DEVELOPMENT OF ANDROID-BASED LEARNING MEDIA: A LITERATURE REVIEW

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Abstract: The development of information and communication technology such as android has not been widely used to support the learning process. Supposedly technological advances such as android can be utilized in the learning process. This study aims to discover some of the inventions of Android-based learning media that are currently being developed to support an efficient and effective learning process. The research design was in the form of a review of journals published in the Sinta database with the keywords "development of learning media" and "android-based learning media". The data used is in the form of journals related to the development of Android-based learning media in the 2016-2022 period. Based on the analysis that has been done, Android-based learning media that has been developed are in the form of video, PowerPoint, and applications. This Android-based learning media has proven successful in increasing student understanding, student motivation, and student cognitive learning outcomes towards a material as well as student skills in mastering technology.

Keywords: Android; Learning Media; Media Development.

INTRODUCTION

The development of Android-based learning media has become an important focus in the field of education. Android, as a popular and easy-to-use platform for many people, offers great potential to enhance the learning experience through interactive, visual, and mobile-accessible applications. However, in developing Android-based learning media, there are some anxieties or problems that may be faced by developers. *First*, limited technical knowledge. Many lecturers or developers have anxiety related to the lack of technical knowledge needed to develop Android applications. They may have an academic background in education or other sciences but lack an in-depth understanding of Android app development, programming, or user interface design (Asti Amalina Puspitaningrum, 2019).

Second, the complexity of development. Android app development can be a complex task. Developers need to understand programming languages like Java or Kotlin, as well as concepts like application lifecycle, resource management, and user interface layout. This complexity can be challenging for developers who are inexperienced in Android app development. *Third*, effective design and user interface. Another problem is related to effective user interface design. Developers need to consider easy-to-use layouts, intuitive navigation, and attractive visual styles to increase user appeal and engagement in the learning medium. Developers must also ensure that the application runs smoothly on various devices with different screen sizes (Ramansyah, 2016). *Fourth*, proper integration of learning content. Incorporating appropriate and effective learning content is a major concern in the development of Android-based learning media.

Developers need to consider how best to present content, such as text, images, audio, or video, so as to provide an optimal learning experience for users. *Fifth*, efficient testing and maintenance. Once the application is developed, a comprehensive testing process and efficient maintenance are also a concern. Developers must ensure that applications run as expected, are free of bugs or performance issues, and are able to survive in the long run through periodic maintenance and updates. In overcoming this anxiety, teachers or developers can seek additional resources, participate in training, or consult experts in the field of Android app development. With deep understanding and hard work.

There are several academic reasons why research on the development of Android-based learning media with a literature review is more appropriate than using field research approaches or case studies. *First*, focus on theoretical studies. In literature review research, the main focus is on theoretical studies and in-depth literature studies related to the development of Android-based learning media. This approach allows researchers to present and analyze a variety of relevant perspectives, concepts, and theories present in the scientific literature. This provides a comprehensive understanding of the development of Android-based learning media and underlies further research (Lisma Meilia Wijayanti, 2022).

Second, an in-depth literature search and analysis. Through literature review research, researchers can conduct a comprehensive literature search and analysis regarding the development of Android-based learning media. By reviewing related studies, existing theories, and approaches and best practices that have been put forward by experts, researchers can gather a deep understanding of the topic. *Third*, identify knowledge gaps. Through literature review research, researchers can identify knowledge gaps that exist in the field of Android-based learning media development. By understanding the existing literature, researchers can identify areas of research that are not yet well covered or need further development. This can provide a solid foundation for future research and contribute to the development of knowledge in the field (Puspa Putri, 2019) (Abiyoga &; Rahmiati, 2021). *Fourth*, conceptual discussion. The "Literature Review" approach allows researchers to conduct in-depth conceptual discussions about the development of Android-based learning media. Researchers can present relevant ideas, concepts, and theoretical frameworks, as well as compare and synthesize existing literature. This helps in building a solid theoretical understanding and linking various concepts relevant to the research context. *Fifth*, the development of a conceptual framework. Through "Literature Review" research, researchers can develop a solid conceptual framework for future research. By synthesizing existing literature, researchers can formulate a theoretical framework that connects important concepts and variables relevant to the development of Android-based learning media. This helps in designing more targeted research and provides clear direction. Although field

research or case studies also have important value in the development of Android-based learning media (et al., 2020).

