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# Designing Mobile Games Application for Digitalization of English Teaching and Learning Materials for Elementary School

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## *Abstrak*

*Dunia menghadapi perubahan industri yang pesat seiring dengan revolusi industri 4.0. Perubahan tersebut menyisakan sejumlah tantangan dan peluang untuk beradaptasi dan berkembang menjawab tantangan zaman. Oleh karena itu, penelitian ini bertujuan untuk mengembangkan bahan ajar digital berbasis Android untuk mendukung mobilitas belajar. Penelitian ini menggunakan pendekatan penelitian pengembangan (R&D). Desain pembelajaran yang digunakan dalam penelitian ini adalah model penelitian Gall. Metode penelitian yang digunakan adalah penelitian metode campuran. Selanjutnya jenis desain yang akan digunakan adalah tipe eksploratif. Penelitian diawali dengan kegiatan penelitian kualitatif yang bertujuan untuk mengeksplorasi proses pembelajaran dan menguji hipotesis melalui penelitian eksperimen. Penelitian eksperimental akan memberikan keputusan tentang diterima atau tidaknya hipotesis yang dikembangkan untuk diterapkan secara luas di sekolah dasar. Hasil penelitian menunjukkan bahwa bahan ajar digital berbasis game Android telah berhasil dikembangkan dan diimplementasikan dengan benar; bahan ajar ini juga membantu mereka dalam memahami materi yang diajarkan. Digitalisasi bahan ajar melalui mobile learning dapat menjadi alternatif efektif dalam meningkatkan pembelajaran bahasa Inggris di sekolah dasar.*

***Kata kunci*:** *Bahan Ajar, Aplikasi* Games Android*, Digitalisasi, Sekolah Dasar*

## Abstract

The world faces rapid industrial changes in line with the industrial revolution 4.0. These changes leave several challenges and opportunities to be adaptive and evolve to respond to the challenges of the times. Therefore, this research aims to develop Android-based digital teaching materials to support learning mobility. This study uses a research development (R&D) approach. The instructional design used in this study is the research model of Gall. The research method used is mixed methods research. Furthermore, the type of design that will be used exploratory type. The research started with qualitative research activities aimed at exploring the learning process and testing the hypothesis through experimental research. Experimental research will provide a decision about the acceptability or not of the hypotheses that developed to be widely applied in elementary schools. The study results showed that digital teaching materials based on Android games have been successfully developed and implemented correctly; this teaching material also helps them understand the material being taught. Digitizing teaching materials through mobile learning can be an effective alternative to improving English learning in elementary schools.

**Keywords:** Teaching Materials, Mobile Game App, Digitalization, Elementary School

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## 1. INTRODUCTION

Indonesia's Programmed for International Student Assessment (PISA) ranking based on the 2018 survey was at the bottom of the list. For reading competency, Indonesia ranked 70 out of 77 countries. For math scores, it ranked 72 out of 787 countries (Ayunin et al., 2013; Nugrahanto & Zuchdi, 2019). At the same time, science scores are ranked 70 out of 78 countries. These values tend to stagnate in the last 10-15 years. Compared to our ASEAN neighbors Singapore, Malaysia, and Thailand, our country is still far behind. Smartphones use individuals of all ages for communication, messaging, online gaming, and information access. Smartphones, which students frequently use for any purpose, increase smartphone

dependency on students and affect them negatively (Irwansyah & Izzati, 2021; Rizal et al., 2022; Safitri et al., 2020).

Digitalizing teaching materials based on mobile learning android games in the English language for elementary schools can provide various advantages. First, students can learn English independently with mobile devices that are familiar to them. Second, android games can present learning materials interactively, such as through challenges, puzzles, or real-life simulations, which make the learning process more exciting and fun. Third, android games can also provide students with direct feedback, so they can correct mistakes and increase their understanding of English effectively (Amoako Atta & Brantuo, 2021; Halabi, 2020). This research on the digitalization of teaching materials based on mobile learning android games in the English language for elementary schools aims to explore the effectiveness of this learning method in improving students' English language ability and analyze the positive impact it has on the learning process. Through this research, it is hoped that innovative and effective solutions can find to overcome students' difficulties in learning English at the elementary school level (Cahyani et al., 2021; Putrayasa et al., 2014).

