

Systematic literature review: Overview of the implementation of interactive multimedia on learning outcomes in mathematics learning

Woro Anglia Banda Sutomo¹, Turmudi²

^{1,2} Universitas Pendidikan Indonesia, Bandung, Indonesia

*Correspondence: woroanglia22@upi.edu

Abstract

Multimedia interaktif telah menjadi sarana efektif dalam media pembelajaran. Multimedia interaktif dalam pembelajaran matematika dapat memberikan kontribusi untuk meningkatkan pemahaman yang berkaitan dengan hasil belajar matematika. Melibatkan elemen – elemen multimedia seperti animasi, suara, video dan simulasi dapat membuat siswa ikut andil dalam menggambarkan konsep - konsep matematika dengan cara yang lebih visual dan dinamis. Akan tetapi, pendidikan matematika di Indonesia masih terbatas dalam menggunakan multimedia interaktif, sehingga peneliti ingin mengidentifikasi dan memberikan gambaran yang luas tentang penggunaan multimedia interaktif terhadap hasil belajar siswa dalam pembelajaran matematika. Metode penelitian yang dipilih dalam penelitian ini adalah *Systematic Literature Review*. Penelitian ini bertujuan untuk menyajikan dan menganalisis secara sistematis literatur yang relevan yang telah dipublikasikan mengenai topik tersebut, Studi primer yang digunakan yaitu artikel yang dipublikasikan periode 2019-2023. Berdasarkan penelitian ini ditemukan bahwa terdapat 188 artikel mengenai penggunaan multimedia interaktif terhadap hasil belajar matematika pada semua jenjang pendidikan dengan 4 jenis multimedia interaktif. Ditemukan artikel yang berindeks Sinta X merupakan artikel terbanyak dalam publikasi dengan demografi penelitian tertinggi di Pulau Jawa. Penelitian dengan metode *Research and Development* merupakan penelitian yang paling banyak ditemukan.

Interactive multimedia has become an effective means of learning media. Interactive multimedia in mathematics learning can contribute to increasing understanding related to mathematics learning outcomes. Involving multimedia elements such as animation, sound, video, and simulations can help students take part in depicting mathematical concepts in a more visual and dynamic way. However, mathematics education in Indonesia is still limited in the use of interactive multimedia, so researchers want to identify and provide a broad picture of the effect of interactive multimedia on student learning outcomes in mathematics learning. The research method chosen in this research is Systematic Literature Review. This research aims to systematically present and analyze relevant literature that has been published on this topic. The primary study used is articles published in the 2019-2023 period. Based on this research, it was found that there were 188 articles regarding the use of interactive multimedia on mathematics learning outcomes at all levels of education with 4 types of interactive multimedia. It was found that articles with the Sinta X index were the most articles in publications with the highest research demographics on the island of Java. Research using the Research and Development method is the research that is most often found.

Keywords: *interactive multimedia, math learning outcomes, systematic literature review.*

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



How to Cite: Sutomo, W. A. B., & Turmudi. (2024). Systematic literature review: Overview of the implementation of interactive multimedia on learning outcomes in mathematics learning. *Journal Focus Action of Research Mathematic (Factor M)*, 7(1), 1-18. http://doi.org/10.30762/f_m.v7i1.2139

INTRODUCTION

In order to prepare qualified human resources who are able to compete well, education plays an important role in facing the challenges and opportunities in this 4.0 era. This means that technology and education cannot be separated. Education provides a strong foundation for innovation and technological progress in utilizing the development of science and technology.

The presence of technology fundamentally changes the educational paradigm and encourages educators to be more active in integrating learning media in teaching and learning activities. Learning media that previously only offered printed books are now increasingly varied by being able to use multimedia such as videos, simulations or educational applications in learning, including learning mathematics.

Mathematics is the basic science of other branches of science. Almost all activities of our lives are related to mathematics, so it is necessary to have a proper understanding of mathematics so that students can accept the fact that mathematics is necessary for them in the future. Seeing the useful role of mathematics, it is not surprising that mathematics lessons are found at all levels of education, from elementary school to college.

The article (Nurhaina, Ikhsan, & Suhartati, 2019) suggests that learning mathematics students will have the ability to think that can solve mathematical problems. Through learning mathematics, individuals will train someone to have the ability to think critically, logically, analytically, creatively and systematically. This means that learning mathematics will affect a person's ability to make decisions in various problems for quality of life and ready human resources.

Furthermore, Depdiknas (Siagian, 2016) states that the objectives of learning mathematics include so that students have the ability (1) to understand mathematical concepts, (2) can use reasoning on properties and patterns, (3) can solve problems with

their problem-solving skills, (4) can communicate an idea with symbols, diagrams, tables or other media, (5) have an attitude of appreciating the benefits of mathematics in life. Therefore, realizing that mathematics learning is materially meaningful and touches aspects of student life is an important challenge for all parties.

Not in line with math's important role, many students are afraid of math in the learning process. Not to mention that math looks abstract and full of numbers and formulas, which cause students to become uninterested and lack the enthusiasm and motivation to understand math material. One way to overcome these problems is to make innovations in the mathematics learning process. Basically, innovation in the learning process is an internal effort to improve or improve aspects of learning in practice and to achieve educational goals (Pratiwi, Larasati, & Berutu, 2022), one of which is the use of learning media. Learning media is one of the important elements in the learning process (Nurrita, 2018).