Android is one of the most popular operating systems today (Marhadini et al., 2017). Android is an operating system that runs on smartphones or tablet PCs, which is open source so that many programmers want to create their own applications, one of which is media that can be utilized in the learning process, namely Android-based learning media (Apsari & Rizki, 2018). Currently, many people are switching to using Android-based devices to serve as a medium for accessing information easily and quickly (Putriani et al., 2017). From this background, This study aims to find out some of the inventions of Android-based learning media which are currently being developed to support an efficient and effective learning process.

Learning media tends to be used in various strategies and learning models in the classroom. The learning media used must be able to assist students in achieving the learning objectives that the teacher has developed, for example, increasing scientific literacy, critical thinking, and creative and innovative thinking. The learning media used must be interactive so that students are more active in learning (Pradana et al., 2022). Learning media is currently being developed by teachers to be accessible to students outside the classroom, so it is very helpful for teaching and learning activities during the COVID-19 pandemic (Fatimah & Bramastia, 2021). According to (Rionanda et al., 2022), media that is appropriate to the problems that occur are Information and Communication Technology (ICT)-based media, in this case, computers with multimedia support, which can present non-sequential, nonlinear, and multidimensional text displays with branching links and nodes Interactively. According to (Kurniawati, 2018), the media has various benefits, including helping teachers deliver their teaching materials. The media is also a communication tool that bridges abstract ideas and the real world.

As in the research entitled "Development of Android-Based English Learning Applications for High School Students". This research resulted in an Android-based English learning application that effectively improves high school students' ability to speak, listen, read, and write in English (Swara & Guci, 2022). The research entitled "Evaluation and Development of Android-Based Physics Simulation Applications for Junior High School Students". This research resulted in an Android-based physics simulation application that helps junior high school students understand physics concepts through interactive visualization, virtual experiments, and practice questions (PILENDIA, 2020). Research entitled "Development of Android-Based Interactive Multimedia Applications for History Learning". This research produces an Android-based interactive multimedia application that helps students learn history through visual content, audio narration, and interesting interactive activities (SYAIFUL NUR ROHMAN, 2020). Research entitled "Development of Android-Based Mathematics Learning Mobile Applications for Elementary School Students". This research resulted in an Android-based mathematics learning

mobile application that facilitates elementary school students in understanding mathematical concepts through games, interactive exercises, and automatic assessment (Coal, 2017). Research entitled "Evaluation of the Use of Android-Based Flashcard Applications in Learning Foreign Language Vocabulary". This study evaluates the use of Android-based flashcard applications in learning foreign language vocabulary and shows that these applications can improve vocabulary comprehension and memorization effectively (Fidiyanti, 2020).

Based on the background above, researchers are interested in studying some of the findings of Android-based learning media that are currently being developed to support an efficient and effective learning process. In addition to developing learning media discourse, this research is also expected to have novelty novelty with the theme of learning media.

METHOD

This study uses descriptive analysis of the data obtained. The research presents search results related to the development of android-based learning media. The literature review was carried out with a focus on the original article containing the abstract, introduction, methods and results. The research design was in the form of a review of journals published in the Sinta database with the keywords "development of learning media" and "android-based learning media". The data used is in the form of journals related to the development of android-based learning media for the 2016-2022 period. The number of samples taken was ten articles. While the sampling technique used focuses more on the selection of relevant literature than on direct sample selection. The data collection technique used is through analysis and synthesis of previously published relevant literature. Langka-Step Data collection techniques begin with the identification of relevant data sources such as journal articles, research reports, and other related electronic sources that discuss the topic of developing Android-based learning media; Literature Search and Selection by applying inclusion and exclusion criteria to select literature that is in accordance with the research objectives; Literature Analysis by Reading and analyzing literature carefully to identify relevant information such as theories, concepts, research findings, methodologies, and best practices related to the development of Android-based learning media; Collect data from relevant literature, such as important citations, research findings, and approaches used in the development of Android-based learning media; Compile and integrate information collected from various literature into a coherent whole based on relevant themes or topics, identification of similarities and differences, and development of a solid theoretical framework; Evaluate the quality of literature used in research, such as checking the validity of sources, relevance, methodology used, and contribution to the understanding of the topic; and Document all information and references collected from literature in the form of a complete bibliography. The data analysis used is content analysis.