Moreover, there is also study investigated attitudes toward mobile learning among language teachers (Li & Swanson, 2014). The introduction of Android-based Arabic language recognition in elementary schools was a subject of research conducted in Indonesia on the development of Android games assisted by the construction of two software programs on the number pattern material. Mobile learning is a learning media that allows educators to deliver learning material to students using Android-based media (Asih et al., 2021; Manuaba, 2017).

Therefore, efforts to revitalize education can be made by digitalizing teaching materials based on mobile learning Android games. Android-based teaching materials are seen as easy to use and develop and to the learning characteristics of children (Hwang et al., 2022; Madadizadeh, 2022). On this basis, developing Android-based mobile learning teaching materials is needed to improve the quality of education in Indonesia. Another thing to consider is that Android-based teaching materials provide learning challenges and motivation for students because they are by the time. Through technology, students are expected not only to acquire language skills but also to be literate in technology as one of the life skills in the 21st century. Using teaching materials allows teachers and students to participate actively and makes learning more effective (Asrizal et al., 2017; Parvathamma & Pattar, 2013). Teaching materials developed that are in direct contact with learning objects have the potential to understand the concepts and motivations of students. Suitable teaching materials are teaching materials that can accommodate the abilities to be developed. Therefore, the structure for presenting teaching materials must follow indicators of the abilities to be developed.

Researchers in Indonesia have carried out research related to teaching materials. Based on research results, using Android-based 2D mobile learning teaching materials can effectively increase student motivation and enthusiasm for learning (Dasilva et al., 2019; Susilo, S. V., & Prasetyo, 2020). Previous study states that the developed learning model-based teaching materials have been proven to effectively improve listening and reading skills and develop student character during the learning process (Fatimah & Santiana, 2017). This research concludes that developing teaching materials can improve students' critical thinking skills. Previous study states the research and development results as follows; content and context, characteristics, teacher responses, and student responses to excellent and relevant to regional potential, mapping of learning indicators, and the quality of the teaching materials produced are in an outstanding category (Laksana et al., 2018). Thematic teaching materials based on the local wisdom of the Ngada people, namely the quality of the teaching materials produced, are outstanding.

Related to Android games have been carried out by researchers in Indonesia. Previous study stating that the educative game learning media developed is valid, practical, and effective by research objectives (Feriatna, 2017; Hart et al., 2021). It can improve students' analytical abilities, especially in bank reconciliation. Furthermore previous study stated that Educational Games are created to teach about the development of intellect and creativity, which includes learning to recognize animals, children's songs, cheerful doodles, coloring, and the alphabet and are supported by an interface easy to understand and operate by children aged 3-6 years (Hardiyana, 2016). Next other study stated that this educational game learning media is a 2-dimensional game with a puzzle genre that runs on the Android operating system and is run using tools (device) smartphone so that it can be played anywhere and anytime (Hijrah et al., 2020). Next previous study states that based on the test results, there is an increase in scores before and after using the media; the game application media is included in the perfect criteria and is suitable for use as a medium for learning vocabulary for deaf students (Vartiainen et al., 2016). Furthermore there is also study states that the results of compatibility testing data on smartphone devices can be concluded that all functions in the Android-based mathematical learning educational game application for elementary school children classes 1 and 2 can run properly (Khaitova, 2021).

Related to that, the researcher this means to design the digitization of mobile learning materials based on Android games used for English lessons for elementary school students. This research will answer many questions about using technology to improve elementary school English skills. The aim of this study is to develop Android-based digital teaching materials to support learning mobility. In addition, it is hoped that learning English in elementary schools can become more attractive, interactive, and practical with Android games-based digital teaching materials, and this can help students improve their English skills from an early age.

## 2. METHODS

This study uses a research development (R&D) approach. The instructional design used in this study is the research model of Gall, namely (1) research and information collecting; (2) Planning (planning); (3) Development of product draft (develop a preliminary form of product); (4) Field trials (preliminary field testing); (5) Completion of the initial product (primary product revision); (6) Field trials (main field testing); (7) Improving product results from field tests (operational product revision); (8) Field implementation test (operational field testing); (9) Completion of the final product (final product revision); and (10) Dissemination and implementation (dissemination and implementation) (Akker et al., 2012; Madadizadeh, 2022).