The use of learning media has a very important role in the world of education, especially in the process of learning mathematics. Learning media also has good benefits for teachers and students. Learning media acts as a learning resource for students and teaching tools for teachers to receive messages and information provided by the teacher so that learning materials can shape and increase student knowledge (Nurrita, 2018). Likewise, teachers can use technological development to support the learning process through learning media (Arofah & Rinaningsih, 2021), such as interactive multimedia.

Multimedia is the use of computers to create and combine text, images, audio, graphics, animation, and other materials through links and tools that allow students and teachers to participate, interact, and communicate in learning to gain a learning experience. The use of interactive multimedia is used to distribute messages and information and can provide stimulation, attention and feelings and the desire of students so that the learning process occurs intentionally, focused and controlled (Paseleng & Arfiyani, 2015).

The learning process with the use of interactive multimedia is one of the efforts to encourage students to be more active in learning (Rahmat, 2015). Multimedia as one of the learning media is a component of the learning process that teachers can use as a tool in learning to realize a learning goal. Learning that utilizes multimedia can provide the

widest possible space and opportunity for students to form their knowledge individually by looking for learning materials that have been provided on learning media so that the intended learning objectives will be easily achieved.

The selection of appropriate multimedia is expected to help students understand the material and stimulate their curiosity to learn (Diu, Mohidin, Bito, Ismail, & Resmawan, 2020) The utilization of multimedia should be a part that gets the attention of teachers in learning activities. With the awareness and active participation of teachers and students, the use of multimedia can create a dynamic, motivating, effective and enjoyable learning environment which in turn can also improve the quality of student learning outcomes

However, it is still not fully using multimedia in its implementation, and several obstacles hinder its use in learning. This is because in its application, several challenges must be faced such as the availability of technological infrastructure, educators' understanding and technological skills, and the development of relevant and interesting content (Utomo, 2023). Supported by the results of research conducted by (Hadijah, 2018), there are several factors inhibiting the implementation of multimedia use such as (1) lack of availability of facilities and infrastructure supporting the use of multimedia, (2) lack of teacher ability to develop multimedia, (3) lack of teacher ability to develop and utilize multimedia in learning, (4) lack of training related to the use of multimedia for teachers. Therefore, multimedia is not necessary, but it is a complement if necessary to facilitate the high quality of learning and teaching. Thus, to overcome these obstacles, it is necessary to involve all parties including students, educators, and managers in planning, implementing and evaluating multimedia use in mathematics learning.

There have been many studies or publications related to the use of multimedia or interactive multimedia on learning outcomes in mathematics learning in Indonesia. Various studies have been conducted related to this phenomenon, one of which is (Idris, Suroyo, Saabighoot, & Hountman, 2023) stating that the use of multimedia as a learning tool is still rarely used in mathematics learning so that regular coaching is needed so that it can optimize the learning process. Furthermore, there is research conducted by (Syofra, 2019) regarding the effect of using Geogebra software on student learning outcomes in trigonometry material.

Learning outcomes play an important role because learning outcomes reflect student success in learning. In the implementation of learning, efforts to improve student learning outcomes experience obstacles in learning mathematics which requires students to understand the material and also be able to apply it. Students may find it difficult to learn because the material only comes from what the teacher delivers in learning, affecting whethertudent learning outcomes are low (Maku, Novian, & Yassin, 2021). Thus, the need for tools in learning is interactive multimedia. In line with that, the research results (Hakim & Windayana, 2012) state that the use of interactive multimedia significantly improves student learning outcomes.

Technology development makes interactive multimedia in mathematics more interesting to develop. Apart from the research related to interactive multimedia that already exists, there is also research on the development of interactive multimedia on mathematics learning outcomes. Such as research conducted by (Prasetya, Suwatra, & Mahadewi, 2021) who developed animated videos on learning math. In his research, the animated video developed has aspects such as appearance, content presentation of material, sound and various indicators that support students' interest in using the multimedia. So that the animated video can be feasible to use as interactive math multimedia in grade 5 SD.

The above explanation of the mathematics learning process can certainly involve the role of multimedia or interactive multimedia in the process of channeling information from teachers to students. Meanwhile, the abstract concepts contained in mathematics certainly have special criteria in the selection of multimedia to be used in mathematics learning to help students internalize the material more concretely. Interactive multimedia also creates an interesting learning environment that can effectively or significantly improve math learning outcomes.

Based on the explanation above, a systematic literature review focused on the implementation of interactive multimedia on learning outcomes in mathematics learning. This research aims to detail things related to the specified issue in the development of research and present a holistic picture. Systematic literature review is a structured research to review and synthesize scientific literature relevant to a particular topic. In an SLR, researchers identify, review and synthesize existing research results with the aim of providing a comprehensive and in-depth understanding of the issue. Therefore, this

research is expected to make a significant contribution by filling the existing knowledge gaps, providing practical guidance for the development of effective interactive multimedia. The problem formulation in this *Systematic Literature Review* includes: (1) How the research results describe the use of interactive multimedia in learning mathematics based on the year of research? (2) What is the description of research results regarding the use of interactive multimedia in learning mathematics based on education level? (3) How to describe the research results on using interactive multimedia in learning mathematics based on journal indexes? (4) How do the research results describe interactive multimedia use in learning mathematics based on research demographics? (5) How to describe the research results on using interactive multimedia in learning mathematics based on research methods ?

