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Systematic Review of Education Games in Science Learning: Teachers and Students of Basic Education

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Article history	Abstract
Submission : 2022-01-14	The lack of ability of students in learning science in elementary schools and the lack of ability of teachers in providing supportive teaching media according to the characteristics of students who have difficulty causing the learning process cannot achieve the desired results. Thus, it affects the learning process, low learning outcomes, and student' cognitive abilities. Therefore, this study aims to determine the types of educational game-based teaching media in science learning in elementary schools and the effectiveness of using educational game-based teaching media used in science learning in elementary schools. The method used was a systematic literature review using PRISMA diagrams. The database used for the literature search employed three digital libraries, namely Scopus, Springer Link, and WOS (Web of Science). For the selected literature to be relevant, the searcher used the keyword "educational games." In addition, screening was committed to obtaining scientific article publications from 2016 to 2021, which discussed the use of educational game-based teaching media in science learning in elementary schools. The search results for scientific articles contained 36 articles to be analyzed and synthesized. The analysis technique used was a narrative method by grouping the extracted data. The results of this study showed that the types of educational game-based teaching media used in science learning were the mixing method, literature review, qualitative, and experimental method. The use of multi-representation-based teaching materials has been demonstrated to be effective in the science learning process in elementary schools.
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1. INTRODUCTION

The Covid-19 pandemic has attacked all countries in the hemisphere. Corona Virus Disease 2019 (Covid-19) started in Wuhan, Hubei Province of China, and has spread rapidly to all countries. Corona Virus or Covid-19 is a large family of viruses that can cause disease with the usual symptoms, including chronic respiratory problems such as fever, shortness of breath, and coughs that affect the respiratory system such as the nose, throat, and respiratory organs. Covid-19 is a contagious disease that can be transmitted

directly or indirectly from one person to another. Given the fast spread, on March 11, 2020, the World Health Organization (World Health Organization) has decided that Covid-19 is a global epidemic (Putra & Afrilia, 2020).

In 2020, precisely in March, Indonesia was hit by the spread of Covid-19 (Handayani & Irawan, 2020). In connection with the Covid-19 outbreak in 2020, the government subsequently has adopted regulation by issuing an appeal to perform learning from home. On March 24, 2020, the Minister of Education and Culture of the Republic of Indonesia has issued Circular Letter No. 4 of 2020 regarding the application of learning policies during the emergency period of the spread of Covid-19 (Dewi, 2020). This outbreak requires a change in the learning system from face-to-face to online learning. This approach is enforced so that the way of learning always takes place (Sintema, 2020). At first, the term online teaching form is used only to describe a learning system using internet technology on a PC (ICT) platform. However, along with the advancement of this era of online teaching, it is not only possible to be conducted through PCs but can also be accessed via smartphones (Rosyid, Thohari, & Lismanda, 2020). Based on the Big Indonesian Dictionary (KBBI), the online learning system is a learning system utilizing the internet network (e-learning) (Nabila, 2020).

Online learning is an electronic learning method using communication and data technology, such as the internet (Irwanto, 2020). This is in line with Putra & Afrilia (2020) if online learning wants to link technology as a tool and network as a system. Furthermore, Fauzy & Nurfauziah (2021) stated that online learning is an innovation that link communication technology and data factors in learning. However, in reality, it is explained that transition from conventional to online learning is not easy, especially in science subjects. This is because students until now still think science is the most memorized subject. This is in line with the reality in the field if the science learning has not been able to succeed optimally. Students assume that science subject is a difficult to understand because the way of learning does not stimulate student creativity, so students still think and feel lazy to pursue science.

In a situation like this, as a teacher, it is obligatory to be able to select the right learning tools to be used in online learning. This is because learning tools are efficient for generating motivation to learn and to be more creative for students (Wibawanto, 2017). To assist in the online learning methods, efficient tools are required to improve student learning outcomes. One of the innovations of learning tools that can be used in the form of games media, this facility can increase student learning motivation so that student learning outcomes can increase. Activities provide students with new ideas about ethical and social implications of the scientific work. The results of this study can help educators and researchers design, implement, and evaluate science ethics activities for high school students (Mawasi et al., 2021). Gorbanev et al. (2018) have published a systematic review of serious games in medical education: quality of evidence and pedagogical strategy. The result of the study is that game developers claimed that games are beneficial pedagogical tools; moderate evidence of effectiveness, as assessed by the MERSQI score. In the systematic review articles studied, no one has discussed the fundamental education level in science learning. This study aims to make an extensive and comprehensive critical study by investigating, examining, and identifying key-educational game features in science learning.

The use of the Kahoot educational game has proven to be effective in the online learning process. This condition makes researchers interested in conducting a literature review on using educational games in science learning. So that in the end, researchers can apply this educational game learning media to science learning in elementary schools.

2. METHOD

This research is a systematic review using the method Preferred Reporting Items for Systematic Reviews and Meta-analyses called PRISMA. To obtain maximum results in writing, this literature is based on the Research Question (RQ). The purpose of this Research Question (research question) is structured to focus more on the literature review and can facilitate researchers to find related data. The Research Questions (RQ) in this study are summarized in Table 1.

