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Application of Multimedia Interactive Learning Based on Educational Games to Increase Motivation & Independence of Science Learning of Elementary School Students: *Literature Review*

A. Afrinaramadhani Hatta[1], Shoffan Fatkhulloh[2]

[1,2] Jurusan Pendidikan IPA, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Negeri Makassar

Article

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Abstract

This study aims to examine the effectiveness of the application of interactive learning multimedia based on educational games in increasing the motivation and independence of junior high school students in science subjects. The method used was literature review by analyzing 29 relevant scientific articles from national and international journals, which were selected through a systematic selection process using the PRISMA approach. The analysis focused on the type of multimedia used, research methods, and its impact on students' motivation and learning independence. The results showed that most studies reported a significant increase in learning motivation, student engagement, and understanding of science concepts after the use of interactive multimedia. Educational and gamification-based game-based media have proven to have a stronger influence than conventional media because they are able to create an interesting, interactive, and not boring learning experience. In addition, interactive multimedia also encourages students to learn independently through exploratory features, direct feedback, and flexibility in regulating the pace of learning. However, the effectiveness of multimedia use is influenced by the type of media, learning approach, and the readiness of teachers and the learning environment. This research contributes to strengthening the understanding of the importance of technology integration in science learning and becomes a reference for the development of more innovative and adaptive learning media at the junior high school level.

INTRODUCTION

The rapid advancement of digital technology has brought significant transformation in the world of education, including in the learning process of

Natural Sciences (IPA) at the junior high school level. One form of innovation that is now widely adopted is the use of interactive learning multimedia, which is considered to be able to create a more interesting, dynamic learning experience, and place students as the center of learning. Through its ability to combine various elements such as text, images, audio, video, animation, and simulation, interactive multimedia is considered effective in helping students understand science concepts that tend to be abstract. More than that, the use of this media is also believed to encourage more active involvement of students in learning activities, when compared to conventional learning approaches that still place teachers as the main source of information (Maharani, 2025; Rahmawati *et al*., 2024)

On a practical level, science learning is still faced with a number of quite serious challenges, especially related to low learning motivation and lack of learning independence in students. Not a few students view science as a heavy and difficult subject to understand, considering the many abstract concepts that require a deep understanding. This situation ultimately encourages students to be passive, lose interest in learning, and rely entirely on the explanations given by the teacher. Low motivation to learn has implications for non-optimal students' participation in the learning process, while lack of learning independence makes it difficult for them to learn independently outside of school hours (Lestari *et al*., 2025; Khairani *et al*., 2024)

Various research results indicate that interactive learning multimedia can be a relevant alternative solution to overcome these problems. A number of previous studies have revealed that interactive multimedia has been proven to be able to encourage an increase in learning outcomes, learning motivation, and understanding of students' science concepts, this is possible because the presentation of the material becomes more varied and easy to digest. In addition, interactive multimedia is also considered to support the realization of independent learning, because students can set their own learning speed through available features, such as practice questions, simulations, and interactive learning guides. A number of other studies have also shown that multimedia designed with a discovery learning and scaffolding approach has the potential to increase students' activeness and critical thinking skills (Nadia *et al*., 2025).

However, previous studies still have a number of limitations that need to be underlined. Most of the research focuses more on the process of developing multimedia products and testing the feasibility of the resulting media, rather than examining more comprehensively the real influence of multimedia on students' motivation and learning independence at the same time. Furthermore, many studies are only carried out on certain learning materials or within a relatively

limited school scope, so the findings produced have not been able to be drawn as conclusions that apply in general and widely. Not a few studies have also prioritized the measurement of improving learning outcomes alone, without specifically examining how changes in motivation and learning independence occur in students (Abdullah & Nurhalizah, 2025).

Based on these conditions, this review article was prepared with the aim of studying and analyzing various research results related to the application of interactive learning multimedia in the context of independent learning, especially in an effort to increase learning motivation and independence to learn science in junior high school students. The study in this article includes the identification of the types of multimedia used in various studies, the presentation of the findings obtained, and the review of the advantages and disadvantages contained in previous studies. Through this study, it is hoped that a meaningful scientific contribution can be made to the development of technology-based science learning, as well as a useful reference for teachers and researchers in designing and developing interactive learning multimedia that is more effective, innovative, and in line with the needs and characteristics of students at the junior high school level.

METHOD

This study uses the literature review method by examining various journal articles, previous research, and relevant scientific sources regarding interactive learning multimedia in science learning. The articles reviewed are from national and international journals published in recent years through Google Scholar and other scientific sources. The research stages include determining the topic of the study, searching for articles according to the theme, selection of relevant articles, analyzing the content of the article, and drawing conclusions based on the results of the literature analysis.

