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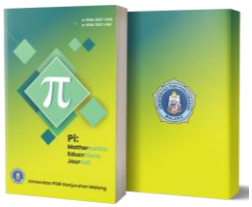

Games in Junior High School Mathematics Learning: Sematic Literature Rivew

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ABSTRACT
Mathematics learning at the junior high school (SMP) level requires an approach that is able to bridge abstract concepts with students' learning experiences. One such approach is the use of games. Therefore, this study aims to systematically examine the form, innovation, research variables, methodological approaches, roles, and advantages and disadvantages of games in mathematics learning. The method used is Systematic Literature Review (SLR) with a qualitative descriptive approach, based on the PRISMA 2020 protocol. Data sources are obtained from relevant scientific articles published in Indonesian or English between 2016 and 2025. The results of the study showed that the games applied were very varied, namely: educational games, quiziz, matrig, multimedia, android-based, character-based math games, snake and ladder games, interactive word wall-based, web-based games, monopoly, unomath, online games, and ludo. In conclusion, games in mathematics learning have the potential to foster independent and meaningful learning and can be an alternative learning strategy that is adaptive to current developments, for example games: education, quiziz, matrig, multimedia, android-based, character-based, snake and ladder games, interactive word wall-based, web, monopoly, unomath, online games, and ludo. It is suggested that further research can design games to make learning more innovative.

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1. Introduction

Mathematics learning at the junior high school level has an important role in shaping students' logical and systematic mindsets. This is because mathematics trains individuals to analyze, and provides the cultivation of concepts that are useful for problem solving in everyday life [1]. Contextual and realistic mathematics learning is necessary so that students can see the relationship between the material taught and their daily lives, which can later increase interest in mathematics needs ([2],[3]). With this approach, students are not only taught to do calculations, but also to understand mathematical concepts in depth and in a practical way, to build a strong foundation for further learning ([4],[5]). However, the challenges faced by students in junior high school are quite significant. One of the main

problems is the low interest in learning mathematics, which can be caused by students' difficulty in understanding abstract concepts [6].

Conventional learning that is commonly applied in schools often has minimal interactivity and tends to be one-way, so it is less able to motivate students to be actively involved in the learning process ([7],[8]). Students only receive information provided by educators, so no student collaboration appears in the learning process [9]. A more active and participatory approach to teaching is needed to keep students interested [10]. By utilizing more interactive learning methods, students can be more engaged and contribute to the learning process ([11]–[13]). One of the innovative solutions that has emerged in mathematics learning is the use of Game as an alternative media. Games can create a fun and meaningful learning atmosphere, and engage students through context, Game is an alternative for teachers to increase students' motivation to learn ([14],[15]). In this context, Game can support the principles of active and constructivistic learning, where students have the opportunity to discover and understand concepts through hands-on experience, rather than just chasing grades or numbers ([16],[17]).

In-depth use Game In mathematics learning at the junior high school level is also important for systematic research, because many studies have been conducted, but there has not been an in-depth synthesis that discusses forms, types, and roles Game In this context [18]. Understanding mathematics is not only limited to technical skills, but also includes critical thinking and adaptability to dynamic changing learning situations [19]. Math learning with Game can affect important things such as comfort, joy, sense of community, increase the spirit of collaboration, never give up, train brain performance, perseverance and improve learning outcomes ([20],[21]). Therefore, further research on the application of Game In learning mathematics in junior high school should be a priority. There is a literature review study to systematically review previous studies on game-based mathematics learning in improving students' academic abilities.

2. Method

This study uses the *Systematic Literature Review* (SLR) with a qualitative descriptive approach to systematically review scientific articles that discuss the use of Games in mathematics learning at the junior high school (SMP) level. This SLR procedure follows the guidelines *Optional Reporting Items for Systematic Review and Meta-Analysis* ([12],[22]), ([23],[24]). The objectives of this systematic literature review are to: 1) Identify forms and innovations Game which is used in junior high school mathematics learning. 2) Classifying variables, research types, and roles Game in related research. 3) Analysis of the advantages and disadvantages of the application Game in mathematics learning in junior high school.

A literature search was conducted in two scientific databases, Google Scholar and Scopus. The search employed the keywords “math education games” and “math learning games,” along with their Indonesian equivalents. Searches were restricted to peer-reviewed journal articles published between 2016 and 2025, excluding conference proceedings and theses. Studies were included if they were written in English or Indonesian and addressed mathematics learning games for junior high school (or equivalent) students.