Table 1. Research question

Research Question	Motivasi
1) What are the educational game-based teaching media used in science learning in elementary schools by students and teachers?	Identify the type of educational game-based teaching media used in science learning in elementary school.
2) How effective is the use of educational game-based teaching media in science learning in elementary school?	Identification of the effectiveness of using educational game-based teaching media in science learning in elementary schools

The articles used in this literature review were obtained using Scopus, Springer Link, and WOS (Web of Science). The search for research literature that is relevant to the topic of this research is carried out with the keywords: "educative games". The literature search was carried out in November 2021. The articles were then sorted according to the research topic so that 38 research articles were collected. These articles were considered to represent all research articles on the use of educational game-based teaching media in science learning in elementary schools. The articles used were 38 articles published in the last five years. Selecting articles used in writing literature required inclusion and exclusion criteria as the main research. The results of the search for data with these criteria were used by the authors to review articles. The inclusion and exclusion criteria in this literature are shown in Table 2.

Table 2. Inclusion and exclusion

Criteria Inclusion	1) Research articles published in 2016-2021, 2) Research topics include science learning, 3) Research subjects are limited to the elementary school level, 4) Article method
Exclusion Criteria	1) Research articles that cannot be accessed in full, 2) The literature is in the form of a thesis/thesis/dissertation.

After determining the inclusion and exclusion criteria, the next step was to select the articles to be reviewed. The following is a chart of the article selection process

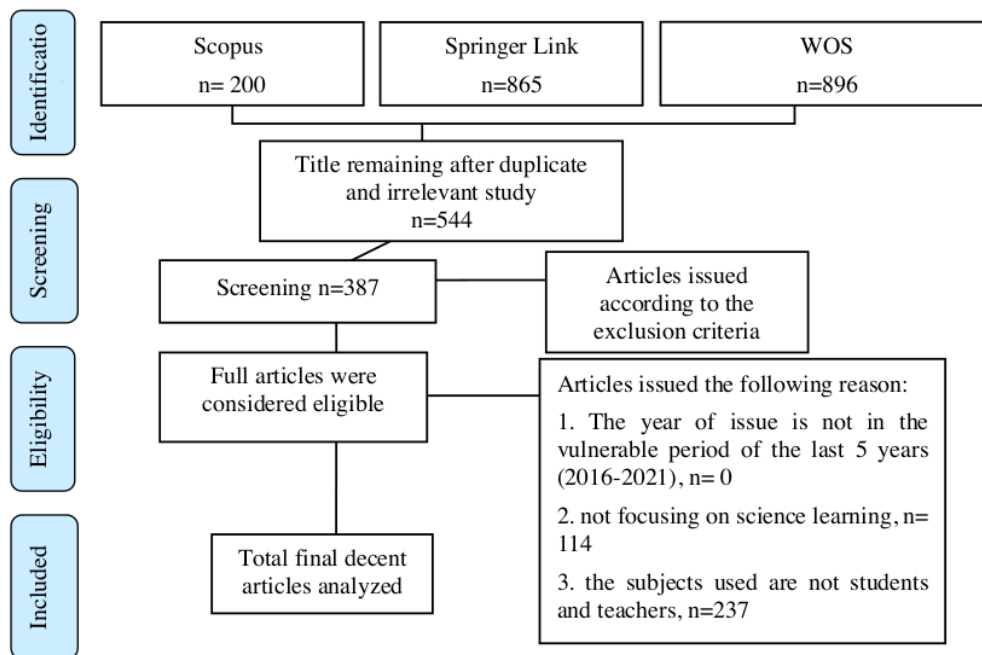


Figure 1. PRISMA Chart

The data analysis technique used was the narrative method. The narrative method aimed to describe the effectiveness of using educational game-based teaching media in science learning in elementary schools.

From Figure 1 above, it can be said that there are five main steps, namely identification, screening, eligibility, and inclusion. At the identification stage with the keyword educational games, 200 Scopus, Springer 865, and WOS 896 were obtained. In the screening stage, the remaining titles after the duplicate and irrelevant studies were 387 articles with more appearing in the nursing field. In the eligibility stage, 36 articles were issued according to the exclusion criteria.

3. RESULTS AND DISCUSSION

Based on the results of the literature review, four types of educational game-based teaching media research methodologies used in elementary science learning are case studies, experiments, literature reviews, and mixed methods. Figure 2 shows the educational game-based teaching media used in elementary science learning along with the references.

