital era, particularly in light of global dynamics and technological advancements. Unfortunately, several international surveys, such as the Programme for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS), indicate that the science literacy levels of Indonesian students remain below international standards (Kemendikbud, 2020). This situation necessitates innovation in the learning process, particularly at the elementary school level.

Science literacy in education is considered one of the key components for improving the quality of human resources to compete in the rapidly evolving era of globalization (Wahyu 2020). In line with this perspective (Fadilla 2023), Proficiency in language, mathematics, and science literacy has been globally recognized as an essential metric for evaluating a country's educational achievements, including Indonesia. The ability to address real-world problems requires decision-making based on scientific principles and a compassionate attitude toward oneself and the environment. The capacity to understand and apply both verbal and written information in daily situations is referred to as science literacy (yuyu yulianti 2017). help students succeed in life and their careers, education aims to prepare them as the next generation capable of carefully managing information (Irianto and Febrianti 2017). This generation is projected to possess strong scientific thinking and behavior by applying science literacy in practical contexts (Linder et al. 2014). Therefore as part of daily learning education must continue to prepare and accustom students to the advancement of science literacy.

Science literacy encompasses an individual's ability to understand and utilize scientific knowledge and skills to identify questions, analyze and explain natural phenomena, and use scientific information to acquire new knowledge. According to the *Organization for Economic Co-operation and Development* (OECD), as cited in the 2017 report by the Ministry of Education and Culture, science literacy is defined as the ability to make decisions relevant to daily life by applying knowledge derived from existing facts and evidence. This capability is crucial in preparing society to address complex global challenges, including public health, climate change, and technological innovation (OECD 2019).

Science literacy involves not only scientific knowledge but also the ability to apply, analyze, and communicate scientific investigation results in the context of daily life and their impact on society. According to (Abdullah & Osman) the primary goal of education is to shape individuals capable of enduring natural challenges and managing social relationships. This has become increasingly important in an era where everyone must compete in various aspects of life. To adapt to the changing times, children's learning processes need to be transformed by actively involving them in acquiring skills and knowledge. One crucial step in facing competition in this era is possessing science literacy, which entails the ability to understand, communicate, and apply scientific concepts in everyday life. An aspect of science literacy includes the capability to explain, characterize, and predict natural phenomena (Council,).

Developing technology based learning materials, such as the game based learning (GBL) approach, is an example of an innovation that can be implemented. This method incorporates game elements into teaching to create an engaging and enjoyable learning environment (Wulandari and Safitri 2024). The Baamboozle learning media, a digital game-based platform, has proven to enhance student motivation and engagement in understanding scientific concepts (Iskandar et al. 2022). This platform provides students with opportunities to learn through healthy competition that fosters collaboration, exploration, and creativity (Wibawa et al. 2020). Additionally, this approach can help visualize abstract scientific concepts, such as Earth's layers, making them easier for students to understand.

The gap between the need for technology-based education and the availability of supporting facilities in elementary schools, such as computer laboratories, poses a significant challenge for implementing technology-based learning. According to a report by the Center for Educational Information and Communication Technology (Pustekkom), only 10% of elementary schools in Indonesia have access to computer laboratories (Jupriyanto and Turahmat 2018). Moreover, the

readiness of teachers to utilize digital media like Baamboozle is also a constraint, as many educators lack the skills required to effectively integrate technology into their classrooms. Therefore, training and mentoring are crucial factors in ensuring the successful implementation of GBL based learning.

This study examines how the science literacy of fifth grade students, particularly regarding Earth's layers, is influenced by using game based learning materials via Baamboozle. The content was chosen as it covers subjects often perceived as abstract and challenging by students. Using a game-based method is believed to facilitate more active, interactive, and meaningful learning while improving students' understanding of scientific ideas.

Observations at SDN Pundenarum 1 identified several issues hindering the growth of students' science literacy. These include (1) monotonous teaching methods, such as lectures and discussions, which make students passive and unmotivated in learning science; (2) students' low comprehension of material, especially related to Earth's layers; and (3) students' low enthusiasm for participating in science lessons, with many perceiving science as a challenging and tedious subject.

