Journal of Educational Sciences
Journal homepage: https://jes.ejournal.unri.ac.id/index.php/JES

P-ISSN 2581-1657
E-ISSN 2581-2203

Analysis of the Application of Interactive Flashcard Learning Media to Improve Learning Outcomes and Science Literacy in Elementary Schools (2019-2025)

Eli Sofiana[1*], Eko Handoyo[2], Sri Wardani[3], Bambang Subali[3] & Nuni Widiarti[3]
[1]*Pendidikan Dasar Sekolah Pascasarjana, Universitas Negeri Semarang, Semarang, 50229, Indonesia*
[2]*Fakultas Ilmu Sosial dan Politik, Universitas Negeri Semarang, Semarang, 50229, Indonesia*
[3]*Pendidikan Kimia, FMIPA, Universitas Negeri Semarang, Semarang, 50229, Indonesia*

ARTICLE INFO

Article history:

Received: 25 Sept 2025
Revised: 20 Oct 2025
Accepted: 25 Oct 2025
Published online: 05 Nov 2025

Keywords:

Elementary School;
Flashcard;
Interaktive Learning Media;
Science Literacy

[*] Corresponding author:

E-mail: elisofiana@students.unnes.ac.id

Article Doi:

https://doi.org/10.31258/jes.9.6.p.4813-4825

This is an open access article under the CC BY-SA license.

A B S T R A C T

In line with the times and the needs of the world of education, the Merdeka Curriculum has been introduced as one of the government's efforts to improve the quality of learning in Indonesia. This article aims to analyze the application of interactive flashcard learning media in elementary schools, with a focus on the use of interactive flashcard learning media in the teaching and learning process, particularly in science subjects. The method used in this study is a literature review of 25 research journals related to the use of flashcards in learning in elementary schools. Based on the results of the literature analysis, it can be shown that the use of interactive flashcard learning media has a positive impact on the learning process, including improving learning outcomes and students' science literacy in science subjects. Flashcards have also been proven to be effective in helping students remember material and improve science literacy skills. In addition, flashcards can create a more enjoyable and interactive learning atmosphere, so that students participate more actively in learning activities. Thus, the application of this media is highly recommended as an alternative learning media in elementary schools.

1. Introduction

In line with the times and the needs of the world of education, the Merdeka Curriculum has been introduced as one of the government's efforts to improve the quality of learning in Indonesia (Fitriyeni, 2023). This curriculum gives educational units and educators the freedom to design a learner-centered learning process, tailored to the characteristics, potential, and needs of students (Apfani, 2022). One of the main objectives of the Merdeka Curriculum is to shape Pancasila-based learners who are characterized by critical thinking, creativity, and adaptability to global developments (Palinussa et al., 2023). In this context, science learning in elementary schools is an important part that emphasizes not only mastery of

concepts but also the development of science literacy, analytical thinking skills, and problem solving (Ahdhianto et al., 2024), (Astuti et al., 2023).

The reality in the field shows that the implementation of science learning in elementary schools still faces various challenges. One of the main challenges is how teachers are able to convey science material that is quite abstract in a way that is easily understood by students who are still in the concrete cognitive development stage (Putri, 2023). Teachers often still use lecture methods or conventional approaches without integrating interesting and interactive learning media (Yuliantoro, 2022). This condition has an impact on students' low interest in learning science subjects and suboptimal understanding of the concepts presented.

The use of interactive learning media is one solution that can be applied in science learning. Interactive learning media plays an important role in helping teachers deliver material in a more interesting, visual, and easy-to-understand way for students (Ramadhani et al., 2024). One form of interactive learning media that is simple but effective is flashcards (Rahayu et al., 2025). Flashcards are cards containing images, words, or specific concepts that can be used as teaching aids in the learning process. The use of flashcards provides strong visual stimuli, helps improve students' memory, and creates a more active and enjoyable learning atmosphere (Rusdiana, 2022).

Another benefit of using flashcards is their ability to increase students' motivation and interest in learning science. Flashcards that are designed to be attractive, colorful, and creative can make students more enthusiastic and less likely to get bored during learning (Dewi, 2023). Thus, students do not just receive the material, but are also eager to explore and understand the concepts being taught (Sapira, 2024). This medium is very suitable for supporting Merdeka Curriculum-based learning, which emphasizes differentiated learning centered on the needs and characteristics of students (Hesti, 2022). By utilizing flashcards optimally, teachers can create science learning that is more meaningful, interactive, and enjoyable for students.