This research was conducted in the districts of Majalengka and Kuningan districts. The subjects of this research were Grade 5 students in elementary school. To facilitate the implementation process, three operational areas have been established. It will be determined in Majalengka District, Majalengka Regency, for limited experimental trials. At the same time, the experimental test will be widely implemented in the two districts. Determination of the subject of this study was determined purposively. The selection of students is made by considering the academic characteristics of students. The number of samples in this study is estimated at 150 students.

The research instrument used test instruments in the form of descriptive questions and non-test instruments in the form of (1) ) semi-structured questionnaires; (2) interview guidelines; (3) field notes; (4) documentation; (5) process assessment; (6) assessment of higher order thinking skills; and (7) assessment of teacher professionalism. Data collection and analysis techniques for this study were collected using (1) testing; (2) questionnaires; (3) interviews; (4)

observation; and (5) documentation to collect data on the research implementation process. After the data was collected, the data were analyzed qualitatively using inductive techniques, while the quantitative data were analyzed using statistical tests with the help of SPSS version 26.

## 3. RESULTS AND DISCUSSION

### Results

The preliminary study phase begins with conducting research and data collection to find problems in the field. The planning stage begins with the preparation of digitizing teaching materials, an essential process in the development of modern education. Digitizing teaching materials is a step toward changing learning materials from physical forms into digital formats. This can include different types of content such as text, images, audio, video, simulations, etc. Digital teaching materials provide flexibility in how students access and interact with learning materials. In a digital format, students can take advantage of interactive features such as links, animations, games, or quizzes, which can increase their engagement and understanding. The preparation of digitizing teaching materials also allows the use of additional resources not available in print format. An example is learning videos, interactive simulations, or learning applications that can enrich student learning experiences. In planning, the first step in preparing for the digitization of teaching materials is to understand the learning objectives and the material to be taught. Then, the content can be converted into an appropriate digital format, considering the needs and characteristics of the students who are the target users of the teaching materials.

The development stage of digitizing teaching materials involves several steps that need to be taken to achieve optimal results. The stages in developing the digitalization of teaching materials begin with needs analysis, instructional design, media and technology selection, content development, testing and revision, implementation and evaluation, maintenance, and sustainable development. By following these stages, the development of digitalization of teaching materials can be carried out in a more structured and effective manner. It is essential to involve collaboration between educational experts, instructional designers, content developers, and students in this process in order to achieve optimal results. Developing teaching materials that utilize technology is an opportunity for teachers to operate commands as educators in the digital era. Technology in the form of applications can help teachers prepare learning tools by providing creative, engaging, and fun content. Technology can help students understand learning concepts better. The application of this teaching material is so that students can study whenever and wherever they need and can collaborate, integrate, and contextualize learning and life.

Technological innovation allows teachers to do many things, significantly increasing learning motivation to achieve maximum learning. Through Android-based application technology, teachers can invite students to improve their speaking skills wherever and whenever. This mobile learning application contains loads for every lesson presented that ask students to read, write, listen, and speak with a draft of Skill-based notifications. This is designed to make it easier for students to improve their language skills, including elements of reading, writing, listening, and speaking. The initial design for digitizing teaching materials developed includes several main components. Here is an example of an initial design that can be used is show in Figure 1.


**Figure 1.** Initial Display of Digitalization Mobile Learning Teaching Materials

Digital teaching materials can be accessed easily through the selected platform during implementation. Also, ensure that the interface navigation is intuitive, the content is easy to understand, and the media supports learning objectives. After implementation, evaluate digital teaching materials. Use feedback from students and instructors to refine and improve the design of teaching materials as needed. This evaluation also helps ensure that digital teaching materials achieve the learning objectives. In developing digital teaching materials, it is essential always to follow the principles of good instructional design, refer to the needs of students, and continue to develop teaching materials according to technological developments and learning needs. Thus, developing digital teaching materials will produce a more enjoyable, interactive, and practical learning experience for students.

The validator assessed the validity of digitizing English Mobile Learning Teaching Materials based on Android Games. The validators who assessed the digitization of English mobile learning materials based on Android games were relevant to the content, clear learning structures, intuitive navigation, availability of learning resources, multimedia quality, technical suitability, and student interactivity and involvement. Android-Based Mobile Learning Teaching Materials are said to be valid if they are assessed well by the validator and meet the following criteria: (a) content accuracy; (b) learning materials; (c) conformity with learning objectives; (d) physical design and others. The results of the validity of the digitization of Android-based English Mobile Learning teaching materials provide essential feedback for application developers to improve the quality and effectiveness of learning through this digital platform. Table 1 summarizes the results of the validator's evaluation of digitizing teaching materials.