RESULTS AND DISCUSSION

In this literature review study, the data used are the results of analysis of several research articles that have been selected in accordance with the research topic regarding the application of interactive learning multimedia based on educational games to increase the motivation and independence of science learning for junior high school students. The selection of articles is carried out based on the suitability of the title, keywords, research objectives, and relevance of the content of the article to the focus of the research study. The article selection process is carried out in stages using the PRISMA (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*) method, so that the articles used are decent and

relevant to the research theme, while articles that do not meet the inclusion criteria are dropped from the analysis process. The articles analyzed came from various national scientific journals that discussed the use of interactive learning multimedia, educational games, learning motivation, and learning independence in junior high school science learning. The results of the analysis of these articles are then presented in the form of a table to make it easier to identify the research findings, the type of multimedia used, the research method, and the results obtained from each study.

Table 1. Number of Articles Reviewed by Year

No.	Year	Number of articles reviewed
1	2013	2
2	2015	1
3	2016	2
4	2017	1
5	2018	3
6	2020	4
7	2021	4
8	2022	3
9	2023	1
10	2024	2
11	2025	5
12	2026	1

Table 2. Analysis of Journal Articles

No.	Researcher	Research Title	Research Results
T1	(Inafah & Saputro, 2024)	Development of Scaffolding-based Interactive Multimedia to Grow Numeracy Ability of Straight Motion Materials	Very valid media (≥92%) and worth using
T2	(Arisanti & Adnan, 2021)	Development of Interactive Multimedia Based on Macromedia Flash 8 Software to Improve Motivation and Learning Outcomes of Elementary School Students	Motivation increased from 65 → 95, learning outcomes also increased
T3	(Light *et al*., 2022)	Development of Physics Interactive Multimedia to Improve Junior High School Students' Concept Understanding	Media is very feasible (≥87%) and improves understanding of concepts
T4	(Novianto *et al*., 2018)	Development of Interactive Multimedia Science Subject Human Circulatory System for Grade VIII of Wahid Hasyim Junior High School Malang	Valid and effective (≥91%)
Q5	(Febriyanti *et al*., 2024)	Development of Multimedia Interactive Learning Based on Discovery Learning to Improve Critical Thinking Skills in Science Subjects	Critical thinking increased significantly (pretest < posttest)
T6	(Hotimah & Muhtadi, 2017)	Development of Multimedia Science Interactive Learning to Improve Students' Understanding of Junior High School Microorganism Materials	Multimedia is considered feasible and able to increase students' understanding of microorganism materials
T7	(Fathoni & Surjono,	Development of Multimedia Interactive Learning of	The product was declared suitable for use, but there

	2022)	Circulatory System Materials to Increase the Learning Motivation of PGSD Students	was no significant difference in learning motivation between the experimental and control classes
T8	(Darojat, 2016)	Development of Interactive Learning Multimedia in Natural Science Subjects for Grade VIII Junior High School Students	Multimedia is valid, feasible, and effective in improving student learning outcomes
S9	(Sure). *et al*., 2018)	Development of Physics Education Game Learning Media to Increase Student Motivation and Learning Achievement in Regular Straight Motion, Regular Change, and Free Fall Material	Learning motivation increased from 3.7 (high) to 4.0 (very high). The average pretest score increased from 52.65 to 93.75 in the posttest.
T10	(Kamalin & Rozi, 2025)	Development of Edpuzzle-Based Interactive Video Media on Human Digestive System Materials Class 8D Al Fattahiyyah Islamic Junior High School	Media obtained very deserved validation: media experts 92%, material experts 89%, student responses 91%. Media enhances students' understanding of concepts and active participation.
T11	(Sutarno & Mukhidin, 2013)	Development of Measurement Interactive Multimedia-Based Learning Model to Improve Learning Outcomes and Independence of Junior High School Students in the City of Bandung	Interactive multimedia has been proven to improve student learning outcomes and learning independence. Students also improve in cooperation, communication, and creative thinking.
T12	(Dwipayana *et al*., 2020)	Analysis of the Need for Interactive Multimedia Development Based on Local	100% of teachers and 98.7% of students say that interactive multimedia