METHODS

Methods this study aims to determine the diversity of multimedia use on learning outcomes in mathematics learning in Indonesia. The method used in this research is the Systematic Literature Review method. This method researchers do with several procedures, namely identifying, reviewing, evaluating and interpreting all available research. In line with (Tirandini, Jayanatha, Indrawan, Putra, & Iswara, 2019) which states that by using the Systematic Literature Review research method, researchers systematically review and identify journals in each process following predetermined steps.

There are inclusion criteria determined in this study, namely (1) primary studies are the results of mathematics education research, (2) primary studies published from 2019 to 2023, (3) primary studies obtained from the Google Scholar database with the help of Publish or Perish software indexed by Sinta 1 to Sinta 6 on the official Sinta page (4) primary studies contain qualitative, quantitative, mixed and developmental research types, (5) primary studies contain research from elementary, junior high, high school to university levels, (6) primary studies contain samples of less than 30 and more than equal to 30.

Based on the stages mentioned, researchers are looking for research results with keywords, namely multimedia, interactive multimedia and math learning outcomes.

RESULT AND DISCUSSION

The results of research data included in this literature review are analysis and summary of primary studies on the use of interactive multimedia on learning outcomes in mathematics learning. Further, it is categorized based on several moderator variables, namely year of publication, level of education, sample size, and type of research, in each of the categories related to interactive multimedia.

The first category of interactive multimedia is Interactive learning applications. Interactive learning applications which can be called CAI (Computer Assisted Instruction) refer to all software that supports education that can be accessed through a computer so that it can interact in learning (Maulida, Anra, & Pratiwi, 2018). (Kartika, 2014) also said that CAI also has various forms of applications, this depends on the purpose and objectives of using computers in learning. Interactive learning applications are an innovative tool that can support students' learning experience. So that both teachers and students can actively participate in the learning process by answering questions, collaborating on projects or interacting with other content. Several learning applications are included in the research results such as Edmodo, Android, Adobe Flash, geogebra, Swishmax, Quizziz, Lectora Inspire, Smart Apps Creator, Kahoot! and others. Therefore, interactive learning applications that utilize.

The second category is interactive websites. Interactive websites in mathematics learning can be considered as a form of interactive multimedia that presents information by directly involving users. Interactive website-based learning is a learning process that can be accessed through the internet network by utilizing website media as both a tool and a source of information (Marjuni & Harun , 2019). Furthermore, (Kurniawan & Marliani, 2014) added that web-based mathematics learning has the advantage of being able to provide flexibility, interactivity, and visualization in learning because it involves all the senses of students. Some websites successfully obtained from the research data are Powtoon, Wordwall, Website, Web Desmos, Moodle, and others. Therefore, interactive websites support mathematical understanding and increase student engagement in the learning process.

The third category is e-books. E-book is a media or learning tool containing teaching materials, methods, limits and ways to evaluate which are systematically designed, interesting and enjoyable to achieve the expected learning objectives using electronics

(Ginting & Simamora, 2021). E-books as interactive multimedia in learning mathematics offer an innovative and engaging approach to understanding mathematical concepts. By combining text, images, graphics and interactive elements such as exercises or live simulations within the e-book, students can benefit from a more personalized learning experience.

The fourth category is interactive presentations. Using interactive presentations through multimedia elements such as interactive graphics, animations and quizzes will allow students to visually explore mathematical concepts or manipulate and explore their understanding in learning mathematics. The presentations included in the research data are powerpoint, learning videos, and YouTube. Interactive features such as simulations or concept maps can help to clarify the relationship between different mathematical concepts, while discussion forums facilitate the exchange of ideas resulting in student and teacher interaction and engagement.

Thus, utilizing or using interactive learning applications, interactive websites, e-books and interactive presentations as interactive multimedia makes learning mathematics more enjoyable, effective and supports the achievement of better learning outcomes. As shown in Table 1.

Tabel 1. Article Documentation Summary

		Types of Interactive Multimedia			
		Interactive Learning Application	Interactiv e Website	E-Book	Interactive Presentatio n
Article Publication	2019	14	2	2	6
	2020	15	7	1	4
	2021	34	5	7	8
	2022	44	13	8	8
	2023	6	3	0	1
Educational Level	ES	42	10	10	12
	JHS	39	6	2	2
	SHS	21	9	2	5
	College	8	5	4	3
	Not Detected	3	0	0	0
Journal Index	Sinta 1	0	0	0	0
	Sinta 2	23	2	5	4
	Sinta 3	28	7	2	7
	Sinta 4	38	10	8	8
	Sinta 5	22	11	3	7

	Sinta 6	2	0	0	1
Types of Research	Quantitative	33	9	4	8
	Qualitative	27	10	1	11
	Mix				
	Method	4	0	0	0
	RnD	49	11	13	8
Research Demographics	Sumatera	23	6	5	4
	Java	58	16	8	10
	Bali	11	1	4	4
	Nusa Tenggara	2	4	0	0
	Sulawesi	11	1	0	6
	Kalimantan	3	2	0	2
	Papua dan Maluku	1	0	1	0
	Not Detected	4	0	0	1

Table 1 shows that research on the use of interactive multimedia on learning outcomes in mathematics learning for less than five years is dominated by interactive multimedia with the type of interactive learning application of 60.1%.