Research on using game-based learning to improve science literacy has been conducted by several previous studies. However, studies specifically focusing on the application of Baamboozle media to enhance elementary students' science literacy remain limited. Science lessons are often considered difficult by students, particularly in understanding abstract concepts like the structure of Earth's layers. This condition necessitates a more interactive and engaging learning approach to increase student engagement. Baamboozle, as a game-based learning medium, offers an innovative approach to delivering content in a fun way. This platform not only helps students visually understand scientific concepts but also motivates them through elements of competition and collaboration. By using this medium, the learning process becomes more engaging, enhances interest, and helps students understand the material in depth. This background highlights the rationale for designing this approach to create an interactive, engaging learning experience that encourages active participation (Aoliyah 2023).

Previous research by (Larasati and Pratama 2024) showed that learning through games is widely recognized as a successful way to meet students' academic needs while fostering their personal growth. Despite the importance of science as a subject, studies indicate that its teaching methods still need improvement, as evidenced by poor academic performance and low student motivation(Mukti, Elvira, and Hussin 2023) found that using game-based instruments can enhance student motivation and provide a fun and interactive learning experience.

Based on previous studies and identified findings, this research seeks to examine the use of Baamboozle media in science education for fifth grade elementary students. The study aims to reveal the impact of using Baamboozle media on students' science literacy, particularly on the topic of Earth's layers. While this research shares similarities with previous studies in utilizing game-based approaches as interactive learning media, it differs in its focus on specific issues, subjects, and education levels. Whereas earlier research was more general or focused on different subjects and educational levels, this study specifically explores Baamboozle's effectiveness on elementary students' science literacy. This research does not aim to create new theories but to strengthen and support existing findings. It is hoped that the results of this study will provide additional references for educators and researchers in developing more effective learning strategies in the future.

RESEARCH METHOD

This study employs a One Group Pretest-Posttest Design model with a quantitative approach using a pre-experimental design. This method was chosen to evaluate how the use of Baamboozle media influences students' science literacy regarding the structure of Earth's layers. The same group of students was used for both initial (pretest) and final (posttest) assessments in this design. The study population consists of all fifth-grade students at SDN Pundenarum 1, totaling 29 individuals.

Table 1. Research Sample Data

Gender	Number of Students
Male	16
Female	13
Total Students	29

The research procedure began by administering a pretest to the fifth-grade students to assess their initial abilities in science literacy, particularly concerning the structure of Earth's layers. Subsequently, students participated in learning sessions using the interactive game-based media, Baamboozle. The learning process was conducted in two sessions, each lasting 70 minutes. Following the learning sessions, students were given a posttest with the same questions to evaluate their improvement after the intervention. The validity findings are presented in the table below.

Table 2. Results of Instrument Validity Testing

No	*r Calculated*	*r Table*	Categori
1	0,58	0,44	Valid
2	0,57		Valid
3	0,47		Valid
4	0,45		Valid
5	0,18		Invalid
6	0,55		Valid
7	0,48		Valid
8	0,13		Invalid
9	0,65		Valid
10	0,62		Valid
11	0,47		Invalid
12	0,44		Valid
13	0,72		Valid
14	0,26		Invalid
15	0,48		Valid
16	-0,08		Invalid
17	0,30		Invalid
18	0,08		Invalid
19	-0,10		Invalid
20	0,46		Valid

Based on the analysis, it can be concluded that out of 20 test items evaluated for the sixth-grade students of SDN Pundenarum 1, 12 items were deemed valid, including items 1, 2, 3, 4, 6, 7, 9, 10, 12, 13, 15, and 20. The validity of these items was proven by their calculated r-values exceeding the r table values, meeting the validity criteria. Conversely, items with r-values below the r table were deemed invalid. Reliability testing was then performed, as detailed in the following table.

Table 3. Results of Instrument Reliability Testing

RELIABILITTY	σ_i^2	7.43158
	$\Sigma\sigma_i^2$	183.692
	σt^2	542.892
	r 11	0.69646
	r tabel	0.444
	Category	Reliable
	Category	High

The data indicates that the reliability or consistency of the tested items is categorized as high. This is demonstrated by a Cronbach's Alpha value of 0.696, indicating high reliability. This value suggests a minimal likelihood of measurement error.

