International Journal of Education and Learning Assessment
Vol. 01, No. 01, Tahun 2024, Hal. 23 - 30

Analysis of the Effectiveness of Using Game Based Learning Methods in Science Learning in Elementary Schools: A Systematic Literature Review

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Article Info

Article history:

Received February 01, 2024
Revised February 10, 2024
Accepted February 25, 2024

Keywords:

Game based learning, Science Learning,Eelementary School

ABSTRACT

Natural Sciences (IPA) is one of the important subjects in elementary schools (SD) which equips students with knowledge and understanding of natural phenomena and the environment. The aim of this research is to analyze the effectiveness of using game based learning methods to increase motivation to learn science in elementary schools. In this study, researchers used the Systematic Literature Review method. SLR is a literature study method that includes identification, evaluation and interpretation of appropriate studies on a particular topic. The results of this research are. The Game Based Learning method has proven to be effective for use in science learning in elementary schools.

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Introduction

Natural Sciences (IPA) is one of the important subjects in elementary schools (SD) which equips students with knowledge and understanding of natural phenomena and the environment (Riva, 2023; Siti, 2022). Through science learning, students are invited to explore the wonders of nature, from the complex structure of the human body to the infinite mysteries of space (Asrorul & Azizi, 2022). Science learning in elementary schools must be fun and interesting so that in the teaching and learning process students are able to understand science concepts well. Students learn about how various natural phenomena occur, such as the rotation of the earth, weather changes, and the water cycle (Suci et al., 2022).However, studying science is often considered boring and difficult for students, which can reduce their learning motivation (Elsa et al., 2022). This results in less than optimal learning outcomes (Mega et al., 2022).

Low motivation to learn science in elementary schools can be caused by several factors, for example learning methods that are monotonous and less interesting, teachers often use lecture methods and give monotonous assignments, so that students feel bored and not interested in the subject matter (Miftahul et al., 2022).Non-contextual teaching and learning activities. Science lesson material is not linked to students' daily lives (Arif et al., 2023). This

makes students feel that the subject matter is irrelevant and not important to learn (Nicole, 2019).

This condition encourages educators to look for creative and innovative solutions to increase motivation to learn science in elementary schools (Heny & Sukadari, 2022). Teachers can use various online platforms such as educational videos, educational games, and learning applications to make learning more interactive and fun. Of the several existing approach methods, one interesting alternative is the Game Based Learning (GBL) method (Vincentas, 2022).

Game Based Learning is a learning model that integrates game elements into the teaching and learning process (Fani et al., 2023). GBL has promising potential to increase motivation to learn science in elementary schools (Mohd et al., 2022). Therefore, further research needs to be carried out to determine the effectiveness of GBL in increasing motivation to learn science and to develop appropriate and effective GBL models for use in science learning in elementary schools (Rahyu, 2023). The question of whether game-based learning methods are effective in increasing motivation to learn science in primary schools will be answered through this literature review.

The aim of this research is to analyze effectivenessusing game based learning methods to increase motivation to learn science in elementary schools, identifying factors that influence the effectiveness of GBL in increasing motivation to learn science in elementary schools, and reviewing previous literature regarding the use of game based learning in elementary schools in learning science.

Research Methods

In this study, researchers used the Systematic Literature Review method. SLR is a literature study method that includes identification, evaluation and interpretation of appropriate studies on a particular topic (Laksmi & Dewi, 2023; Wahyu & Al, 2023). Stage research begins with planning, namely drawing a general picture based on reading scientific articles to identify questions that form the basis of the research. Next, the implementation stage is the stage of looking for references and sources for conducting literature research using the "search" facility on the Google Scholar website.

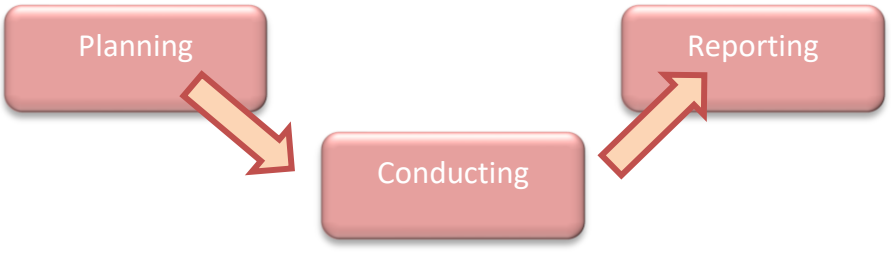


Chart 1. Research Stages Systematic Literature Review Method

Inclusion Criteria

Searches for journal articles to be reviewed are based on data contained in Google Scholar. The search started by using the initial keyword "Game Based Learning" obtained 142,000 articles, then limited from 2019-2024 so that 29,400 articles were obtained, then a

search was carried out by adding the keyword "Science Learning" and obtained 798 articles. Lastly, adding the keyword "Primary School" resulted in 561 articles. From the last search, the articles obtained were then selected for several articles to be reviewed.