**Table 1.** Recapitulation of Expert Validation Test

| No. | Subject of Validation | Percentage | Category |
|---|---|---|---|
| 1 | Media Expert Validation 1 | 77% | Valid |
| 2 | Media Expert Validation 2 | 81% | Very Valid |
| 3 | Media Expert Validation 1 | 80% | Valid |
| 4 | Media Expert Validation 2 | 80% | Valid |
| **Average Percentage of Validations** | | **80%** | **Valid** |

Base on Table 1 show the results of the recapitulation of the product feasibility level obtained an average of 80% with a valid category. The recapitulation of the expert validation test results provides an overview of the scoring scores for each aspect of digitizing teaching materials. This score indicates the extent to which the digitization of teaching materials meets the criteria set by experts. These results can be used as a reference for increasing and improving the quality of digitizing teaching materials with input from experts. Furthermore, the recapitulation of the teacher's response questionnaire to digitizing English mobile learning teaching materials can be seen in Table 2.

**Table 2.** Recapitulation of Teacher Response Questionnaires

| No. | Respondents | Average | Percentage | Category |
|---|---|---|---|---|
| 1 | Teacher Response 1 | 4.55 | 91% | Valid |
| 2 | Teacher Response 2 | 4.75 | 95% | Valid |
| 3 | Teacher Response 3 | 4.45 | 89% | Valid |
| 4 | Teacher Response 4 | 4.40 | 88% | Valid |
| 5 | Teacher Response 5 | 4.65 | 93% | Valid |
| **Average Amount** | | **4.56** | **91.2%** | **Valid** |

Base on Table 2 shows the average score given by the teacher in the response questionnaire to the digitization of English Mobile Learning teaching materials. The average score is 4.56 or 91.2%, with a valid category. This score reflects the teacher's level of satisfaction with each aspect assessed. The higher the score, the better the teacher assesses that aspect. These results can be used as feedback to improve and develop the digitization of English Mobile Learning teaching materials to suit teachers' needs and expectations better. The recapitulation of student response questionnaires about digitizing English Mobile Learning teaching materials can be seen in Table 3.

**Tabel 3.** Recapitulation of Students Response Questionnaires

| No. | Contention | ∑R | | | | | Jml NRS | %NRS | Criteria |
|---|---|---|---|---|---|---|---|---|---|
| | | SS | S | N | TS | STS | | | |
| 1 | The display of English Mobile Learning teaching materials caught my interest in learning English | 63 | 55 | 27 | 5 | 0 | 626 | 83.4 | Very Interested |
| 2 | The use of teaching materials based on Mobile Learning in English makes it easier for me to understand the material | 49 | 68 | 28 | 5 | 0 | 611 | 81.4 | Very Interested |
| 3 | Presentation of material using mobile learning-based media makes me more enthusiastic | 65 | 64 | 21 | 0 | 0 | 644 | 85.8 | Very Interested |
| 4 | This mobile learning-based teaching material is by the level of students' thinking | 48 | 54 | 43 | 5 | 0 | 595 | 79.9 | Interested |
| 5 | Learning using this teaching material makes it easier for me to understand the material | 62 | 62 | 24 | 2 | 0 | 634 | 84.5 | Very Interested |

| No. | Contention | ∑R | | | | | Jml NRS | %NRS | Criteria |
|---|---|---|---|---|---|---|---|---|---|
| | | SS | S | N | TS | STS | | | |
| 6 | Mobile learning-based teaching materials make learning more efficient | 60 | 70 | 20 | 0 | 0 | 640 | 85.3 | Very Interested |
| 7 | The writing on this teaching material is easy to read | 65 | 66 | 18 | 1 | 0 | 645 | 86 | Very Interested |
| 8 | The images displayed are attractive and can be observed clearly | 56 | 58 | 36 | 0 | 0 | 620 | 82.6 | Very Interested |
| 9 | This teaching material adds to my learning experience | 62 | 65 | 23 | 0 | 0 | 639 | 85.2 | Very Interested |
| 10 | I can use this teaching material wherever and whenever, easily | 57 | 71 | 22 | 0 | 0 | 635 | 84.6 | Very Interested |
| | **Average** | | | | | | | **83.8** | **Very Interested** |

Based on Table 3, the average student response is 83.8%, with exciting criteria. The average value reflects student satisfaction with the teaching materials developed. These results can be used as input to improve and improve the quality of digitizing English Mobile Learning teaching materials to meet students' learning expectations and needs better. This shows that the digitization of Android-based English mobile learning materials has received a positive response from teachers and students in the learning process.