The tools and media used in this study include computers or tablets with access to the Baamboozle platform and essay questions designed based on science literacy indicators. These questions encompass three primary components of science literacy: content, context, and scientific processes. The test blueprint and example instruments were developed to ensure alignment with the study objectives. The instruments were validated and tested for reliability before use to ensure their feasibility.

Data collection was conducted by administering pretests and posttests. The data obtained was analyzed using paired-sample t-tests to determine whether there were significant differences between pretest and posttest results. Statistical software such as SPSS was employed to ensure accuracy in the results.

This method follows the principles of quantitative research, as outlined by (Sugiyono 2019), emphasizing the importance of quantitative data collection and testing relationships between variables. With carefully designed procedures and instruments, this study aims to provide an accurate depiction of the effectiveness of Baamboozle media in elementary school science education.

RESULT AND DISCUSSION

The research consists of three main stages: pretest, intervention, and posttest. The pretest stage was conducted with the experimental group of students to measure their initial abilities. Next, the experimental group underwent game-based learning using the Baamboozle platform during two learning sessions held on November 26-29, 2024. Each session included activities in the opening, middle, and closing stages.

During the core learning activities, the researcher implemented steps of the Game-Based Learning model inspired by the Game Based Learning syntax. The process involved five stages as follows: 1) Orientation to the problem: In this stage, the teacher introduced relevant challenges through Baamboozle to encourage students to understand the problems and seek solutions. 2) Assigning tasks to students: Students collaborated in groups to explore the game, seek information, and use resources or tools provided in Baamboozle to solve the Building and presenting work results: Students discussed within their groups to formulate solutions to the game's challenges. The results were integrated into answers or products presented in front of the class. 5) Evaluation and reflection: After completing the game, students presented their final results with their groups. These findings were analyzed and summarized, with feedback from other groups used to draw conclusions and refine problem-solving processes.

In the first stage, students were introduced to real-life problems through a relevant educational video. In the second stage, students worked in groups to discuss and solve pre-prepared tasks in worksheets. The investigation process began in the subsequent stage, where students individually and collaboratively explored the necessary information, while the teacher monitored their participation and engagement. In the next stage, students presented their discussion results or solutions. Finally, in the closing stage, students and the teacher discussed group results, drew conclusions, and reflected on the material and learning experiences. This approach was designed to integrate game-based learning with real-world problem-solving, utilizing platforms like Baamboozle to enhance student engagement and understanding of scientific literacy.

Figure 1. Initial Activities

Figure 1 illustrates the initial learning stage where the teacher asks students to watch a video depicting real-world problems and provides instructions to answer related questions.

Figure 2. Group Activities

Figure 2 depicts group activities where students collaborate to complete challenges presented by the teacher through Baamboozle. Students used worksheets as guides and followed the game flow and teacher instructions to achieve learning objectives.

Figure 3. Presenting Work Results

Figure 3 shows each group presenting their work results to the class, while other groups provide feedback and suggestions on the presentations.

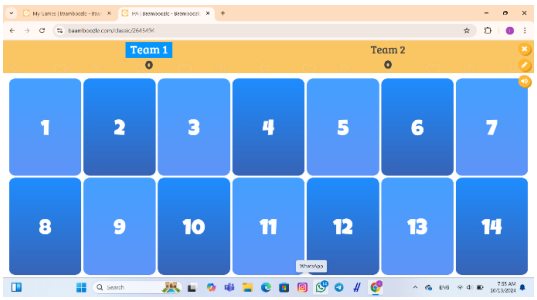

Figure 4. Baamboozle Media

Figure 4 displays the Baamboozle platform. After learning while playing with Baamboozle, students draw conclusions about the material learned, followed by teacher reviews and feedback to deepen their understanding.

This study aimed to analyze the impact of using Baamboozle media on the science literacy of fifth-grade students in the topic of Earth's layers. The results were presented through descriptions of pretest and posttest data, complemented by tables for visualization.