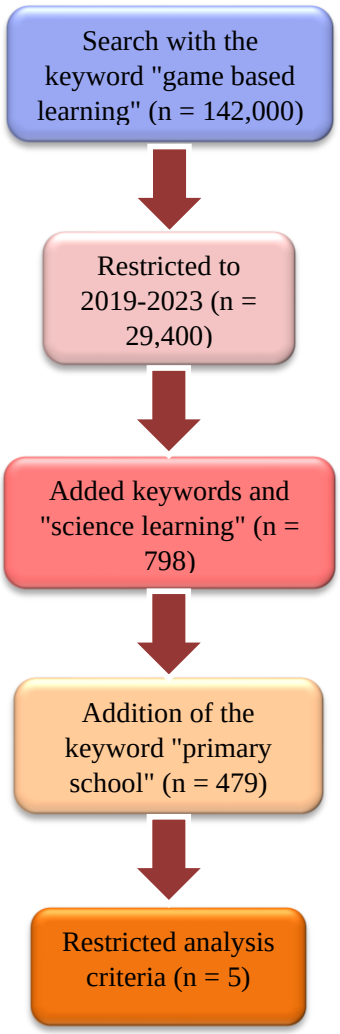
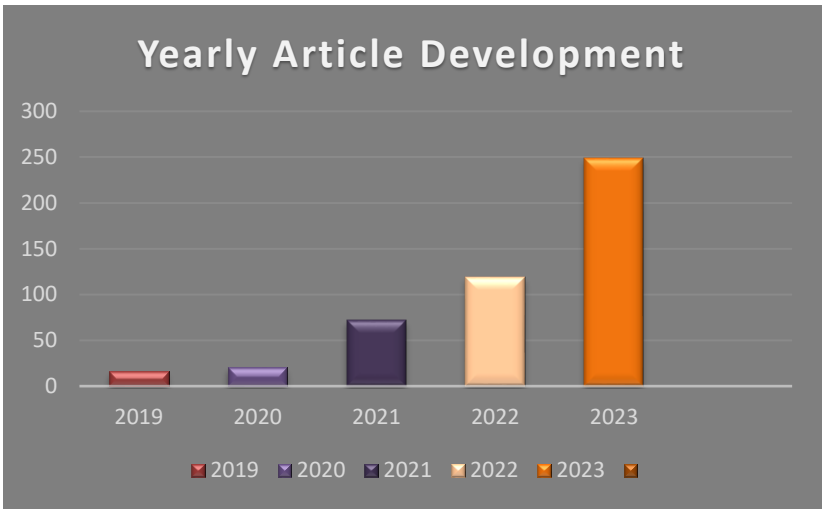


Chart 2. Inclusion criteria analyzes the effectiveness of game based learning methods in science learning in elementary schools

Research Result

The results of literature searches on the Google Scholar data base aim to clarify the verbal presentation of research results and analysis results in the form of charts and tables containing comments and discussions. Results are obtained by identifying subsections that are relevant to the research problem. From data searches using Google Scholar, the development of articles regarding. Analysis of the effectiveness of game based learning methods in science learning in elementary schools has had different developments in the last 5 years, namely in 2019-2023. The development of the article is presented in the form of a line diagram below:



Graph 1. Development of articles in the Google Scholar database regarding analysis of the effectiveness of game based learning methods in science learning in elementary schools

In diagram 1, it can be said that the articleAnalysis of the Effectiveness of Using Game Based Learning Methods in Science LearningThe average has increased, especially in 2023, where the number of articles found was 249 articles, while the lowest number of articles was found in 2019, namely 16 articles. Furthermore, in 2020 the number of articles found was 23 articles, then in 2021 the number of articles found was 72 articles. Furthermore, in 2022, 119 articles were found. The following is a calculation of the average number of articles yearly:

$$\tilde{x}=\frac{Jumlah\ artikel}{Jumlah\ tahun}$$

$$\tilde{x}= = 96 \text{ Articles}\frac{479\ artikel}{5\ tahun}$$

So the average number of articles published over the last 5 years is 93 articles.

Based on a search using the keyword "problem based learning method" 142,000 articles were found. Next, the search was focused by limiting the years to the last 6 years, namely 2019-2023, obtaining 29,400 articles. Then the article search was added with the keyword "science learning" and 798 articles were found. Then adding the keyword "primary school" in the final search resulted in 479 articles. Of the 479 articles that have been found, there are 5 articles that can be reviewed and contain the words Game Based Learning Method in Science Learning in Elementary Schools. The following are the results of a review of 5 articles related to Problem Based Learning Methods in Science Learning in Elementary Schools.