RESULTS AND DISCUSSION

Result

The use of learning media plays an important role in achieving the learning achievements to be achieved (Pratiwi & Meilani, 2018). Learning media is very helpful for learning activities from elementary school to university. On the other hand, the development of information and communication technology, such as android, has not been widely used to support the learning process. Supposedly technological advances such as android can be utilized in the learning process (Kuswanto, 2020). Therefore, this research focuses on learning media based on android. Based on the selection of articles that have been carried out, 5 articles regarding Android-based learning media were obtained. The results of research related to the use of Android-based learning media are presented in Table 1.

Table 1. Research Results About the Use of Android-Based Learning Media

| Author	Research Title
(Rahman et al., 2019)	Pemanfaatan Teknologi Mobile Learning Sebagai Media Pembelajaran Untuk Siswa Sekolah Dasar
(Yektyastuti & Ikhsan, 2016)	Pengembangan Media Pembelajaran Kelarutan Berbasis Android Untuk Meningkatkan Prestasi Akademik Siswa SMA
(Setiawan et al., 2020)	Pengembangan Media Pembelajaran Listening Melalui Aplikasi Android Tingkat Bipa Sd
(Azzahra, 2017)	Analisis Pembuatan Media Pembelajaran Video Pada Mata Kuliah Pembelajaran Listening 0 Oleh Mahasiswa Kelas A Semester V Program Studi Pendidikan Bahasa Indonesia Universitas Khairun Ternate
(Nurhidayati et al., 2019)	Pembuatan Media Pembelajaran Berbasis Powerpoint Dan Memanfaatkan Aplikasi Android Untuk Guru Bahasa Arab
(Kuswanto, 2020)	Media Pembelajaran Berbasis Android Pada Mata Pelajaran Sistem Operasi Jaringan Kelas Xi
(Anita Adesti & Siti Nurkholimah, 2020)	Pengembangan Media Pembelajaran Berbasis Android Dengan Menggunakan Aplikasi Adobe Flash CS 6 Pada Mata Pelajaran Biologi
(Kartini & Putra, 2020)	Respon Siswa Terhadap Pengembangan Media Pembelajaran Interaktif Berbasis Android
(Astuti et al., 2018)	Pengembangan Media Pembelajaran Berbasis Android Dengan Menggunakan Aplikasi Appypie Di Smk Bina Mandiri Depok
(Kuswanto, 2020)	Pengembangan Media Pembelajaran Berbasis Android Mata Pelajaran Desain Grafis Kelas X

Table 1 is the finding of a research article that discusses android-based learning based on various subjects and at different levels. The findings will be analyzed in the discussion section.

Discussion

In a study by Rahman et al. (2019) with, an article entitled "Pemanfaatan Mobile Learning sebagai Media Pembelajaran Siswa SD, it was found that Mobile learning is a learning medium that utilizes technology and information as a learning medium. Mobile learning is a technology product that can be linked With 21st-century learning. Mobile learning can motivate students to be active in learning because the learning media used are mobile devices that are very close to students' lives today.

Furthermore, Yektyastuti & Ikhsan, (2016) research entitled "Mengembangkan Media Pembelajaran Kelarutan Berbasis Android untuk Meningkatkan Prestasi Akademik Siswa SMA". Developing Android-based chemistry learning media that functions to improve academic performance has been successfully developed using the Adobe Flash Professional CS 6 computer program. The resulting learning media product is in the form of a file in the Android Package (apk) format. Files in apk format are application installation requirements files on Android devices. If this file is opened on an Android device, the learning media application will be automatically installed on that device. The results of this study include (1) Android-based chemistry learning media software on solubility materials has been successfully developed; (2) the developed learning media is considered suitable for use in chemistry learning in terms of the assessment of material and media aspects; and (3) the use of Android-based chemistry learning media affects improving academic performance in the form of learning motivation and cognitive learning outcomes for high school students.