The purpose of this article is to determine the application of interactive flashcard learning media in elementary schools through a literature study of 25 journals published in recent years. The aim is to summarize whether the application of interactive flashcard learning media can have a positive effect on the learning process of elementary school students (Nuraini, 2022). This paper provides an in-depth review of various research results on interactive flashcard learning media in the context of learning in elementary schools. This article is expected to be an innovation in determining the effectiveness of flashcard media in improving student learning outcomes and science literacy (Setiawati et al., 2020). In addition, the results of this study are expected to be taken into consideration by teachers, education practitioners, and researchers in developing and implementing attractive and effective interactive learning media in elementary schools (Zourmpakis, 2022).

This analysis was conducted by reviewing various references, both national and international journals, published in the last five years. Each study reviewed provides

valuable information on how flashcards are used in the learning process, particularly in science subjects, and how they affect the learning process of students (Alsadoon et al., 2022), (Pratiwi et al., 2022).

The main objective of the literature study was to provide a comprehensive overview of the effectiveness of using flashcards in improving the quality of science learning in elementary schools (Latifah et al., 2023). Flashcards, as an interactive medium, play an important role in helping students understand science concepts that are often abstract. Through the images, symbols, and brief information presented in flashcards, students can more easily visualize the material being taught (Fitriyani, 2024). In addition, the use of this media is also able to create an active and enjoyable learning atmosphere and encourage student engagement in the learning process (Slemrod et al., 2023).

2. Methodology

This study is a type of qualitative research using a literature review approach. Data processing was carried out using qualitative methods. Qualitative research is used to study, describe, and explain the quality or characteristics of social phenomena, in this case related to the impact of using flashcards on science learning in elementary schools (Setiawati et al., 2020). This qualitative research is based on a post-positivist paradigm, with the researcher as the main instrument in the data collection and analysis process. Data sources were selected purposively, based on the relevance of journals and articles to the topic being studied (Krisdiana, 2023). The data collection technique was triangulation, which combines various data sources from literature journals. Data analysis was conducted inductively and qualitatively, and the research results emphasized meaning rather than numbers (Kurnia Sari et al., 2020). The literature review process was conducted in several stages, namely:

a. Determining the Topic and Formulating the Problem
The researcher determined the topic of study, namely the application of interactive flashcard learning media in science education in elementary schools. The focus of the problem was clearly formulated to guide the process of searching and analyzing the literature.

b. Literature Search
Literature was searched using the Publish or Perish search engine with keywords such as “Flashcard Media in Science Education in Elementary Schools” or “The Use of Flashcards to Improve Science Learning Outcomes in Elementary Schools.” The researcher prioritized journals available in full-text PDF format, with clear and relevant sources, published within the last five years.

c. Literature Selection and Evaluation
Each article found will be evaluated to ensure its suitability for the study topic. Articles discussing the use of flashcards in the context of science learning in

elementary schools, either independently or in combination with specific learning models, will be selected.

d. Data Extraction
After the relevant literature has been collected, the researcher extracts data by identifying important information from each journal, such as the title, author, research objectives, class or level, media used, and research findings.

e. Compilation of Journal Matrix Tables
The data from these journals is then compiled into a journal matrix table to facilitate the analysis process. This table contains information about the author, title, school level, learning method, and the resulting impact, making it easier to compare studies.

f. Data Analysis
The analysis is carried out by comparing existing research results, looking for similarities, differences, and trends in the use of flashcards. The researchers discussed the contribution of each study to the understanding of the effectiveness of flashcards in increasing learning interest, concept understanding, and science learning outcomes of elementary school students. Based on the analysis results, the researchers drew conclusions about the effectiveness of flashcards and provided recommendations for educators and future researchers (Lu et al., 2021).

3. Result and Discussion

The results of a literature study show that the use of interactive flashcard learning media in science education in elementary schools has a significant impact on improving the quality of the teaching and learning process (Hayati, 2021). The use of interactive media such as flashcards helps teachers deliver material in a more interesting and effective way (Wangi, 2021). Teachers can directly involve students in the learning process, making them more active and enthusiastic in participating in learning activities (Arsyaf et al., 2022). Flashcards have also been proven to increase students' creativity in learning and reduce boredom during the learning process (Ainulfais, 2025). With attractive visuals, flashcards make it easier for students to understand science concepts, both concrete and abstract. In addition, the use of flashcards encourages students to think creatively, connect one concept to another, and improve their memory of the material being studied (Utami et al., 2021).

