Android-Based Natural Science Learning Application: Review

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Info Artikel	Abstrak
	The use of learning applications is currently increasing from year to year. Learning applications are considered useful in the era of the industrial revolution 4.0, which integrates digital technology. Learning applications that are currently widely used are learning applications using Android-based smartphones. It needs to be seen to what extent the Android-based science learning application has been implemented. Systematic literature review analysis is used to determine the similarities and differences in the journals under review, such as the research objectives, the methodology chosen, and the study's findings. According to keywords, articles are selected through sources from several journals such as ERIC, Elsevier, IJSE, Science Direct, and Google Scholar. The keywords used in the search are android-based learning applications. Search is limited to the period 2016 to 2020. A total of 30 articles have been analyzed based on the systematic literature review steps, including compiling questions, searching, reading titles, abstracts and content, and filtering information from selected articles. Based on the review conducted, it can be concluded that the Android-based science learning application is necessary and essential to be applied and developed. Learning applications have many benefits, including increasing interest in learning, motivation, learning outcomes, learning independence, and understanding concepts.

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INTRODUCTION

Learning applications are a form of learning media that can be integrated with technology. Learning media integrated with technology has an essential role in the era of the industrial revolution 4.0 (Indartiwi et al., 2018; Sebayang, n.d.). The use of learning applications using smartphones or tablets based on android is increasing every day (Zubair et al., 2016).

In the era of the industrial revolution 4.0, learning applications can be easily accessed via Android-based smartphone devices (Yektyastuti & Ikhsan, 2016). Cellular technology using gadgets provides opportunities for innovative education methods (Louhab et al., 2018). This technology in learning makes it easier to access material and is more flexible because it can be carried anywhere by students (Bano et al., 2018). The use of technology in learning in schools can be found in smartphones based on Android (Husniah et al., 2019). Android-based learning applications are currently widely used as a learning style in the era of the industrial revolution 4.0 (Of et al., 2020). The rapid development of technology makes students use gadgets or smartphones more often in their activities. Devices with the Android operating system (OS) are trendy (Zaini & Soenarto, 2019). Based on data in September 2020, it shows that the android operating system is 91.84%, iOS has increased to 7.93%, Samsung is 0.06%, Windows is 0.04%, and others are 0.03% (StatCounter, 2018).

Android-based learning applications in the learning process are one of the innovations that need to be improved in the sophisticated digital era (Napsawati, 2020). Research on android applications is seen and published in several journals such as IJSE, Science Direct, ERIC, Elsevier, and Google Scholar by writing the keyword "android-based learning application" in the search box. Systematic reviews related to Android-based science learning applications are still rarely found.

Therefore, it is necessary to conduct a study with the primary objective of analyzing systematic research literature on the topic of "Android-based science learning applications" to identify the articles' similarities and differences under study regarding the objectives, methodology, and research results.

METHOD

Research articles were selected through databases from ERIC, IJSE, Science Direct, Elsevier, and Google Scholar based on the keywords used. The keywords used in the search were android-based learning applications from 2016-2020.
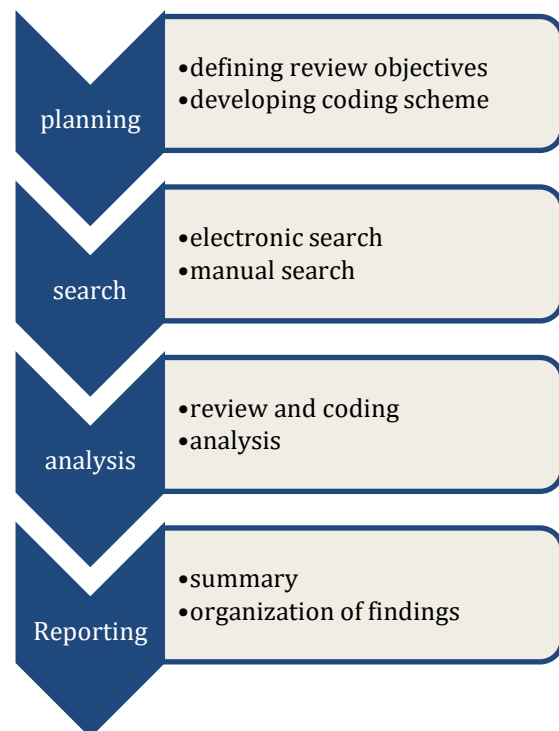
The review reviews were carried out using procedures adopted from research (Schwendimann et al., 2017). The research steps consisted of four main steps, namely: Query, Academic Databases, Raw Results, Analyzed Papers. The research steps are shown in Figure 1.
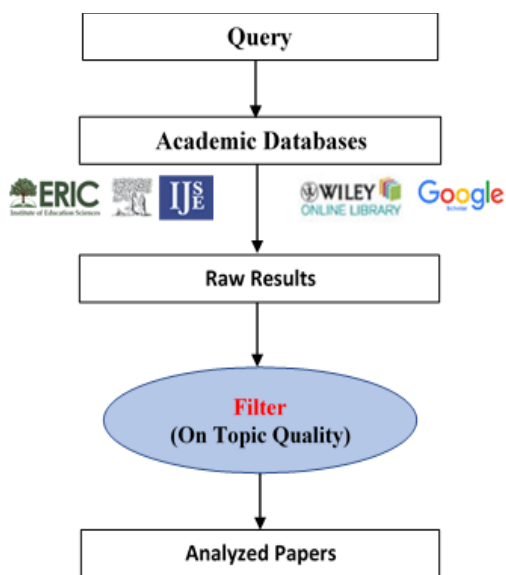
Figure 1. Research steps