Table 4. Pretest Data Description

No	Criteria	Data
1	Number of samples (students)	29
2	Standard Deviation	13,39
3	Variance	170,30
4	Minimun	24
5	Maximum	70
6	Average	48,65

After learning with Baamboozle, students took a posttest to evaluate the improvement in their science literacy. The posttest average score increased to 80.44, with a minimum score of 70 and a maximum score of 98. The standard deviation decreased to 7.27, indicating a more uniform score distribution.

Table 5. Posttest Data Description

No	Criteria	Data
1	Number of samples (students)	29
2	Standard Deviation	7,27
3	Variance	52,97
4	Minimum	70
5	Maximum	98
6	Average	80,44

A paired sample t-test comparison of pretest and posttest results revealed a significant difference in students' scores (p-value < 0.05). This indicates that using Baamboozle media positively impacts students' science literacy.

Table 6. Paired Sample T-test Results

Paired Samples Test						
		Paired Differences		t	df	Sig. (2-tailed)
		95% Confidence Interval of the Difference				
		Lower	Upper			
Pair 1	Nilai_Pretest - Nilai_Postest	-34.34148	-29.24472	-25.556	16	**.000**

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Based on the data on scientific literacy achievements, the following is an analysis of the improvements: The Content indicator showed an increase of 31% (from 29% to 60%). The Context indicator increased by 28% (from 24% to 52%). The Product indicator increased by 29% (from 19% to 48%). This significant improvement demonstrates a notable development in students' scientific literacy, particularly in the Content aspect, which saw the highest increase. This finding proves a difference in students' abilities to understand, connect, and produce science-based outputs before and after participating in science literacy-based learning activities.

The achievements in scientific literacy indicators in the pretest and posttest reflect meaningful differences in students' abilities before and after engaging in literacy-based science learning activities. Among all the indicators, the Product indicator showed the greatest improvement, while the Context indicator displayed the smallest improvement.

During the pretest, students exhibited low abilities in producing science-based outputs, such as creating models of the Earth's layers or explaining the dynamics of Earth's layers. Through science literacy-based learning, students were guided to understand and apply concepts of Earth's structure through concrete activities, such as creating two-dimensional models of Earth's layers using colored paper or origami. Teachers also facilitated learning using interactive videos or simulations of volcanism, illustrating how magma moves from the mantle to the crust, enabling students to visualize these concepts more clearly and tangibly.

The Context indicator, with the smallest improvement, highlights students' continued difficulties in connecting the concept of Earth's structure with real-world phenomena, such as earthquakes, volcanic eruptions, or plate tectonics. During the pretest, students were unable to analyze how these phenomena relate to the dynamics of Earth's layers. Teachers directed students to explore these relationships through case studies or interactive discussions on the impact of plate tectonics on human life. However, some students still struggled to make relevant connections, particularly when asked to explain such phenomena using real-life examples.

This evidence underscores the positive impact of science literacy-based learning on students' ability to understand Earth's structure in terms of Content, Context, and Product. To further enhance the Context indicator, teachers should incorporate more case-study-based activities or simulations involving everyday life, such as analyzing earthquake patterns or the effects of volcanic eruptions.

From the tables, diagrams, and analyses presented, it is evident that the percentage of indicator achievement in the posttest was significantly higher than in the pretest. The improvement in students' abilities is reflected in the difference between pretest and posttest results, where the average student score increased significantly from 48.65 to 80.44 after implementing game-based learning. These findings align with the science literacy theory by (OECD 2019) emphasizing the importance of individuals' ability to understand, analyze, and utilize scientific knowledge to explain natural phenomena and make relevant life decisions. The results show that students were able to identify, analyze, and explain previously abstract concepts, such as Earth's structure. The learning process using Baamboozle enabled students to actively participate in group discussions and answer questions directly. This approach gave students opportunities to communicate their ideas, engage in discussions, and draw conclusions based on facts presented in the game.

Research, as formulated by the *National Research Council* (1996), includes the ability to explain, describe, and predict natural phenomena. In learning about Earth's structure, students demonstrated improved abilities to explain the functions of Earth's layers, analyze the causes of earthquakes, and predict the impacts of volcanic activity. This finding proves that learning approaches actively involving students can help them develop scientific skills relevant to addressing modern challenges.