Then research Setiawan et al. (2020) with the title "Pengembangan Media Pembelajaran "Menyimak Melalui Aplikasi Android untuk BIPA Tingkat Dasar". This study uses educational research and development because the researchers are trying to develop an Android-based learning media product for listening to BIPA at the basic level. The type of research and development used is still relatively simple because it is not multi. The design used in this study is the Hannafin and Peck design. The Hannafin and Peck version of research and development has three main procedures that need to be done sequentially and one that needs to be done regularly. The following is the research procedure carried out in this study:
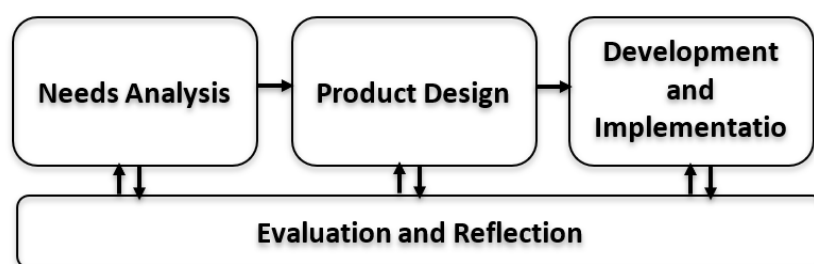
Figure 1. Hannafin and Peck Research Procedure

Based on the results of the study, it was found that the research was carried out based on research procedures with the flow of 1) needs analysis, 2) product design, and 3) development and implementation. In addition, at each stage, evaluation and revision are carried out. The results of the needs analysis according to the perception of the literature and BIPA teachers produce product development characteristics that are in accordance with the context, oriented to learner needs, thematic, productive, entertaining, sustainable, explicit, translation-based, measurable, and varied. The product prototype is developed based on the Media Content Outline (GBIM), scenario, flow chart or storyboard, media script, recording, and editing. The assessment of hypothetical products was carried out by two learning media experts and two BIPA learning experts. The average for learning media experts is 4.08 (effective), and BIPA learning is 4.25 (very effective). Development and implementation are carried out by means of product trials. The trial was conducted in a limited manner with three research subjects. This is because the quantity of BIPA students around the research location has decreased. The response value given by the research subject to the developed product is 3.5 (effective). This research also has practical implications. This research is a concrete form of the researcher's contribution in the world of listening and learning media through the android application. The practical implications of this research are that listening learning media products through the android application improve the quality of BIPA listening learning. Learning media products through the android application are learning media that focus on listening learning. Still, users can use them in language skills-based learning.

The next research on the development of android-based learning media is researched by Azzahra, (2017) with the research title "Analisis Pembuatan Video Media Pembelajaran dalam Mata Kuliah Pembelajaran Menyimak oleh Mahasiswa Kelas A Program Studi Pendidikan Bahasa Indonesia Semester V Universitas Khairun Ternate". The research was conducted based on the importance of the role of learning media in the success of the teaching process. This research aims to know the students' ability to make effective learning media to support the achievement of teaching objectives. This research is descriptive research, which is researching an object. The data research is the result of making learning media in the form of videos in listening learning courses.

The data were analyzed based on the criteria of effective learning media, among others, from the perspective of 1) the accuracy of the media with the purpose of teaching; 2) support for the content of lesson materials; 3) easy access to media; 4) the skills of the teacher in using it; and 5) according to the child's level of thinking. The results of making video learning media by students were classified as successful because students were able to produce media that was effective in allocating time, easy to operate, and attractive in appearance. From the data analysis, several conclusions were made, that: 1) the media can be used for several competencies at once in one material theme. Thus, it will help teachers in the effectiveness of the allocation of learning

time; 2) several media such as short stories, news, and information themes can be used simultaneously in taking learning evaluation scores; 3) making video media can help teachers as facilitators so that teachers are more conceptualized in implementing learning. The results of making video learning media by students are classified as successful because students can produce effective media in time allocation, are easy to operate, and are attractive.