Table 1. Results of analysis of article reviews regarding game based learning methods in science learning in elementary schools

No	Research Title	Research Findings	Research result
1	The Influence of Game Based Learning (GBL) Methods on Alternative Energy Science Learning Outcomes at SD Negeri	Based on the posttest data that has been analyzed, it can be seen that the average scores for the experimental class and the control class	It has been proven to be true that there is an influence in the application of the Game Based Learning (GBL) method on

	02 Lahat (Purnama, et al. 2023)	are different. The average value of the experimental class is 76.54, while the average value of the control class is 48.80, so the average value of the experimental class is greater than the control class.	the learning outcomes of Alternative Energy Science at SD Negeri 2 Lahat.
2	Application of the Educational Game 'Treasure' Based on Problem Based Learning on Students' Science Literacy (Susilowati & Saputra, 2022)	There was an increase in science material learning outcomes from pre-cycle to cycle I by 38%. Then from cycle I to cycle II it was 43%.	The application of the educational game 'Harta Karun' based on problem based learning can improve the scientific literacy competency of sixth grade elementary school students.
3	The Effectiveness of Scratch-Based Game Media in Class IV Elementary School Science Learning (Kusumawati, n.d.)	learning using Scratch-based game media is quite effective on the learning outcomes of class IV students in science material. The N-gain test results obtained a value of 75.67%.	Learning using Scratch-based game media is quite effective for fourth grade students' learning outcomes in science material.
4	Efforts to Increase Learning Achievement of Class VI Students Using the Game Based Learning Model "Quizwhizzer" on Electrical Circuit Material at Uptd Sdn Durjan 3 Kokop Bangkalan(Rochmawati, n.d.)	The increase in student learning achievement results occurred after improvements were carried out in cycle II, which showed that children were happier and more focused. Game Based Learning media "Quizwhizzer" can really trigger students to compete quickly to complete the game with their group friends.	Game Based Learning media "Quizwhizzer" can improve the learning achievement of class VI students at UPTD SDN Durjan 3, Kokop District, Bangkalan Regency.
5	The Influence of the Game-Based Learning Model Assisted by Worldwall on Earth Material and Natural Events on the Learning Outcomes of Class V Students at Sdn 060934 Medan(Sianturi, 2023)	game based learning model assisted by wordwall which is more optimal compared to the control class. Judging from the changes in the average value, the learning achievement of the control class is relatively low. These learning outcomes are	The wordwall-assisted game-based learning model influences student learning outcomes. The use of wordwall media also influences students' interest in learning and does not give a boring impression, because several functions

	inversely proportional to the experimental class learning outcomes which are included in the medium standard.	in it are interesting for students and teachers.

From the 5 articles reviewed above, there are several findings as follows:

1. The use of game based learning methods in some science materials can have an effect on improving student achievement.
2. Learning that uses game based learning methods becomes more interesting and less boring so that students are able to understand the material well.
3. The use of game based learning methods can improve students' competitive abilities.

Discussion

Based on the results of research by (Purnama, et al. 2023) it is proven that there is an influence in the application of the Game Based Learning (GBL) method on alternative energy science learning outcomes at SD Negeri 2 Lahat. Furthermore (Kusumawati, n.d.) Learning using Scratch-based game media is quite effective on the learning outcomes of class IV students in science material. The N-gain test results obtained a value of 75.67%. Learning using Scratch-based game media was quite effective on the learning outcomes of class IV students in science material.

According to research findings by (Susilowati & Saputra, 2022)said that there was an increase in learning outcomes for science material from pre-cycle to cycle I by 38%. Then from cycle I to cycle II it was 43. Then, the results of research by (Rochmawati, n.d.)said that the Game Based Learning media "Quizwhizzer" can improve the learning achievement of class VI students at UPTD SDN Durjan 3, Kokop District, Bangkalan Regency. According to (Sianturi, 2023)said that the wordwall-assisted game-based learning model influences student learning outcomes. The use of wordwall media also influences students' interest in learning and does not give a boring impression, because several functions in it are interesting for students and teachers.

Conclusions and Recommendations

Based on the explanation above, it can be concluded that the Game Based Learning Method has proven to be effective for use in science learning in elementary schools. The use of game based learning methods can make learning more interesting so that students can be more creative in their thinking, apart from that, the use of this method also makes students not feel bored. The game based learning method has a positive impact on students, increasing the competitive spirit of students, the use of game based learning methods can also make it easier for students to understand the learning material. Therefore, this problem based learning method is very effective to be applied in science learning in elementary school.

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