This shows that the use of interactive learning applications is more desirable in learning mathematics. With the implementation of interactive learning applications, students can understand the material provided more quickly because the presentation is not monotonous and encourages learning mathematics. This is in line with what Emithu (Aminuddin, Yusuf T, & Sulasteri, 2016) stated that interactive learning applications are an integral part of the learning system for the teaching and learning process, which aims to support student learning through two-way and multi-way interaction patterns. Therefore, the use of interactive learning applications in mathematics learning allows students to interact directly with the subject matter being taught, thus improving their learning outcomes and helping them achieve their learning goals.

Furthermore, it is also seen that research on interactive websites, e-books and interactive presentations has not been the focus of many researchers.

Future researchers need to consider this. Research on the use of interactive multimedia on mathematics learning outcomes related to interactive website multimedia, e-books and interactive presentations needs to be improved so that researchers, educators or part of parties related to education can find out about the effect of various interactive multimedia on mathematics learning outcomes.

In addition to the number of studies in inclusion, the following results and detailed discussion of the five problem formulations have been compiled.

Description of Interactive Multimedia Use on Mathematics Learning Outcomes Based on Year of Publication

Research on the use of interactive multimedia on learning outcomes in mathematics learning was obtained for less than 5 years, namely 2019 to 2023. During this period the following data was obtained:

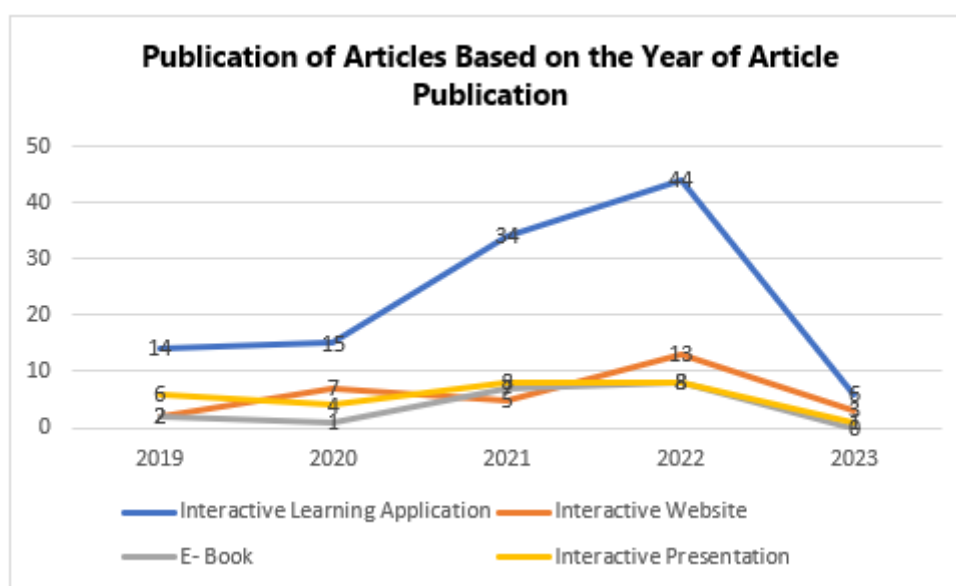


Figure 1: Data Based on Publication Year of Article

Figure 1 shows that the publication of articles on the use of interactive multimedia on learning outcomes (interactive learning applications, interactive websites, e-books and interactive presentations) is dominated by research using interactive learning applications.

The publication of interactive multimedia research on mathematics learning outcomes using interactive learning applications was the most popular in 2022, with 44 published articles. In contrast to articles using interactive multimedia using e-books, interactive websites, and interactive presentations with a total of 8, 13 and 8 published articles respectively. This shows that researchers are more interested in using interactive learning applications on math learning outcomes such as Kahoot!, Quizziz, Android and so on.

Based on the research data that has been collected, it is stated that the results of research on the use of interactive multimedia produce multimedia that is feasible and has a positive effect on students' mathematics learning outcomes.

In line with the results of research (Laknasa, Abdullah, Pauweni, Usman, & Kaluku, 2021) namely the effect of increasing mathematics learning outcomes with learning using the help of interactive learning applications on spherical material. This is because the teacher can provide material directly using learning multimedia, so students become actively involved in learning, which affects student activity. Thus, the activities of gathering information, observing and solving a problem are easier for students and there is also a learning impetus that is not monotonous in the use of interactive learning applications.

The use of interactive learning applications can provide many benefits, but it can also cause some obstacles. Such as the availability of adequate technology infrastructure, technical difficulties, and lack of training and understanding on how to use the application effectively. In the face of these obstacles, there needs to be strong support from various parties to ensure that the use of interactive learning applications can provide maximum benefits in the learning process.

Description of the Use of Interactive Multimedia on Mathematics Learning Outcomes Based on Level of Education.