Through activities such as educational games, question and answer sessions, or group discussions using flashcards, students become more actively involved. This creates a more enjoyable and interactive learning atmosphere. The learning process is no longer one-way, but places students as active subjects in constructing their own knowledge (Ainulfais, 2025). Thus, the use of interactive flashcards as a learning medium has been proven effective in improving learning outcomes, activity, and thinking skills of students in science learning in elementary school (Yuliana et al., 2025). The use of interactive learning media such as flashcards has

become one of the alternative teaching strategies that has been widely discussed in basic education research. Flashcards have been proven to contribute significantly to improving student learning outcomes and science literacy. A study by (Faridah et al., 2021) shows that third-grade students who use this media demonstrate better conceptual understanding and increased enthusiasm for learning, with 76.25% of students strongly agreeing that flashcards help them understand science material.

Additionally, research by Febriyanto (2019) in fourth grade showed that students' average scores increased from 52.7 to 74.7 after two cycles of using flashcards. Another study by Nuraini (2022) even proved that barcoded flashcards were able to significantly improve students' science literacy through the integration of technology. Thus, it can be concluded that flashcards not only help in mastering the material, but also stimulate students' critical, creative, and analytical thinking skills in the context of science. The use of interactive flashcard learning media in science learning in elementary schools has shown a significant positive impact. This discussion will be divided into two parts: first, based on the grade level at which flashcards are applied; second, based on the impact of their use on student learning outcomes and science literacy (Oktaviani, 2024).

The Use of Flashcards Based on Grade Level

Research shows that flashcards are effective for use at various grade levels in elementary school, both lower grades (grades 1-3) and upper grades (grades 4-6) (Suratimah et al., 2023). Flashcards are small cards containing pictures, text, or symbols designed to help students remember or understand specific concepts. The use of flashcards in science learning can make the learning process more interesting and interactive for students.

Use of Flashcards in Lower Grades (Grades 1-3)

The use of interactive learning media such as flashcards has been proven effective in improving student learning outcomes, especially in Natural Sciences (IPA) in Grade 3 of elementary school. Several recent studies show that the use of flashcards can improve students' conceptual understanding and motivation to learn. For example, a study (Faridah et al., 2021) conducted at SD Negeri 2 Bungbulang showed that the use of flashcards in Grade III science learning can maintain and improve student learning outcomes. The students' response to the use of this media was very positive, with 76.25% of students stating that they “strongly agree” that flashcards help them understand the material. The use of interactive learning media such as flashcards has been proven effective in improving student learning outcomes and science literacy in elementary schools, especially in lower grades (grades 1-3).

Use of Flashcards in Upper Grades (Grades IV-VI)

In a study conducted (Febriyanto, 2019) in Grade IV of SDN I Pesanggrahan, the use of flashcards was proven to be effective in improving student learning outcomes. This study was a classroom action research conducted collaboratively

between teachers and researchers in two cycles. The research subjects consisted of 26 Grade IV students. Before the implementation of flashcards, the class average score was 52.7 with a student mastery rate of 30.8%. After cycle I, the average score increased to 66.2 with a mastery rate of 53.8%. In cycle II, the average score reached 74.7 with a mastery rate of 80.8%. These results indicate that the use of flashcards can improve student learning outcomes in social studies in the fourth grade at SDN I Pesanggrahan.

The use of interactive flashcards as a learning medium has been proven to be effective in improving student learning outcomes and science literacy in elementary schools. In the lower grades (grades 1-3), flashcards help students understand basic science concepts in an interesting and easy-to-understand way, as well as increase their motivation to learn. Meanwhile, in the upper grades (grades IV-VI), flashcards are able to deepen students' understanding of more complex concepts, as evidenced by the increase in students' average scores and learning completeness after using this media (Bikalawan et al., 2024).

The Impact of Flashcards on Science Learning

The use of flashcards in science learning has several positive impacts, including:

Improving Learning Outcomes

Learning is essentially a process that brings about change in a person. These changes include various things such as increased knowledge, understanding, attitudes, behavior, skills, abilities, and other capabilities (Nurhasanah, 2022). Learning outcomes are the abilities or competencies that students acquire after participating in the learning process designed by teachers in the classroom. Learning outcomes arise as a result of the interaction between student learning activities and teacher teaching activities, and this process ends with an evaluation to measure its success. Learning outcomes can also be understood as positive changes in students, including knowledge, skills, attitudes, values, and thinking abilities (Slemrod et al., 2023). These changes indicate the development and improvement of students' abilities after they have participated in the learning process.