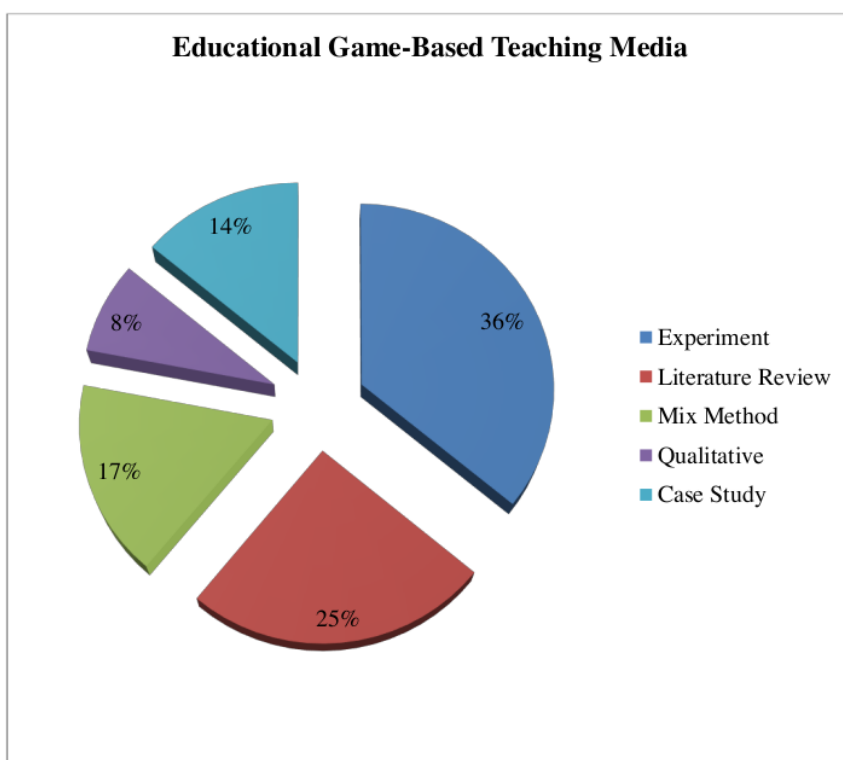


Figure 2. educational game-based teaching media

From the pie chart, it can be known that educational game-based teaching media found from journal platforms with experimental research methods are 36%, literature review methods 25%, mixed methods 17%, qualitative methods 8%, and case study methods 14%.

Articles about teaching media based on educational games mostly use experimental research methods with a total of 36% and 8% for qualitative research methods.

Our thematic analysis of the selected review articles produced a number of themes, as illustrated in Figure 1. Starting from top to bottom, a total of themes has been identified. There are the following:

- Identification: Identify what you are looking for based on the desired keywords using “OR” and/or “AND”. These keywords are used to search for relevant literature in online databases such as Scopus, Springer Link, Garuda Garba Reference Digital.
- Screening: At this stage, all the selected literature is re-filtered, if duplicates are found from different databases, one of them will be deleted. Furthermore, in the literature screening process, it is usually filtered based on reading the titles, abstracts, and keywords.
- Eligibility: Papers that have been successfully screened are based on predetermined criteria, at this stage, the eligibility is reviewed by reading the entire contents of the paper. This process is carried out to ensure that the paper is suitable for review and can answer the research questions from a systematic literature review.
- Included: After that, at the last stage, the papers obtained through the criteria previously mentioned are then prefiltered for references from other papers that will be processed after going through the quality assessment process.

In the distribution of Scopus, Springer Link, and WOS there are articles categorized as teachers and students in science learning, as presented in Table 3.

Table 3. Number of Articles

Scopus	(Tsekleves et al., 2016) (Shim et al., 2016) (Kokkalia et al., 2016) (Papanastasiou et al., 2016) (Fränti et al., 2017) (Mayer, 2016) (Hainey et al., 2016) (Harvey, 2016) (Huu & Tran, 2018) (Mayer, 2019) (Sanina et al., 2020) (Topalli & Cagiltay, 2018) (Whitton et al., 2018) (Lameras et al., 2016) (Dore et al., 2019) (Drigas, n.d.) (Huizenga et al., 2017) (Hopman et al., 2017) (Rugelj, 2016) (Calderón et al., 2018)	20
Springer Link	(Wallon et al., 2017) (Gould & Parekh, 2017) (Johnson, 2018) (Turan, 2019) (Wilson et al., 2018) (Bressler & Bodzin, 2016)	6
WOS	(Piancastelli, 2021) (Casanoves et al., 2016) (Solé-llussà et al., 2018) (Luttikhuizen, 2018) (Sampson et al., 2018) (Guedes, 2020) (Grether et al., 2021) (Borsos, 2018) (Cesar et al., 2018) (Ezezika et al., 2021)	10
Total		36

CONCLUSION

Our investigation of the relevant literature has revealed continued interest in the area of game education in science course. At the identification stage, using the keyword "educational game", the data obtained from the Scopus database were 200, Springer Link 865 articles, and WOS 896. In the screening stage, the remaining titles after duplicate and irrelevant studies were 387 articles that appeared more in the nursing field. In the eligibility stage, 36 articles were issued according to the exclusion criteria. At the included stage, the articles issued on the grounds that the year of publication was not vulnerable to the last five years were 0 article, the topics of learning that did not focus on science learning were 114 articles, the subjects used were not for teachers and students as many as 235 articles. Applying learning media with educational games can increase the student's learning motivation by displaying LKPD that is presented with attractive colors and writing.

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