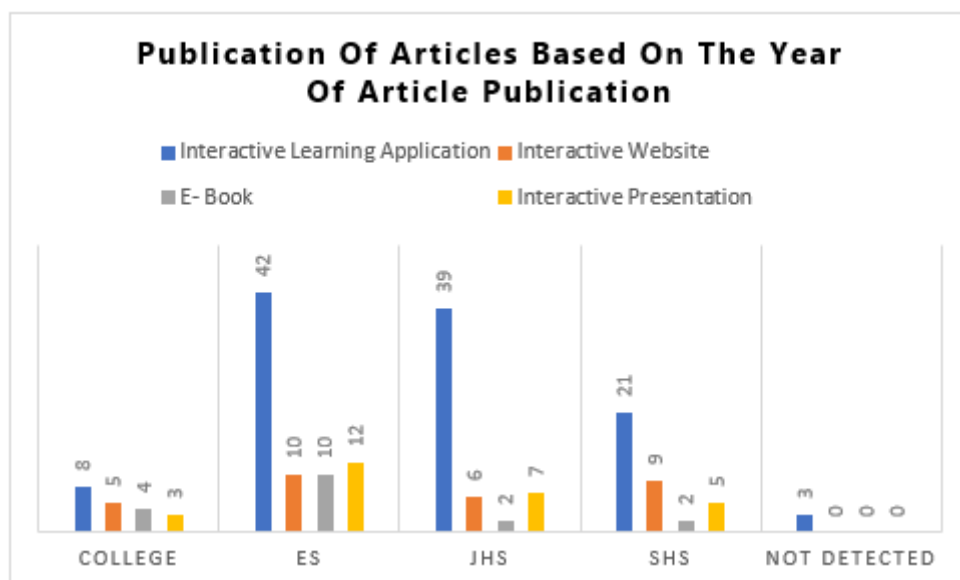


Figure 2: Data Based On Educational Research

Description based on education level is divided into five categories, namely elementary school, junior high school, high school, college and not detected as presented in figure 2. It is clear in figure 2 that research on interactive multimedia on mathematics learning outcomes is dominated by research at the elementary school level, with a total of 74 publications or 39.36%. Through the use of images, animations, and sound elements of interactive multimedia can present material visually and audio so that in addition to supporting learning outcomes in learning mathematics, but also helping students develop technological skills early on. Meanwhile, figure 2 shows that there is a "not detected" category, indicating that there are articles that do not contain or provide information about the level of education.

Research conducted (Paseleng & Arfiyani, 2015) on interactive games as one part of interactive learning applications for elementary school students explains that interactive games are designed by teachers in learning mathematics by adjusting student characteristics. So that it can attract interest, attention and students find it easy to understand concepts and can practice applying these math concepts through available games. The same applies to all levels of education. By designing interactive multimedia that considers students' characteristics, interactive multimedia can be produced that is not only educational, but also builds a learning atmosphere that supports learning outcomes and is positive for student development.

Description of Interactive Multimedia Use on Mathematics Learning Outcomes Based on Journal Index

SINTA or Science and Technology is a database system or data center for accredited national journals and for indexing published scientific journals. While Astuti et al (Derlini, Siagian, Manullang, Nur, Syah, & Saputra, 2023) said that the SINTA Index is used as one of the important indicators in the world of education to measure the quality and impact of scientific publications produced by researchers, writers and academics in Indonesia. Journals listed in the Sinta Index are assessed based on criteria such as editorial quality, open access and the quality of published scientific articles. In calculating the score, SINTA refers to the scientific work of researchers and journals in the form of h-index and citations in Google Scholar and Scopus (Saputra, 2020).

SINTA indexed journals usually have an index logo on the journal's website, but it needs to be checked again on the official SINTA page <https://sinta.kemdikbud.go.id/>.

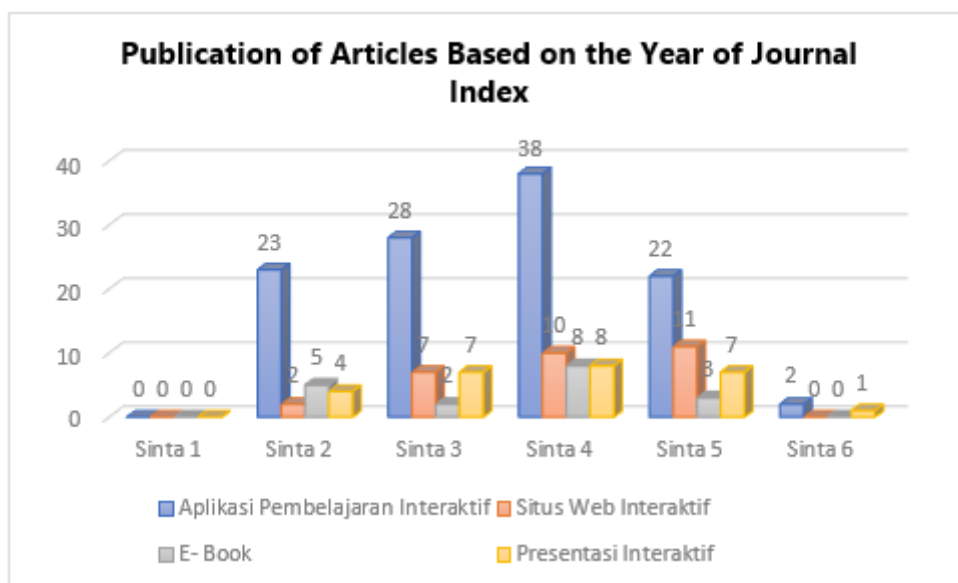


Figure 3: Data Based on The SINTA Index

Figure 3 shows that most articles regarding the use of interactive multimedia on mathematics learning outcomes are published in the Sinta 4 journal with interactive learning applications. Furthermore, it can be seen that not many articles have been published in Sinta 6. Sinta 1 indexed journals are internationally assessed, recognized, and professionally managed in terms of content and management (Muriyatmoko, 2018). Meanwhile, no articles on the use of interactive multimedia on learning outcomes have been published in Sinta 1.