In other words, learning outcomes reflect the extent to which students are able to master the material, develop skills, and form better attitudes and behaviors after learning. In a study conducted by Oktaviani (2024), the use of flashcards helped students understand science concepts better, as reflected in an increase in average scores and learning completion rates. Overall, the use of interactive flashcards as a learning medium in science learning in elementary schools has a significant positive impact, especially in improving students' learning outcomes and critical thinking skills. The implementation of this medium can be an effective alternative for teachers in delivering science material in an interesting and interactive way (Nugraha, 2022).

Improving Science Literacy

Science literacy is the ability to understand scientific concepts and processes, enabling individuals to make informed decisions, think critically, and participate in a science-based society. It includes the ability to identify questions, acquire new knowledge, explain scientific phenomena, and draw conclusions based on facts (Laksana, 2024). The use of interactive learning media, such as flashcards, has been proven effective in improving science literacy in elementary schools. Flashcards are learning aids that display information in the form of cards, usually with questions on one side and answers on the other, which help students remember and understand key concepts.

In a study (Nuraini, 2022) entitled Development of Barcoded Flashcard Media on the Effect of Heat on Temperature Change and the Form of Objects, barcoded flashcard media was developed for material on the effect of heat on temperature change and the form of objects. The results of the study showed that the use of this media was effective in improving the science literacy of fifth-grade elementary school students. There was a significant difference between students' pretest and posttest scores after using the flashcard media. In the study (Yuliantoro, 2022) entitled Utilization of Barcoded Flashcards to Improve Science Literacy Activities of Students at SDN Tileng Dagangan Elementary School. This study evaluated the effectiveness of using barcoded flashcards in improving students' science literacy activities. The results showed that the use of barcoded flashcards was effective in improving students' science literacy skills.

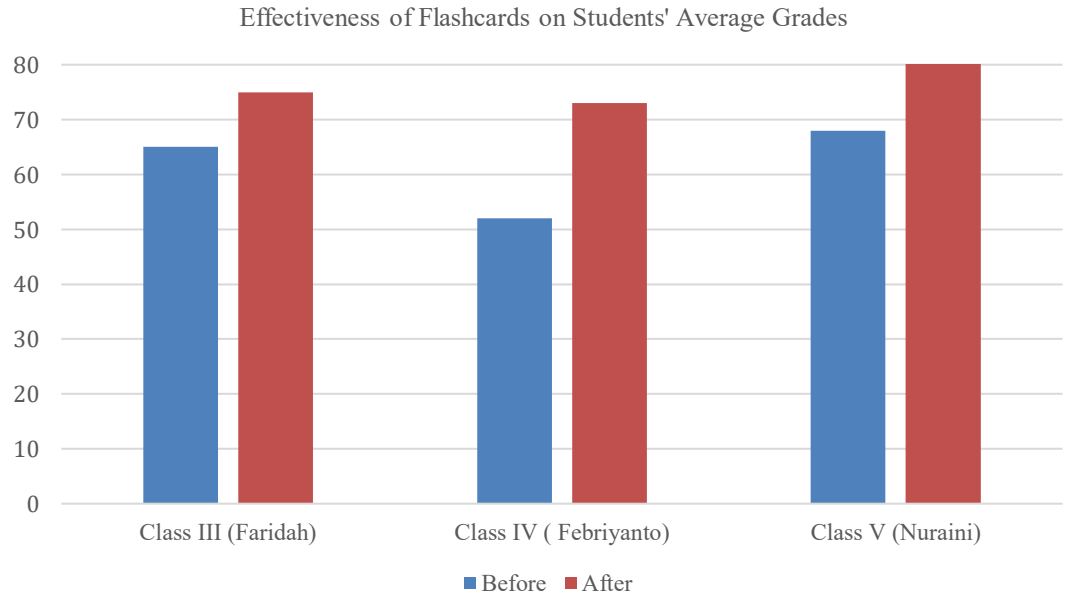
In a study (Rohmatin et al., 2023) entitled The Use of Flashcards to Improve Second Grade Students' Recognition of Letter Forms in Indonesian Language Lessons at SD Inpres Malakaya, Gowa Regency, the aim was to determine the use of flashcards in improving second grade students' recognition of letter forms. The results showed that the use of flashcards can improve students' letter recognition, which is part of basic science literacy. Based on a review of 25 journals analyzed, it can be concluded that the use of interactive flashcard learning media consistently shows a significant positive impact on improving the quality of science learning in elementary schools. From all the studies analyzed, it was found that flashcards are not only effective in helping students understand basic and complex concepts in science learning, but also able to increase student motivation, active involvement, and critical thinking skills.