The success of this study was also supported by a more dynamic and interactive learning atmosphere. Students were divided into small groups to participate in games, encouraging them to collaborate in answering questions related to the material. This activity incorporated elements of challenge and competition, as mentioned by (Hermawan 2024) motivating students further. The Baamboozle game not only enhanced students' understanding of science concepts but also trained their critical thinking skills through group discussions. This process proves that GBL (Game-Based Learning) can create learning experiences that focus not only on information transfer but also on actively involving students in learning activities.

During Baamboozle-based learning, students appeared more enthusiastic and motivated compared to conventional methods. They actively asked questions, participated in discussions, and

showed curiosity about the material. This reflects that GBL can meet educational goals, as noted by (Firosa Nur Aini 2018), by combining lesson content with activities that allow students to engage actively.

Previous research by (Mukti et al. 2023) supports the use of game-based HOTS (High Order Thinking Skills) assessment instruments to enhance scientific literacy among Madrasah Ibtidaiyah students. These instruments were developed using the Quizizz platform, with perfect content validity and very high reliability (0.89). The results showed that 70.96% of students had scientific literacy skills in the good category, with 12.9% in the very high category and 58.06% in the high category. Another supporting study by Triutami et al. (n.d.) on the development of the "Little Danger" game found that game-based learning media effectively improve scientific literacy in early childhood (5-6 years). The results showed a significant increase in posttest scores compared to pretest scores. All 35 students involved in the study demonstrated improved scientific literacy, with an average posttest score 18 points higher than the pretest. The reliability test showed a Cronbach's Alpha coefficient of 0.767, indicating a high level of instrument reliability. These successes indicate that interactive game-based approaches, such as "Little Danger," can enhance children's understanding of complex scientific literacy concepts.

CONCLUSION

Based on data analysis, hypotheses, and discussion, it can be concluded that the game based learning approach with the help of Baamboozle media is highly effective in improving science literacy skills among 5th-grade students at SDN Pundenarum 1. This method successfully aided students in understanding scientific concepts, connecting them to real-life events, and producing science-based solutions. The students' critical thinking and analytical skills were fostered through this engaging and dynamic game-based learning environment. These findings highlight the potential of Baamboozle as an effective tool for improving science literacy standards in elementary schools.

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REFERENCES

Abdullah, Maria, and Kamisah Osman. 2010. “21st Century Inventive Thinking Skills among Primary Students in Malaysia and Brunei.” *Procedia - Social and Behavioral Sciences* 9:1646–51. doi: 10.1016/j.sbspro.2010.12.380.

Aoliyah, Nurlutfi. 2023. “Penggunaan Teknik Game-Based Learning Dalam Pembelajaran Sejarah Dan Dampaknya Terhadap Minat Belajar Siswa.” *Kala Manca: Jurnal Pendidikan Sejarah* 11(1):31–36. doi: 10.69744/kamaca.v11i1.205.

Council, National Research. 2009. *National Science Education Standards Supported*. Vol. 26.

Fadilla, Aylinda Nurul. 2023. “Science, Technology, Engineering and Mathematics (Stem) Approaches To Improving Students’ Learning Outcomes in the Subject of Redox Reactions.” *Jurnal Pembelajaran Sains* 6(1):41. doi: 10.17977/um033v6i1p41-47.

Firosa Nur Aini. 2018. “Pengaruh Game Based Learning ..... Volume 6 Nomor 3 Tahun 2018 PENGARUH GAME BASED LEARNING TERHADAP MINAT DAN HASIL BELAJAR PADA MATA PELAJARAN EKONOMI SISWA KELAS XI IPS Firosa Nur ‘ Aini Program Studi Pendidikan Ekonomi , Fakultas Ekonomi , Universitas.” *Jurnal Pendidikan* 6:249–55.

Hermawan, Wawan. 2024. “Sosialisasi Pemanfaatan Game Base Learning (GBL) Dalam Pembelajaran Di SMP N 2 Ngronggot.” *Communnity Development Journal* 5(1):1263–69.