Description of the Use of Interactive Multimedia on Mathematics Learning Outcomes Based on Research Demographics

Grouping based on research demographics is divided into 9 categories, namely research conducted on the islands of Sumatra, Java, Bali, Nusa Tenggara, Sulawesi, Kalimantan, Maluku, Papua, and there are articles where the research demographics are not detected. The publication of articles based on research demographics is presented in Figure 4 below.

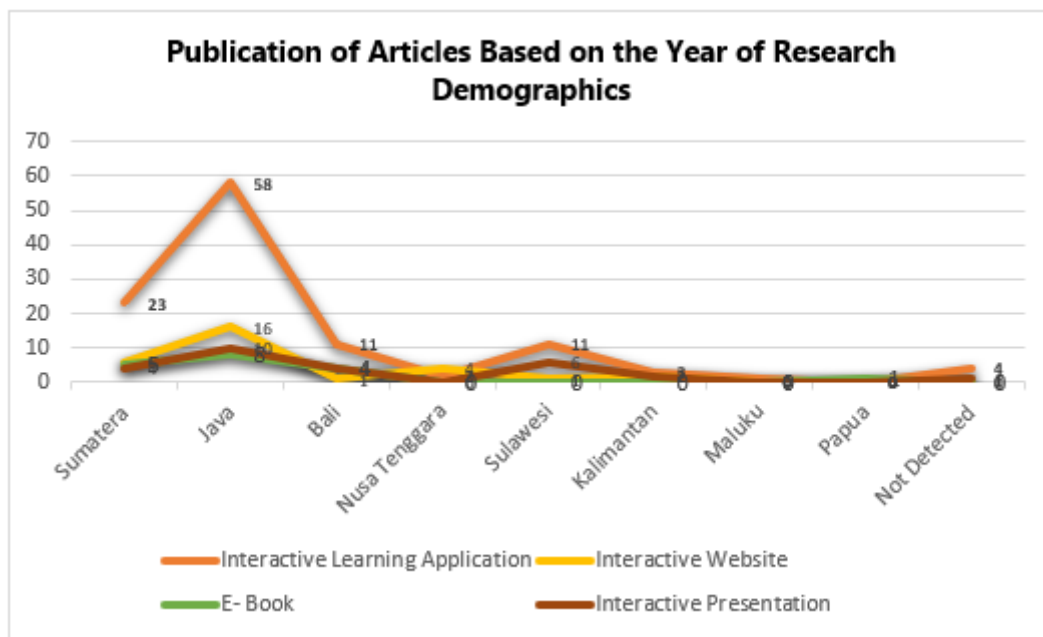


Figure 4: Data Based on research Demographics

Based on Figure 4, it can be observed that the highest publication of articles from 2019 to 2023 occurred on the island of Java, with 58 articles on the use of interactive learning applications as interactive multimedia in mathematics education. This is attributed, among other reasons, to Java, which attracts high attention from the central government in building technology-based infrastructure (Tanaamah, Wijaya, & Maylinda, 2021). Research (Umar & Nursalim, 2020) also supports this, indicating that Java has relatively more comprehensive facilities and infrastructure. Another factor that may influence this is the collaboration among researchers, industries, and educational institutions on the island of Java, facilitating innovative development in interactive multimedia. Figure 4 also provides information that three out of nine regions, namely Nusa Tenggara, Sulawesi, Kalimantan, and Maluku, have not had research results on the topic of using e-books as interactive multimedia in improving learning outcomes in mathematics learning.

Description of the Use of Interactive Multimedia on Mathematics Learning Outcomes Based on Research Types

Classification based on research types is divided into 4 categories: RnD (Research and Development), quantitative, qualitative, and a combination. The number of studies based on research methods can be seen in Figure 5.