In general, the use of flashcards at various grade levels yields similar results. In lower grades (I-III), flashcards help students recognize and understand basic science concepts in a more concrete, visual, and enjoyable way. This is very important because at this age, students are still in the concrete operational stage of cognitive development, so they need learning media that can stimulate their visual thinking. Meanwhile, in higher grades (IV-VI), flashcards have been proven effective in deepening students' understanding of more abstract and complex science concepts, accompanied by a significant increase in class average scores and learning completion rates (Table 1).

Table 1. Effectiveness of Flashcards in Science Learning Based on Grade Level

Grade Levels	Researcher	Method	Impact of Learning Outcomes	The Impact of Science Literacy
Class I-III	Faridah et al. (2021)	Quantitative Study	Increased motivation and understanding of basic science concepts	Learning is more enjoyable and visual
Class II	Rohmatin et al. (2023)	PTK	Improved letter recognition	Basic literacy improves.
Class IV	Febriyanto & Yanto (2019)	PTK 2 Siklus	Average scores increased from 52.7 to 74.7	
Class V	Nuraini & Suryanti (2022)	Research R&D	Measurable improvement in learning outcomes through pretest-posttest	Increases student active participation

In addition to impacting learning outcomes, the use of flashcards also contributes significantly to improving students' science literacy. Through attractive visual displays and concise yet comprehensive information, students find it easier to understand scientific processes, identify questions, and connect the scientific concepts they learn with their daily lives. Studies conducted by Nuraini (2022), Yuliantoro (2022), and Rohmatin et al. (2023) show that flashcards, both conventional and technology-based (such as barcoded flashcards), are effective in improving students' science literacy in innovative ways (Figure 1). Therefore, in today's modern education era, the use of creative and interactive learning media such as flashcards is highly recommended for wider implementation in primary education settings (Maharani, 2024).



Sources: Faridah et al. (2021), Febriyanto (2019), Nuraini (2022)

Figure 1. Effectiveness of Flashcards on Students' Average Scores

The graph shows the changes in students' average scores in three different studies before and after using interactive flashcards as learning media. In third grade, a study by Faridah et al. (2021) showed that students' average scores increased significantly after the implementation of flashcards, from 65 to 76.25. This shows that visual media such as flashcards are effective in helping early-age students understand concrete science concepts. A study by Febriyanto and Yanto (2019) in fourth grade also showed a notable increase from 52.7 to 74.7 after two cycles of implementing flashcards. This study supports the finding that the integration of visual and interactive media can overcome difficulties in delivering abstract material to middle school students.

Furthermore, Nuraini (2022) in her research on fifth-grade students used barcode-based flashcard innovations, which combine technology with visual learning. The average student score increased from 68 to 84. This shows that simple technology-based learning can improve teaching effectiveness, including in building more complex science literacy skills. In general, this graph confirms the effectiveness of flashcards as a medium that not only conveys information visually and attractively, but also improves students' conceptual understanding and cognitive achievement. This upward trend is in line with various modern studies that suggest the use of digital and visual media in science education (Fitriyani, 2024; Maharani, 2024).

In the future, the trend of using visual and digital-based learning media, including interactive flashcards, is expected to continue to grow along with increased access to technological devices in school environments. Innovations such as digital flashcards integrated with augmented reality (AR) or interactive audio can be a more immersive and adaptive learning solution (Puspasari, 2024). Additionally, the prospects for developing this medium are also wide open for personalizing materials based on students' levels of understanding, as well as integration with online learning platforms. Thus, flashcards have the potential to become a relevant, effective, and flexible learning medium of the future in supporting the achievement of 21st-century educational goals.