		Cultural Context for Junior High School Science Learning	based on local culture is important to be developed
T13	(Dhaniawaty *et al*., 2021)	Interactive Multimedia Learning Application for Science Subjects Regarding the Human Digestive System for Grade VII Students	The app helps visualize the human digestive process and makes it easier for students to understand
T14	(Wiratmoko, 2020)	The Effectiveness of Educational Games to Know Objects in the Surrounding Environment as an Effort to Cultivate Learning Independence for Android-Based Blind Students	Educational games were considered effective with an average score of 70 and increased learning time, concentration, motivation, student involvement, and learning outcomes
T15	(Ekaputra & Sungkono, 2025)	The Effectiveness of the Application of Quizizz-Based Educational Games on Increasing Learning Independence and Scientific Attitudes	There was a significant increase in students' learning independence and scientific attitudes
T16	(Hamria & Hasmirati, 2022)	Educational Games for Junior High School Science Learning for Grade VIII Based on Android	Educational games obtained an excellent system acceptance rate of 91%
T17	(Haerani & Sudianti, 2025)	The Role of Educational Technology (EdTech) in Improving the Quality of Science Learning: A Narrative Review	Digital technology improves concept comprehension, learning motivation, student engagement, and science literacy
T18	(Hastina *et al*., 2025)	Identifying the Needs of Students and Teachers for Educational Games in Science Learning as Problem Solvers	Educational games help increase student engagement and support problem-solving skills
T19	(Geminiawan *et al*., 2018)	Characteristics of Interactive Multimedia for Junior High	Interactive multimedia helps to understand

		School Science Subjects	science concepts and improve student learning outcomes
T20	(Sultan *et al*., 2026)	The Effectiveness of Multimedia Interactive Learning of Solar System Materials to Improve Understanding of Science Concepts and Elementary School Students' Learning Independence	Interactive multimedia effectively improves understanding of science concepts and students' learning independence
T21	(Kusumawati *et al*., 2021)	Feasibility of Interactive Learning Multimedia in Motivating Students to Learn Mathematics	Interactive multimedia is declared feasible and effective in increasing student learning motivation through animated displays, activities, and reward systems.
T22	(Hand ayani *et al*., 2025)	Learning Models Game Based Learning (Game LakASiSiKu, LaKaTaSiSiPa, and LaKaTaSiSiHa) Increasing the Learning Motivation of Students In Class VIII Of SMP Negeri 1 Mumbulsari	There was a significant increase in student learning motivation from 75.32% to 90.09% after the implementation of game-based learning.
T23	(Manurung, 2020)	Interactive Multimedia as a Learning Media during the Covid 19 Pandemic	Interactive multimedia is effectively used in online learning and is able to increase students' interest and motivation to learn.
T24	(Dangkua *et al*., 2023)	Application of Cooperative Learning to Multimedia Interactive Learning Materials for the Human Digestive System	Interactive multimedia with cooperative learning improves the quality of student learning, participation, and interaction.

T25	(Saputra, 2021)	The Effect of the HOTS Test Online Assisted Adventure Educational Game on Students' Creative Thinking Skills	Educational games have a significant effect on improving students' critical thinking skills (moderate N-Gain).
T26	(Revelation *et al*., 2026)	The Effect of the Use of Zep Quiz Interactive Learning Media in the Game Based Learning (GBL) Model on Students' Motivation and Cognitive Learning Outcomes in Science Learning Grade VII Junior High School	There was a significant increase in motivation and learning outcomes of students with higher N-Gain scores in the experimental class.
T27	(Astuti *et al*., 2025)	Sketchfab's Augmented Reality (AR) Assisted Kahoot Educational Game Development to Increase Students' Interest and Motivation to Learn	AR-based educational games are effective in increasing students' interest (91.05%) and learning motivation (89.90%).
T28	(Scott) *et al*., 2021)	Development of Multimedia-Based Learning Media in Informatics Grade VII at SMP Negeri 1 Seririt	Interactive multimedia is able to increase learning motivation and make it easier for students to understand material.
T29	(Sigh) *et al*., 2025)	Increasing Motivation to Excel with Gamification in Science Subjects at SMPN 6 Siak Hulu, Kampar Regency for the 2024 \ 2025 Academic Year	Gamification has great potential in increasing students' motivation to learn and understanding of the material.

Based on a review of 29 articles related to the development and implementation of interactive learning multimedia in science subjects, a comprehensive picture was obtained that multimedia-based technology has a significant impact on improving the quality of learning, both in terms of process and student learning outcomes. The scope of research studied includes the development of various types of digital media, including educational games, the application of gamification, and the integration of technology in the context of science education (Haerani & Sudianti, 2025).

From the results of the study, most studies reported a significant increase in learning motivation after students used interactive multimedia in learning. This increase can be observed quantitatively through a comparison of pretest and posttest data, as well as from motivation scores that show a significant increase after the use of multimedia-based media (Arisanti & Adnan, 2021). This finding is further strengthened by a number of other studies that reveal that the use of interactive multimedia in various forms, both animations, videos, and educational games, has been proven to be able to encourage active student involvement while creating a more varied and less boring learning atmosphere (Dangkua *et al*., 2023).

Similar improvements are also seen in the aspects of learning outcomes and mastery of science concepts by students. Interactive multimedia is considered effective in helping students understand abstract material through a more real and easy-to-understand visual display, for example on the topic of the blood circulation system, the world of microorganisms, and concepts in physics (Hotimah & Muhtadi, 2017). In addition, the use of game-based media and gamification approaches also have a positive influence on students' learning independence. They tend to be more proactive in exploring the material independently and no longer rely entirely on the delivery of material from the teacher (Sigh) *et al*., 2025).