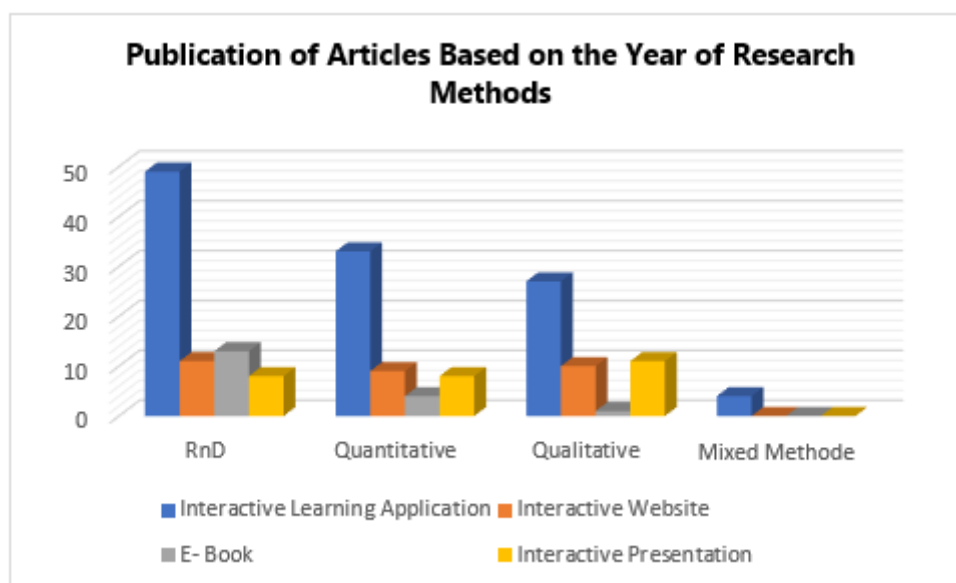


Figure 5: Data Based on Research Methods

Based on Figure 5, it is evident that the type of research RnD (Research and Development) dominates, specifically in studies on the use of interactive multimedia in improving mathematics learning outcomes. The use of the Research and Development (RnD) research method in studies on interactive multimedia is employed, among other purposes, to test effectiveness or generate specific products (Rahma & Nurhayati, 2021). By involving expert validation and user feedback, the RnD method ensures that the resulting product not only meets technical standards but also ensures that the solution meets the needs and expectations of researchers, in this case, regarding its impact on mathematics learning outcomes.

Meanwhile, when looking at the type of interactive multimedia used, in both RnD, quantitative, qualitative, and combination research, studies are predominantly focused on mathematics learning applications. This is expected to draw attention to academics and researchers, especially in the field of interactive multimedia, encouraging a more varied approach in article writing, exploring research methods beyond RnD with interactive multimedia, such as interactive learning applications.

CONCLUSION

Research on the description of the use of interactive multimedia on learning outcomes in mathematics education, categorized by various types of interactive

multimedia, has received considerable attention, especially in the use of interactive learning applications to improve mathematics learning outcomes.

Meanwhile, the connection with other types of interactive multimedia still requires attention for publication. The synthesis of this research recommends further exploration using a more comprehensive method, such as meta-analysis, to reevaluate the aspects that shape it.

ACKNOWLEDGMENTS

In this article, I would like to express my gratitude to Mr. Dadang Juandi for his valuable guidance and encouragement. Special thanks are also extended to my colleagues who have shared valuable ideas in group discussions. I appreciate my beloved alma mater, the Universitas Pendidikan Indonesia, for providing the environment where I pursued knowledge. My family and friends also deserve recognition for their invaluable support. All these contributions, from academic guidance to personal support, have been meaningful and have greatly assisted in completing this research article.

REFERENCES

- Aminuddin, M., Yusuf T, M., & Sulasteri, S. (2016). Efektivitas Penerapan Aplikasi Pembelajaran Matematika Interaktif Terhadap Hasil Belajar Matematika Siswa Kelas VII SMP Negeri 2 Sinjai Timur Kabupaten Sinjai. *MaPan : Jurnal Matematika dan Pembelajaran* , 61 - 74.
- Arofah, S., & Rinaningsih. (2021). Meta Analisis Efektivitas Multimedia Interaktif Untuk Meningkatkan Cognitive Skill Peserta Didik Dalam Belajar Kimia. *Journal of Chemical Educaion (UNESA)*, 84 - 93 .
- Astuti, I. P., Untari, E., & S, D. (2022). Pengaruh Minat Belajar Siswa dengan Sistem Daring Menggunakan Aplikasi Sempel Pada Pembelajaran Matematika Kelas X SMA PSM 1 Kedunggal. *Journal Factor M : Focus Action of Research Mathematic*, 142 -153
- Derlini, Siagian, T., Manullang, S. O., Nur, M., Syah, S. P., & Saputra, A. A. (2023). Pelatihan Penulisan Artikel Ilmiah Terindeks SINTA. *Communnity Developement Journal*, 9541 - 9545.
- Diu, A. A., Mohidin, A. D., Bito, N., Ismail, S., & Resmawan. (2020). Deskripsi Penggunaan Multimedia Interaktif pada Pembelajaran Matematika Bangun Ruang Sisi Lengkung Tabung. *Jambura Journal Of Mathematics Education*, 83-89.
- Ginting, Y. F., & Simamora, H. (2021). Penggunaan E-Book Dalam Pembelajaran di Sekolah Dasar. *Edu Cendikia : Jurnal Ilmiah Kependidikan*, 36 - 39.
- Hadijah, S. (2018). Analisis Respon Siswa dan Guru terhadap Penggunaan Multimedia Interaktif dalam Proses Pembelajaran Matematika. *Jurnal Nurmeracy*, 76 - 183.
- Idris, M., Suroyo, Saabighoot, Y. A., & Hountman. (2023). Pengaruh Model Pembelajaran Berbantuan Multimedia Terhadap Hasil Belajar Matematika Ditinjau Dari Gaya