4. Conclusion

The results of a literature review indicate that the implementation of interactive flashcard learning media in science lessons in elementary schools has a significant positive impact on the quality of the teaching and learning process. The use of interactive flashcard learning media in science lessons in elementary schools has proven effective in improving learning quality. Flashcards help teachers deliver material in an engaging manner, motivating students to be more active, enthusiastic, and creative. In lower grades (I-III), flashcards facilitated a concrete and visual understanding of basic science concepts. Meanwhile, in higher grades (IV-VI), flashcards deepened understanding of more complex concepts, as evidenced by increases in average grades and learning completion. In addition to improving learning outcomes, flashcards also improved scientific literacy, encouraged critical thinking, and connected concepts to everyday life. Therefore, flashcards are an

effective medium for improving learning outcomes and scientific literacy in elementary school students.

Acknowledgement

The author expresses his deepest gratitude to all parties who contributed to the preparation of this article. Special thanks go to the Graduate School of Semarang State University and all the supervising lecturers for their guidance, input, and scientific support. Thanks are also extended to the journal authors and researchers who served as primary sources in this literature review, ensuring the successful completion of this article. We hope this article will be beneficial to educators, researchers, and others involved in the development of interactive learning media in elementary schools.

References

Ahdhianto, E., Masula, S., Thohir, M. A., & Khotimah, K. (2024). Pengembangan E-modul berbasis PBL untuk meningkatkan keterampilan pemecahan masalah dan berpikir kritis siswa sekolah dasar. *Jurnal Math Educator Nusantara: Wahana Publikasi Karya Tulis Ilmiah Di Bidang Pendidikan Matematika*, *10*(1), 167–178. https://doi.org/10.29407/jmen.v10i1.22376

Ainulfais, F. A. (2025). *Pengembangan Media Augmented Reality Untuk Meningkatkan Pengetahuan Sains Siswa Kelas Iii Sd Negeri Karangroto 04* (Doctoral dissertation, Universitas Islam Sultan Agung Semarang). https://doi.org/10.12345/njms.v2i7.1111

Alsadoon, E., Alkhawajah, A., & Suhaim, A. Bin. (2022). Effects of a gamified learning environment on students' achievement, motivations, and satisfaction. *Heliyon*, *8*(8), e10249. https://doi.org/10.1016/j.heliyon.2022.e10249

Apfani, S., Utami, E. P., & Suryani, A. I. (2022). Efektivitas media pembelajaran flashcard pada keterampilan membaca permulaan di kelas I Sekolah Dasar. *Jurnal Pendidikan Tambusai*, *6*(2), 16789-16796.

Arsyaf, F., Usman, H., Aunurrahim, M., & Yulianingsih, S. (2022). Pengembangan media pembelajaran e-Flashcard berbasis website untuk pembelajaran IPA SD. *Jurnal Pendidikan Dan Kebudayaan (JURDIKBUD)*, *2*(3), 349-357.

Astuti, E. M. W., Hambali, H., & Nur, A. M. (2024). Pengaruh Penggunaan Media Flashcard Terhadap Hasil Belajar IPA Siswa Kelas IV SDN Kompleks IKIP. *Didaktik: Jurnal Ilmiah PGSD STKIP Subang*, *10*(2), 190-198.

Bikalawan, S. S., Al Ardha, M. A., Indahwati, N., Wijaya, A., Nurhasan, N., Ridwan, M., & Yang, C. B. (2024). Flash Card Learning Media in Physical Education Improves Students' Locomotor Movement Skills. *Retos*, *57*, 80–87. https://doi.org/10.47197/retos.v57.105460

Dewi, N. M. A. P. (2023). Penerapan Model Pembelajaran Make A Match Berbantuan Media Flash Card untuk Meningkatkan Kompetensi Pengetahuan IPA Siswa Kelas V. *Mimbar Pendidikan Indonesia*, 3(1), 45–55. https://ejournal.undiksha.ac.id/index.php/JIPI2/article/view/60239

Faridah, A. U. N., Nugraha, W. S., Mutaqin, E. J., & Soraya, D. D. (2021).

Penggunaan Media Pembelajaran Flashcard Dalam Mata Pelajaran IPA SD Kelas III. *Social, Humanities, and Education Studies (SHEs): Conference Series*, *5*(2), 593–601.

Febriyanto, B., & Yanto, A. (2019). Penggunaan media flash card untuk meningkatkan hasil belajar siswa sekolah dasar. *Jurnal Komunikasi Pendidikan*, *3*(2), 108-116.