If examined more deeply, the majority of existing studies show a similar pattern of findings, namely that interactive multimedia has consistently proven to be effective in encouraging increased motivation and learning outcomes of students. This is reflected in various multimedia development research that produces products with valid, practical, and suitable categories for use in science learning (Novianto *et al*., 2018).

In addition, other research also revealed the development of students' critical thinking skills and cognitive skills after utilizing interactive multimedia designed based on discovery learning and game-based learning approaches (Febriyanti *et al*., 2024). However, not all studies produce the same findings. In some specific conditions, the use of interactive multimedia did not show a significant difference in the level of student learning motivation when compared to other learning approaches (Fathoni & Surjono, 2022). This condition indicates that the effectiveness of multimedia is highly dependent on the context and situation in which the medium is applied.

The difference in findings between studies is influenced by a number of fundamental factors. First, the type of media used plays an important role in determining the magnitude of the impact produced. Educational game-based multimedia and gamification generally show greater influence than multimedia in the form of conventional interactive presentations or videos (Saputra, 2021). Second, the methodological approach chosen in the study also affects the results obtained. Research using the Research and Development (R&D) method tends to focus on the feasibility aspect of the developed product, while experimental research focuses more on measuring the effectiveness of media on certain variables (Fathoni & Surjono, 2022). Third, the characteristics of students and the learning context that encompasses them are also important determinants in the success of multimedia implementation. Differences in educational levels, social and academic conditions of students, and learning settings, both face-to-face and online, are variables that cannot be ignored in assessing the success of the use of these media (Kamalin & Rozi, 2025).

Departing from all the findings that have been presented, there is a close relationship between the use of interactive multimedia and increasing motivation, learning outcomes, and learning independence of students. Interactive multimedia is able to attract attention and arouse students' interest in learning, which in turn contributes to the growth of motivation in them. Strong motivation further encourages students to be more active and independent during the learning process. This confirms that interactive multimedia can function as a stimulus that has the potential to improve the quality of learning comprehensively (Sutarno & Mukhidin, 2013).

Although most of the research that has been conducted has produced positive findings, there are still a number of limitations that deserve attention. Many studies have focused more on the process of media development and product feasibility testing, without attempting to examine more deeply the impact of the use of these media in the long term, especially on students' motivation and learning independence (Inafah & Saputro, 2024). In addition, not a few studies still rely on limited samples, so the findings produced cannot be used as a widely and comprehensive reference.

Based on the results of the analysis that has been carried out, there are still a number of research gaps that need attention and further study. One of them is the need for research that simultaneously integrates interactive multimedia based on educational games with efforts to increase student motivation and learning independence in the context of science learning at the junior high school level. In addition, research that specifically examines the effectiveness of multimedia over a longer period of time, as well as its implementation in a wide range of conditions and characteristics of diverse schools, is still very limited (Haerani & Sudianti, 2025)

In terms of trend development, research on interactive multimedia in science learning has shown significant growth in recent years. This condition reflects that the use of digital technology in the world of education is increasingly developing into an unavoidable need (Haerani & Sudianti, 2025). In addition, there is also a significant shift from the use of conventional multimedia to more innovative and interactive forms of multimedia, such as game-based multimedia, gamification, and augmented reality and virtual reality technology.

Based on the overall results of the study that has been described, it can be concluded that interactive learning multimedia holds great potential in supporting the increase of motivation and learning independence of students. However, it should be understood that the effectiveness of multimedia is not solely determined by the type of media chosen, but is also greatly influenced by how the media is appropriately integrated in the learning flow, the readiness and competence of teachers in operating it, and the conditions of the existing learning environment. Therefore, the application of interactive multimedia in learning needs to be planned and designed in a systematic and structured manner in order to be able to have an optimal impact on the overall quality of science learning.

CONCLUSION

Based on the results of a literature review that includes 29 articles, it can be concluded that the application of interactive interactive learning multimedia based on educational games is effective in increasing the motivation and learning

independence of junior high school students in science learning, especially in overcoming the problem of low interest in learning and students' dependence on teachers. Interactive multimedia is able to present abstract science concepts in a more concrete way through visualization and interactivity, thereby increasing engagement, understanding, and encouraging students to learn independently. However, its effectiveness is influenced by the type of media, learning methods, and the readiness of teachers and the learning environment, so it needs to be systematically designed and integrated in learning. Therefore, interactive multimedia based on educational games can be used as an alternative to innovative learning strategies, with suggestions that further research examine the long-term effectiveness and development of more adaptive technologies to improve the quality of science learning.

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