Irianto, Putri Oviolanda, and Lifia Yola Febrianti. 2017. “Pentingnya Penguasaan Literasi Bagi Generasi Muda Dalam Menghadapi Mea.” *Conference Proceedings Center for International Language Development of Unissula* 640–47.

Iskandar, Sofyan, S. Primanita Rosmana, Adela Agnia, Gaida Farhatunnisa, Pingkan Fireli, and Rayi Safitri. 2022. “Pengunaan Aplikasi Baamboozle Untuk Meningkatkan Antusias Belajar Siswa Di Sekolah Dasar Sofyan.” *Jurnal Pendidikan Dan Konseling* 4(6):12052.
Jupriyanto, Jupriyanto, and Turahmat Turahmat. 2018. “Bahan Ajar Multimedia Interaktif Ilmu Pengetahuan Alam Sebagai Media Pembelajaran Inovatif.” *Jurnal Ilmiah Pendidikan Dasar* 4(2):119. doi: 10.30659/pendas.4.2.119-128.
Kemendikbud. 2020. “Literasi Sains.” *Gerakan Literasi Nasional* 1–36.
Larasati, Andini, and Rizky Pratama. 2024. “Pembelajaran Game-Based Learning Dalam Pengajaran Sains Untuk Siswa Kelas 2 Sekolah Dasar Di Sekolah XYZ Jakarta.” 4(June):88–95.
Linder, Anne, John Airey, Nokhanyo Mayaba, and Paul Webb. 2014. “Fostering Disciplinary Literacy? South African Physics Lecturers’ Educational Responses to Their Students’ Lack of Representational Competence.” *African Journal of Research in Mathematics, Science and Technology Education* 18. doi: 10.1080/10288457.2014.953294.
Mukti, Taufiq Satria, Melly Elvira, and Zaharah Binti Hussin. 2023. “Development of the Game-Based HOTS Assessment Instrument for Measuring Science Literacy Skills of Islamic Elementary School Students.” *Al Ibtida: Jurnal Pendidikan Guru MI* 10(1):63. doi: 10.24235/al.ibtida.snj.v10i1.11393.
OECD. 2019. *PISA 2018 Assessment and Analytical Framework*.
Sugiyono. 2019. “Metode Penelitian Pendidikan (Kuantitatif, Kualitatif, Kombinasi, R&D Dan Penelitian Pendidikan). Metode Penelitian Pendidikan, 67.” *Teaching, Learning and Development* 1(1):43–53. doi: 10.62672/telad.v1i1.8.
Triutami, Nita, Nur Ika, Sari Rakhmawati, and Wulan Patria Saroinsong. n.d. “PENGEMBANGAN GAME ‘ LITTLE DANGER ’ UNTUK STIMULASI LITERASI SAINS ANAK USIA 5-6 TAHUN.” 12(1):203–12.
Wahyu, Endah. 2020. “Analisis Buku Siswa Mata Pelajaran IPA SMP/MTs Kelas VII Semester I Berdasarkan Kategori Literasi Sains.” 500.
Wibawa, Aisyah Cinta Putri, Hashina Qiamu Mumtaziah, Lutfiah Anisa Sholaihah, and Rizki Hikmawan. 2020. “Game-Based Learning (Gbl) Sebagai Inovasi Dan Solusi Percepatan Adaptasi Belajar Pada Masa New Normal.” *INTEGRATED (Journal of Information Technology and Vocational Education)* 2(1):49–54. doi: 10.17509/integrated.v3i1.32729.
Wulandari, Sekar Ayu, and Sani Safitri. 2024. “Penerapan Metode Game Based Learning Dalam Materi Sejarah Bandung Lautan Api Di Kelas XI IPS SMA Negeri 4 Pagar Alam.” *JIPSOS: Jurnal Inovasi Pendidikan Dan Ilmu Sosial* 2(1):334–41.
yuyu yulianti. 2017. “LITERASI SAINS DALAM PEMBELAJARAN IPA.” *Prosiding SNFA (Seminar Nasional Fisika Dan Aplikasinya)* 2(2):257. doi: 10.20961/prosidingsnfa.v2i0.16408.