Further research was conducted by Nurhidayati et al. (2019) with the title "Pembuatan Media Pembelajaran Berbasis Powerpoint dan Memanfaatkan Aplikasi Android untuk Guru Bahasa Arab". In terms of facilities and infrastructure, MTs in Bojonegoro Regency already have adequate infrastructure, in some madrasah, Internet facilities are also available, but their use is not optimal. It is still very rare for teachers to use the computer for the purpose of improving learning, let alone using Powerpoint-based learning media with its various applications. This service is carried out to increase knowledge and improve the skills of Arabic language teachers at MTs in Bojonegoro about the concept of powerpoint-based learning media.

Regarding the material developed in Arabic learning media and making learning videos through android, the method used is training and mentoring. The results of this training show that the skills of the teachers have improved considerably with the indicator that the training outputs have met attractive media standards and have the potential to accelerate the achievement of students' competence in learning Arabic.

In research (Kuswanto, 2020), it shows that this android-based learning media has a level of feasibility and product attractiveness on good criteria. The results of data collection evidence this through questionnaires there is an average percentage of instrument items in good criteria. Based on the results data obtained, android-based learning media in class XI Network Operating System subjects can be said to be feasible to be applied in schools. Research (Anita Adesti &; Siti Nurkholimah, 2020) shows that there is an effectiveness of student learning outcomes by using learning media in biology courses compared to using German learning. This happens because learning using learning media can be anywhere and anytime. With a good understanding of students, the learning outcomes obtained by students increase. Research (Kartini &; Putra, 2020), it shows that the results of student response questionnaires to android-based learning media on IUPAC nomenclature material inorganic compounds get an average percentage of 76.41% in the beta test I with good categories and student response questionnaire results in beta test II get an average percentage of 83.07% with very good categories.

In research (Astuti et al., 2018), the results show that the products produced by teachers are in the form of android-based learning media applications that teachers can use to support learning activities in the classroom. While the research (Kuswanto, 2020), the results show that through several stages, namely the expert trial stage and the field trial stage. The results of expert evaluations conducted by media experts obtained 78.30 with good predicates, design expert

evaluations obtained a percentage of 78 with good predicates, and material experts assessed products made with a percentage of 80 good predicates. So the overall average score of the percentage on expert validation obtains the Good eligibility criteria. After the feasibility test of the experts, it was continued with individual trials obtained an average percentage of 80 with a good predicate, small-scale trials obtained an average percentage of 80.05 with a good predicate, and large-scale trials obtained an average percentage of 80.05 with a good predicate. So overall the average percentage score of respondents obtained Good eligibility criteria. Based on the results of several stages of trials conducted by experts and respondents, it can be concluded that this android-based learning media is feasible to be applied in graphic design learning in class X.

This Android-based learning media has succeeded in increasing student understanding, student motivation, and student cognitive learning outcomes of a material, as well as student skills in mastering technology. However, in the use of Android-based learning media, there are also advantages and disadvantages.

The advantages include 1) Can be repeated if necessary to add clarity; 2) The message conveyed is quick and easy to remember; 3) Developing students' thoughts and opinions; 4) Develop imagination and clarifying abstract things and providing more realistic explanations. The disadvantage in using this learning media is that it takes the ability to create classes that remain conducive to learning activities. Teachers are also required to be able to guide well in accordance with the use of supporting materials displayed in learning media. Learning media that is developed is less supportive if used independently by students without being accompanied by a teacher, requires other technologies to access media, and is developed on material whose phenomena are easily observed by students in everyday life. For this reason, it is better to add the development of learning media to help students understand the material optimally.

CONCLUSION

Based on the analysis that has been done, Android-based learning media that has been developed are in the form of video, PowerPoint, and applications. This Android-based learning media has proven successful in increasing student understanding, student motivation, and student cognitive learning outcomes towards a material as well as student skills in mastering technology. In the use of android-based learning media, there are also advantages and disadvantages.

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