Fitriyeni, F. (2023). Pengembangan LKPD Digital Berbasis Etnosains Melayu Riau pada Muatan IPA Sekolah Dasar. *Jurnal Basicedu*, *7*(1), 441–451. https://doi.org/10.31004/basicedu.v7i1.4399

Hayati, D. K. (2022). (2021). Pengembangan Media Pembelajaran Flashcard pada Materi Klasifikasi Makhluk Hidup. Al-Jahiz: *Journal of Biology Education Research*, 3, 82–93.

Hesti, R. M. , & N. L. (2022), & Nuryanti, L. (2022). Efektivitas Media Flashcard terhadap Keterampilan Menulis Kosakata Bahasa Inggris Siswa Sekolah Dasar. *JIP (Jurnal Intervensi Psikologi)*, 14(1), 85–92.

Krisdiana, M., & Jamaludin, U. (2023). Pengaruh media flash card untuk meningkatkan hasil belajar siswa sekolah dasar. *Jurnal Ilmiah Pendidikan Citra Bakti*, *10*(2), 341-354.

Laksana, B., & Putra, G. M. C. (2024). Pengembangan Media Smart Flashcard pada Muatan Pembelajaran IPAS untuk Meningkatkan Hasil Belajar Peserta Didik Kelas V SDN Bandar 03 Batang. *FONDATIA*, *8*(3), 554-574.

Latifah, N., Saifuddin, A., & Widiarini, W. (2023). Developing The Snake And Ladder Game As Media For Teaching Vocabulary At Ma Al Khoiriyah. *Jurnal Ilmiah Mandala Education*, *9*(3), 1717–1727. https://doi.org/10.58258/jime.v9i3.5506

Lu, M., Farhat, J. H., & Beck Dallaghan, G. L. (2021). Enhanced Learning and Retention of Medical Knowledge Using the Mobile Flash card Application Anki. *Medical Science Educator*, *31*(6), 1975–1981. https://doi.org/10.1007/s40670-021-01386-9

Maharani, S. A., & Wati, D. P. (2024). The impact of flashcard media on student cognitive improvement in IPAS subjects at elementary school. *SPEKTRA: Jurnal Kajian Pendidikan Sains*, *10*(2), 307-317.

Nugraha, D. M. D. P. (2022). Hubungan kemampuan literasi sains dengan hasil belajar ipa siswa sekolah dasar. *Jurnal Elementary*, *5*(2), 153-158.

Nuraini, A., & Suryanti. (2022). Pengembangan Media Flashcard Berbarcode Materi Pengaruh Kalor Terhadap Perubahan Suhu dan Wujud Benda Untuk Meningkan Literasi Saisn Siswa Kelas V Sekolah Dasar. *Jurnal Pendidikan Guru Sekolah Dasar*, *10*(2), 302–316.

Nurhasanah, S. (2022). Pengembangan media pembelajaran papan pintar pada mata pelajaran IPA kelas IV SD negeri rejosari. *Linggau Journal Science Education (LJSE)*, *2*(2), 174-183.

Oktaviani, P., & Isdaryanti, B. (2024). Learning Media for Sound Picture Cards Based on E-Flashcard Quizlet Content for Elementary School IPAS Lessons. *Journal of Education Technology*, *7*(4), 742–751. https://doi.org/10.23887/jet.v7i4.69680

Pratiwi, F. P., & Gunansyah, G. (2022). Pengembangan Media Kartu Bergambar untuk Meningkatkan Kemampuan Berpikir Kritis Siswa Kelas IV Sekolah Dasar. *Jurnal Penelitian Pendidikan Guru Sekolah Dasar*, *10*(02).

Puspasari, A. D., Afiani, K. D. A., & Setiawan, F. (2024). Pengembangan media fraction AR (augmented reality) berbasis assemblr edu pada pembelajaran matematika materi pecahan sederhana kelas II SD. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, *9*(3), 1888-1904.

Putri, M. L., & Syofyan, H. (2023). Pengembangan Bahan Ajar E-Book Berbasis Pendekatan Saintifik Pada Mata Pelajaran IPA Kelas 3 SD. *Efektor*, *10*(2), 263–273. https://doi.org/10.29407/e.v10i2.20640

Ramadhani, A. A., & Andriani, A. E. (2024). Development of Interactive E-Module Based on Inquiry Learning to Enhance IPAS Learning Outcomes for Students Public Elementary School. *Jurnal Pijar Mipa*, *19*(2), 209-215.