An article search is carried out at the Query stage by writing the keyword "Android-Based Science Learning Application" on the search box site. The search for these articles was continued in the second stage. Namely, Academic Databases carried out on the ERIC, Google Scholar, Science Direct, Wiley Online Library, and IJSE sites. The search was carried out for publications in the period 2016 to 2020. The third stage was Raw Results, where results were obtained from the searches carried out. Many articles were found related to keywords. Then filtering or screening and eligibility of all articles that have been identified based on the title, abstract, keywords, and relevance of the downloaded topic is carried out. Articles that meet the eligibility requirements in this study are 30 articles. The last stage, namely the Analyzed Papers stage, analyzes and studies all articles that meet the requirements to get a synthesis or conclusion.

RESULT AND DISCUSSION

Of the 30 articles obtained, the similarities and differences that were devoted to the study's purpose, the methodology selected, and the research results were in a review journal.

Research purposes

Research from (Astiningsih & Partana, 2020), focuses on knowing the feasibility and effectiveness of learning chemistry using Android. Who is the same as the research objective of (Yadiannur, 2017), which is to determine the feasibility and effectiveness of mobile learning applications to improve the ability to interpret electric current material. While the goal (Nofitasari et al., 2021) is to analyze the feasibility of an Android based learning application based on teacher and student responses. The rapid development of science and technology has made Android-based learning applications developed. Research from (Sunarto et al., 2020; Sunarto et al., 2020; Taufiq & Amalia, 2017; Ai et al., 2017; Eliyawati et al., 2020) has the same goal of developing learning-based applications. Android. By the research (Liliarti & Kuswanto, 2018), which aims to produce productive media based on Android with local cultural content in the form of othok-othok toy boats to improve diagrammatic competence argumentative representations in physics material.

The purpose of developing learning applications such as research from (Hendikawati et al., 2019) is Android-based computer-assisted instruction to improve students' learning abilities. Meanwhile (Kurniawan et al., 2020a) focuses on developing android-based assessment applications to improve students' conceptual skills in understanding vector topics. The development of an android-based assessment application was also carried out by (Sokolova et al., 2017) and (Dini et al., 2018) to evaluate the risks of the android application used. In developing Android-based learning applications, the application quality is essential, such as research from (Taba et al., 2017) to improve the display design in building application quality. Quality in android-based learning applications affects the detectors of

learning systems in dangerous android applications, which is the research goal (Alzaylaee et al., 2020) and (Ren et al., 2020).

Android-based learning applications can be developed more broadly, such as in research from (Arista & Kuswanto, 2018) which develops learning applications in the form of an android-based virtual laboratory. (Minichiello et al., 2020a) aims to develop learning applications in fluid teaching (Kocakoyun & Bicen, 2017). They developed an android application regarding the mobile learning environment, as was also done by (Peixoto et al., 2020) by developing smartphone-based simulations through virtual in practicum activities. Research from (Falloon, 2017) which aims to report integrated technology applications to current science activities. Research (Boutell, 2017) aims to determine the level of learning demand via video with mobile-based learning applications. In contrast to (Radhy, 2018a) which aims to determine the application of technology in mathematics teaching methods, this research is supported by (Dini et al., 2018) to conduct an assessment or evaluation of android applications.

Android-based learning applications are used in the learning process to determine students' potential, abilities, or skills. Research on android-based learning applications from (Prasetio et al., 2019) and want to know the practicality and effectiveness of learning applications also aim to improve students' independent learning skills. Many Android-based learning applications are used to improve students' conceptual understanding of the material, according to the study's objectives (Budi & Muliyati, 2018).