Table 1. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Articles on games in mathematics learning	Articles don't discuss math learning
Focus on junior high school level or equivalent	Levels outside of junior high school (elementary, high school, college)
Full text available	Only available in abstract form
Publications in the last 10 years	Publications before 2016
Types of research other than literature reviews	Types of literature research reviews
Publications in the form of articles, journals	Publications outside of articles/journals such as theses etc
Written in Indonesian or English	Written in other languages

The article selection stage is carried out through 4 main stages:1) Identification: Aggregate articles based on keywords from various databases. 2) *Screening*: Eliminating duplication and reading titles and abstracts for initial selection. 3) Eligibility: Evaluating the content of full-text articles based on inclusion/exclusion criteria. 4) Inclusion: Determine the final article to be analyzed. This process is visualized in the PRISMA flowchart. Articles that passed the selection were then analyzed thematically based on six problem formulations, paying attention to: 1) The form and type of game used. 2) Innovation in game media. 3) Research variables. 4) Type of research approach. 5) The function or role of the game in the research. 6) The advantages and disadvantages of games in learning. The results of the analysis are presented in the form of a synopsis table of the article, then explained in a descriptive narrative.

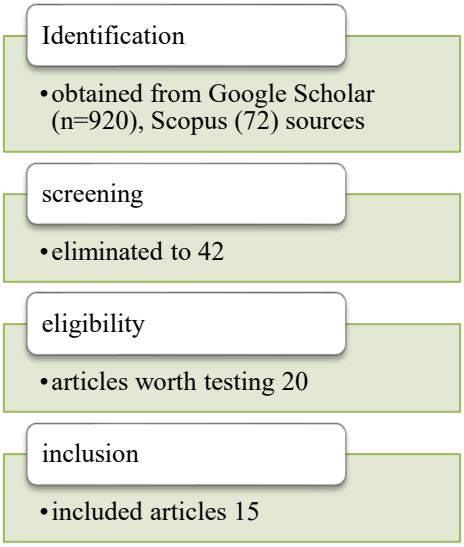

Figure 1. Research Flow of Study Literature Rivew in Research on the Application of Game in Junior High School Mathematics Learning

Based on Figure 1, 920 articles were identified, including 72 indexed in Scopus. During the screening stage, 42 articles were retained. At the eligibility stage, 20 articles were deemed eligible, and the final inclusion stage resulted in 15 included articles.

3. Results and Discussion

The results of this study present findings in the form of article titles, year of publication, type of *game*, research variables, main findings, and the role of games in Mathematics

learning at the junior high school level. The presentation of the findings is briefly presented in Table 2.

Table 2. Results of a Literature Study on the Application of Games in Junior High School Mathematics Learning

Article Title	Author & Year	Game Type	Types of Research	Key Findings	Game Roles	Advantages & Disadvantages
Development of Computer-Based Mathematics Educational Games on Number Pattern Materials	[25]	Computer-based games	R&D (Formative evaluation /Tessmer)	The game is very feasible and effective to use, increasing motivation	Contextual and interactive media	Worthy & Attractive; The evaluation process is time-consuming
Learn Mathematics through Quizizz Game Media to Improve Learning Outcomes	[26]	Quizizz Game (online quiz)	PTK (Classroom Action Research)	Learning outcomes increased from 63 → 78, students were more active and enjoyed learning	Fun digital quiz media	Practical, real-time; Need a stable connection
MaTriG: Math Education Game with Construct 3	[27]	Platformer game (Construction 3)	R&D (ADDIE)	The MaTriG game is valid and practical for SPLDV learning	Android educational game-based learning media	Interactive, engaging; Limited testing on a small scale
Multimedia Development of Junior High School Mathematics Learning Games	[28]	Bubble Algebra (Bubble Puzzle)	R&D (Plomp Model)	Valid, practical, and effective games improve algebra learning outcomes	A concrete and fun medium for algebraic forms	Amazing; Depends on the computer lab
Math Games Apps in Improving Math Calculation Skills	[29]	Android-based counter games	Experiments (quasi-experiments)	Games improve numeracy skills and interest in learning	Interactive exercises for counting	Effective, adaptive; Just focus on the basic calculations

Article Title	Author & Year	Game Type	Types of Research	Key Findings	Game Roles	Advantages & Disadvantages
Development of Mathematics Education Games to Improve Junior High School Numeracy Skills	[30]	Android-based math education game using Adobe Animate software	R&D (ADDIE)	Android-based math education games using Adobe Animate software are valid, effective and practical to improve mathematical numeracy skills	Improve numeracy skills	Effective and practical; Focus on the material of the system per two-variable linear equation
Development of Character-Oriented Mathematics Game Project to Increase Learning Motivation of Grade VIII Junior High School Students	[31]	Interactive math games (online games)	R&D (ADDIE)	Interactive games increase the motivation to learn isswa, and the math game project is valid and practical.	Increase students' motivation to learn	Effective, practical, character-oriented, and interactive; Focus on functional material and must use stable internet service
Development of PERMUTATION (Material-Based Snake and Ladder Game) Learning Media for Junior High School Grade VIII	[32]	Material-based snake ladder	R&D (4D)	This product is valid and worth using.	Mathematics learning innovations	Valid Focus on validity only; Not measure practicality, and effectiveness