Rohmatin, B., Akib, T., & Muhammad, S. (2023). Penggunaan Media Flashcard Untuk Meningkatkan Pengenalan Bentuk Huruf Siswa Kelas II Pada Mata Pelajaran Bahasa Indonesia di SD Inpres Malakaya Kabupaten Gowa. *Jurnal Bima: Pusat Publikasi Ilmu Pendidikan Bahasa Dan Sastra*, *1*(3), 44–65.

Rusdiana, N. P. M., & Wulandari, I. G. A. A. (2022). E-Book Interaktif Materi Siklus Air pada Pembelajaran IPA untuk Meningkatkan Hasil Belajar Siswa Kelas V Sekolah Dasar. *MIMBAR PGSD Undiksha*, *10*(1), 54–63. https://doi.org/10.23887/jjpgsd.v10i1.45180

Rahayu, S. S., Alpian, Y., & Dewi, S. M. (2025). Pengaruh Media Flashcard Terhadap Kemampuan Membaca Permulaan Siswa Sekolah Dasar. *Jurnal Pendidikan Dasar*, *6*(1), 38-51.

Sapira, & Ansori, I. (2024). Development of Science Learning Media Based on Augmented Reality Book with Problem Based Learning Model to Improve Learning Outcomes of Third Grade Students. *Jurnal Penelitian Pendidikan IPA*, *10*(6), 3249–3260. https://doi.org/10.29303/jppipa.v10i6.7642

Setiawati, N. L. M., Dantes, D. N., Candiasa, D. I. M., & Komp, M. I. (2015). Pengaruh Penggunaan Media Gambar Flash Card Terhadap Minat dan Hasil Belajar IPA Peserta Didik Kelas VI SDLBB Negeri Tabanan. *Jurnal Penelitian Dan Evaluasi Pendidikan Indonesia*, *5*(1).

Slemrod, T., Howorth, S., Wood, L., Lemmi, C., Hart, S., Cheney, D., & West, E. (2023). A Comparison of Science Vocabulary Acquisition Using Keyword Mnemonics via Technology and Flash Cards. *Journal of Special Education Technology*, *38*(3), 301–313. https://doi.org/10.1177/01626434221100729

Suratimah, D. , S. & D. I. (2023)., Sumarmo, & Dwijayanti, I. (2023). Pengembangan media flashcard pada pembelajaran IPA materi perpindahan panas kelas V sekolah dasar kota Semarang. *Ta'rim: Jurnal Pendidikan Dan Anak Usia Dini*, 4(3), 117–126.

Utami, F., Rukiyah, R., & Andika, W. D. (2021). Pengembangan media flashcard berbasis augmented reality pada materi mengenal binatang laut. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *5*(2), 1718-1728.

Wangi, I. D. A. N. P., & Angung, A. A. G. (2021). Pengembangan Media Pembelajaran E-Flashcard Pada Muatan Pelajaran IPA Kelas V. *Mimbar PGSD Undiksha*, *9*(1), 150-159. https://ejournal.undiksha.ac.id/index.php/jjpgsd/article/view/32355

Yuliana, I., Jatmiko, B., Widodo, W., Suryanti, & Irwanto. (2025). Primary education students' scientific literacy in terms of some variables. *Edelweiss Applied Science and Technology*, *9*(1), 1277–1288.

https://doi.org/10.55214/25768484.v9i1.4384

Yuliantoro, S. (2022). Pemanfaatan Media Flashcard Berbarcode Untuk Meningkatkan Aktivitas Literasi IPA Siswa SDN Tileng Dagangan. *Jurnal Literasi Digital*, *2*(2), 96–101. https://doi.org/10.54065/jld.2.2.2022.132

Zourmpakis, A. I., Papadakis, S., & Kalogiannakis, M. (2022). Education of preschool and elementary teachers on the use of adaptive gamification in science education. *International Journal of Technology Enhanced Learning*, *14*(1), 1–16. https://doi.org/10.1504/IJTEL.2022.120556

How to cite this article:

Sofiana, E., Handoyo, E., Wardani, S., Subali, B., & Widiarti, N. (2025). Analysis of the Application of Interactive Flashcard Learning Media to Improve Learning Outcomes and Science Literacy in Elementary Schools (2019-2025). *Journal of Educational Sciences*, *9(6)*, 4813-4825.