- Belajar Siswa SD. *Jurnal Nuansa Akademik : Jurnal Pembangunan Masyarakat*, 35 - 44.
- Kartika, H. (2014). Pembelajaran Matematika berbantuan Software Matlab sebagai Upaya Meningkatkan Kemampuan Komunikasi Matematis dan Minat Belajar Siswa SMA. *Jurnal Pendidikan Unsika*, 24 - 35.
- Kurniawan, D. T., & Marliani, L. (2014). Pembelajaran Matematika Konsep Aljabar Terhadap Siswa Kelas VII SLTP Melalui Website Interaktif. *Jurnal Delta*, 89 - 94.
- Laknasa, D. A., Abdullah, A. W., Pauweni, K. A., Usman, K., & Kaluku, A. (2021). Meningkatkan Hasil Belajar Matematika Siswa Melalui Pembelajaran Multimedia Interaktif dengan Model Discovery Learning. *EULER : Jurnal Ilmiah Matematika, Sains dan Teknologi*, 103 - 108.
- Marjuni, A., & Harun, H. (2019). Penggunaan Multimedia Online dalam Pembelajaran. *Jurnal Idaarah*, 194 - 204.
- Maulida, N., Anra, H., & Pratiwi, H. S. (2018). Aplikasi Pembelajaran Interaktif Pengenalan Hewan pada Anak Usia Dini. *Jurnal Sistem dan Teknologi Informasi*, 28 - 3.
- Muriyatmoko, D. (2018). Pengaruh Indeksasi Doaj Terhadap Sitasi Pada Jurnal Terakreditasi Sinta Menggunakan Analisis Regresi Linier. *Jurnal SimanteC*, 31 - 38.
- Nurhaina, R., Ikhsan, M., & Suhartati. (2019). Kecemasan Matematika Siswa dengan Penerapan Model Pembelajaran. *Jurnal Ilmiah Mahasiswa Pendidikan Matematika*, 244 - 252.
- Nurrita, T. (2018). Pengembangan Media Pembelajaran untuk Meningkatkan Hasil Belajar Siswa. *Misykat*, 171 - 187.
- Paseleng, M. C., & Arfiyani, R. (2015). Pengimplementasian Media Pembelajaran Berbasis Multimedia Interaktif Pada Mata Pelajaran Matematika Di Sekolah Dasar. *Scholaria*, 131 - 149.
- Prasetya, W. A., Suwatra, I. I., & Mahadewi, L. P. (2021). Pengembangan Video Animasi Pembelajaran pada Mata Pelajaran Matematika. *Jurnal Penelitian dan Pengembangan Pendidikan Undiksha*, 60 - 68.
- Pratiwi, D., Larasati, A. N., & Berutu, I. L. (2022). Pentingnya Inovasi Media Pembelajaran Berbasis Digital Di Abad-21. *BEST JOURNAL :Biology Education Science & Technology*, 211 - 216.
- Rahmat, S. T. (2015). Pemanfaatan Multimedia Interaktif Berbasis Komputer dalam Pembelajaran. *Jurnal Pendidikan dan Kebudayaan Missio*, 196 - 208.
- Saputra, A. (2020). Pemanfaatan Science and Technology Index (SINTA) untuk Publikasi Karya Ilmiah dan Pencarian Jurnal Nasional Terakreditasi. *Media Pustakawan*, 56 - 68.
- Siagian, M. D. (2016). Kemampuan Koneksi Matematik Dalam Pembelajaran Matematika. *Journal of Mathematics Education and Science*, 58 - 67.
- Supartini, M. (2016). Pengaruh Penggunaan Media Pembelajaran Dan Kreativitas Guru Terhadap Prestasi Belajar Siswa Kelas Tinggi Di SDN Mangunharjo 3 Kecamatan Mayangan Kota Probolinggo. *Jurnal Penelitian dan Pendidikan IPS*, 277 - 293.
- Syamsudin, A., Mufti, R., Habibi, M. Ilham., Wijaya., I. K., & Sofiastuti, N. (2021). Pengembangan Game Edukasi Berbasis Web pada Materi Bangun Ruang dengan Construct 2. *Journal Factor M : Focus Action of Research Mathematic*, 63-76
- Syofra, A. H. (2019). Pengaruh Penggunaan Media Geogebra Terhadap Hasil Belajar Siswa Pada Materi Grafik Fungsi Trigonometri. *Jurnal Mathematics Paedagogic*, 84 - 90.

- Tanaamah, A. R., Wijaya, A. F., & Maylinda, S. A. (2021). Tata Kelola Teknologi Informasi Pada Sektor Publik : Penyelarasan Teknologi Informasi Dengan Visi Kepemimpinan. *Jornal Teknologi Informasi dan Ilmu Komputer*, 1319 - 1330.
- Tirandini, E., Jayanatha, S., Indrawan, A., Putra, G. W., & Iswara, B. (2019). Metode Systematic Literature Review untuk Identifikasi Platform dan Metode Pengembangan Sistem Informasi di Indonesia. *Indonesian Journal of Information Systems (IJIS)*.
- Tiwow, D., Wongkar, V., Mangelep, N. O., & Lomban, E. A. (2022) Pengaruh Media Pembelajaran Animasi Powtoon terhadap Hasil Belajar ditinjau Dari Minar Belajar Peserta Didik. *Journal Factor M : Focus Action of Research Mathematic*, 107 - 122
- Umar, L. M., & Nursalim, M. (2020). Studi Kepustakaan Tentang Dampak Wabah Covid-19 Terhadap Kegiatan Belajar Mengajar pada Siswa Sekolah Dasar (SD). *Jurnal BK Unesa*, 599 - 609.
- Utomo, F. S. (2023). Inovasi Media Pembelajaran Interaktif Untuk Meningkatkan Efektivitas Pembelajaran Era Digital Di Sekolah Dasar. *Pendas : Jurnal Ilmiah Pendidikan Dasar*, 3635 - 3645.