Research methods

The development of technology is increasingly rapid, and nowadays, more and more studies develop Android-based learning applications. Research (Arista & Kuswanto, 2018) and (Hendikawati et al., 2019) used a research and development (R&D) method that adopted from Borg and Gall. The steps are through information gathering, planning, product initial form development, initial field testing, product first revision, field testing, second product revision, operational field test, final product revision, and implementation. Another research using research and development (R&D) method was conducted by (Astiningsih & Partana, 2020;Yadiannur, 2017;Liliarti & Kuswanto, 2018;Sunarto et al., 2020) using the ADDIE combination 4D model, namely analyze, design, develop, implementation, evaluation, disseminate. Meanwhile, the instruments used in the Android-based learning application research include product eligibility sheets, questionnaires, and tests. Research from (Nofitasari et al., 2021) in R&D research used instruments in the form of a feasibility sheet, a motivation questionnaire, and a test. In contrast to the Android-based learning application research (Peixoto et al., 2020), it uses the experimental method through pretest and post-test with 27 students.

In general, the research methods used in the literature study are experimental research methods and development research. Most studies use development methods to develop android-based learning application products for use in the learning process. The experimental method is more appropriate to determine the relationship between the independent variable and the dependent variable. Besides, development research aims to determine the effectiveness and feasibility of the developed android-based learning application (Astiningsih & Partana, 2020).

Research results

The research results from (Arista & Kuswanto, 2018) state that an Android-based learning application in the form of a virtual laboratory can be used in learning outside of school equipped with the material, practicum, virtual, exercise questions accompanied by exciting media. Applications in the form of a virtual laboratory can also improve learning independence and understanding of concepts. The Android-based CAI media (Hendikawati et al., 2019) shows that the application media

meets the criteria in the content of the material and media, and can be used as a flexible learning resource. Another study from (Astiningsih & Partana, 2020) found that the effective android application is very significant for metacognition abilities, but it is not significant enough for learning motivation. In contrast to research (Nofitasari et al., 2021), the application developed can increase learning motivation and student learning outcomes. Research from (Nofitasari et al., 2021) also resulted that learning applications were able to increase student motivation in the experimental class than in the control class.

Research from the development that has been carried out by (Sunarto et al., 2020) shows that the appearance of an Android-based learning application called MoLearn is comfortable to use, fulfilling learning needs by utilizing information technology. Android-based learning applications fall into the feasible category and can improve interpretation of material (Yadiannur, 2017). Supported by (Taufiq & Amalia, 2017), Android-based learning applications' validity is in the very good category and has an attractive appearance. It can increase student interest in learning, student responses to the learning application are good. They can be accessed easily. (Ai et al., 2017) state that the application developed can be used as a learning resource and can increase student learning independence. According to what was obtained (Prasetio et al., 2019), the student response was in a very good category, especially to improve students' independent learning abilities.

Mobile applications provide students with technological abilities that can visualize and are designed to increase interest and intuition from a material (Minichiello et al., 2020b). This application can also display various simulations that help improve student understanding (Budi & Muliyati, 2018). Android applications are detected to be good for use (Sokolova et al., 2017). Learning applications have advantages, including (1)

able to present material in mobile learning products that are easy to operate; (2) is interactive so that it can attract the attention of students; (3) learning application products are packaged in the form of apk files (Ibrahim & Ishartiwi, 2017). Research on learning applications used by teachers in assessments carried out by (Kurniawan et al., 2020b) is expected to motivate teachers to develop android-based assessments independently. Research conducted by (Ashim et al., 2019) states that students often use technology in learning through Android-based learning applications to improve digital communication skills.

The role of android-based learning applications makes many contributions to research, including understanding learning (Arista & Kuswanto, 2018; Astiningsih & Partana, 2020; Minichiello et al., 2020b; Budi & Muliyati, 2018; Surahman & Surjono, 2017), student learning interest (Taufiq & Amalia, 2017; Minichiello et al., 2020a), student learning motivation (Kocakoyun & Bicen, 2017; Radhy, 2018b; Astiningsih & Partana, 2020; Falloon, 2017; Boutell, 2017; Nofitasari et al., 2021; Helliyatul Matlubah, Anik Anekawati, 2016; Prasetio et al., 2019), student learning independence (Ai et al., 2017; Syaputrizal & Jannah, 2019; Arista & Kuswanto, 2018; Prasetio et al., 2019), and metacognition (Astiningsih & Partana, 2020). In general, the understanding and effectiveness of learning in this study are the dominant influences in research.

CONCLUSION

Development of android-based learning applications, especially in science learning, has been proven in the systematic library review analysis. In general, the research design in the literature review analysis is research and development (R&D) research and experimental research. Students, students, and educators are widely used in this study as respondents. Based on the literature review analysis results, it is

concluded that the android-based learning application is feasible, effective, practical, and flexible in learning, and can increase understanding, interest in learning, learning

motivation, metacognition, and student learning independence.

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