Article Title	Author & Year	Game Type	Types of Research	Key Findings	Game Roles	Advantages & Disadvantages
The Use of Interactive Games Based on Wordwall as a Mathematics Learning Media for Junior High School Students	[33]	Interactive Wordwall-Based Games	R&D (4D)	The product is declared valid and students can have an interest in learning and it is easy to understand the material	Increase interest and understanding of the material	Effective, valid, and increases interest in learning; Focus on series and arithmetic material
The Effectiveness of Web-Based Mathematics Learning Media and Educational Games on Improving the Learning Outcomes of Junior High School Students	[34]	Web-based games	experimental i.e. Pretest-Posttest Control Group Design	Improved student learning outcomes	Improve learning outcomes	Effective, valid, practical, educated; Must be used onlie
Monopoly Game as an Interactive Question Practice Media for Junior High School Students	[35]	Monopoly games	R&D (ADDIE)	Valid, practical, and effective	Improve learning outcomes on flat building materials	Effective, valid and practical; Focus on flat building materials and only available in print form
Unomath Beam: Game Integration as a Reinforcement of the Fractional Concept in Junior High School	[36]	The game's product is named Unomath Beam (Uno Math Beam)	Development of the Sugiyono model	valid, practical, and effective	Improve understanding of the mathematical concepts of fractional	Effective, valid, and practical; The scale of media development is still small and limited

Article Title	Author & Year	Game Type	Types of Research	Key Findings	Game Roles	Advantages & Disadvantages
					operations	
The Use of Online Math Game Media to Improve Mathematical Representation Ability of Junior High School Students in Lhokseumawe City	[37]	Online math games	Quasi-experiment	There is an increase in students' mathematical representation skills	Improve mathematical representation skills	Effective, valid, and practical; The research sample is still small
Development of Mathematics Uno Spin Card Game Media for Algebraic Mathematics Learning in Junior High School Students	[38]	Uno card	R&D (Sugiyono	There is an increase in the ability of Mathematics Algebra Material	Improve the Mathematics Skills of Algebraic Materials	Effective, valid, and practical; Print form is not yet accessible online
The Use of Ludo Game Media to Improve Students' Mathematics Learning Outcomes	[39]	Ludi Games	Quantitative with a descriptive approach	There is an improvement in line and angle material	Improve students' mathematics learning outcomes	Effectively improve learning outcomes; Used for small scale and limited to quantitative descriptive research

The results of the study show that Usage of the game In mathematics learning in junior high school varies greatly. Some are in the form of games education on Android, game types of adventures (platformers), interactive digital xuizzes such as Quizizz, to board games game). Among them all, game digital is more often used because it provides flexibility for students to learn independently at any time, even outside of school hours. This shows that game It can be a flexible, engaging, and capable learning tool to help students better understand math concepts. Through learning-based learning game Learning environments

become more sporty, increase student engagement, motivation, and can create a context that supports effective learning ([40]–[42]).

The discussion in this study is lots game It also has an innovative touch, both in terms of appearance, inserted story, and motivational gradual challenges. For example, in MaTriG game and The Adventures of Kolev, students are invited to explore and learn through interactive flows. The quiz/test feature in digital games can help students to develop self-assessment skills through the instant feedback provided which has the potential to increase students' liveliness and confidence, as they can see the progress of their comprehension first-hand [43].

In various studies, some aspects that are often researched include how well students understand the material, how independent they are in learning, and whether the games used are effective and fun. The results show that games not only help students understand the content of the lessons, but also encourage them to actively learn and organize their own way of learning. Most research uses a development (R&D) approach, experiments, or classroom actions. This approach emphasizes on how games are designed and tested directly on the field. This is proof that educational games that are seriously designed can really help students learn more independently and understand math concepts better, especially if they are tailored to their needs. In general, games in learning can prove to be a tool that supports students to learn without always relying on teachers.

Games make students more engaged and feel in control of the learning process. With attractively designed exercises, powerful visuals, and easy simulations, the understanding of concepts becomes stronger [44]. So it game make it easier for teachers to transfer information to students and be able to accommodate the characteristics and learning needs of students because game provide opportunities for students to learn according to their abilities and speed ([45] – [47]). Even so, there are also challenges, such as the limitations of technological devices, teachers' ability to manage learning-based learning game, and there have not been many long-term trials that have been conducted widely.

4. Conclusion

Based on the systematic literature review, mathematics learning games for junior high school students have evolved into diverse forms and innovations. These games have the potential to promote independent and meaningful learning and may serve as an adaptive instructional strategy in response to current educational developments. The identified examples include educational games, Quizizz, Matrig, multimedia-based games, Android-based games, character-based games, *Snakes and Ladders*, interactive Wordwall-based games, web-based games, *Monopoly*, Unomath, online games, and *Ludo*. Further research is recommended to design and develop more innovative game-based approaches for mathematics instruction.

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