In order to find out the English language skills of the control class students, it was carried out through an English proficiency test twice, namely the initial English test (pretest) of students before using digitalization of teaching materials/printed books and the final test (posttest) of students' English after using standards. Digitization of teaching materials/printed books. Whereas in the experimental class, an initial test (pretest) of students' English was carried out before using the digitization of mobile learning teaching materials based on Android games, and a final test (posttest) of students' English after using the digitization of mobile learning teaching materials based on Android Games. The analysis was performed using the Normalized Gain formula. The results of the N-Gain test for improving students' English skills can be seen in Table 4.

**Table 4.** N-Get Test Results

| Ability | | Score | | |
|---|---|---|---|---|
| Class | Learning Outcomes | Average | N- Gain | Criteria |
| Control | Pretes | 54.12 | 0.33 | Medium |
| | Posttest | 69.44 | | |
| Test | Pretes | 53.84 | 0.72 | High |
| | Posttest | 87.44 | | |

Table 4 shows that the N-gain value for the control class is 0.33, which is included in the medium category. At the same time, the N-gain value for the experimental class is 0.72 in the high category. Thus, using English-language Mobile Learning teaching materials is very effective in learning.

**Discussion**

From the results, developing mobile learning materials based on Android games in English subjects in elementary schools which refers to mobile technology for educational purposes, has become a popular approach in teaching and learning today (Hijrah et al., 2020; Khaitova, 2021). In this digital era, children in primary schools have extensive access to mobile devices, including smartphones and tablets. Therefore, developing Android games-based mobile learning teaching materials can effectively teach English in Elementary Schools. Developing Android-based learning media on the subjects of English class the results of this study indicate that the Android-based learning media developed on the subject of English class is feasible for use in learning by teachers and students (Cubukcu et al., 2020; Nurohman & Suyoso, 2014). In addition, students also commented that the android-based learning media are good, varied, engaging, and fun (Dasilva et al., 2019; Payu et al., 2022). In addition, teacher supervision and guidance are still needed to ensure the effective use and maximum learning of these teaching materials. By combining mobile technology and an exciting learning approach, developing mobile learning materials based on Android games can effectively improve English learning in elementary schools.

Developing learning patterns that apply mobile learning materials based on Android games in English subjects in elementary schools, the use of mobile learning materials based on Android games in learning English in elementary schools can be integrated with innovative learning patterns (Suci et al., 2019; Yildirim, 2017). These patterns can help improve learning effectiveness, motivate students, and strengthen their understanding of English. The following results from the discussion on developing learning patterns that apply mobile learning teaching materials based on Android games in elementary schools with cooperative learning, project-based learning, discovery-based learning, and challenge-based learning (Parvathamma & Pattar, 2013; Sulianta et al., 2019). In developing learning patterns that apply Mobile Learning teaching materials based on Android games in English subjects in elementary schools, it is crucial to consider compatibility with the curriculum and students' abilities. Learning based on Android games must be well designed, considering the difficulty level appropriate to the class level and ensuring that the learning material presented is relevant to the learning objectives. Learning English in elementary school can be more engaging, interactive, and practical by applying creative and innovative learning patterns that apply Mobile Learning teaching materials based on Android games (Singh. & Prasad Singh, 2021; Wu et al., 2022). These patterns can encourage students' active participation, build English skills holistically, and motivate students to continue learning and improve their understanding.

Furthermore, improving English language skills and increasing the digital literacy of elementary school students in this digital era, improving elementary school students English skills must also be accompanied by increased digital literacy. The combination of English proficiency and digital literacy will equip students with relevant and essential skills in facing global challenges in the future (Basyoni et al., 2020; Pangrazio et al., 2020). The following is the result of a discussion on how to improve English language skills in elementary school while at the same time increasing the digital literacy of elementary school students. Technology Integration in Learning English using English applications and online research. Furthermore, the development of digital learning materials with interactive digital books and learning multimedia (Hussin et al., 2019; Saripudin et al., 2021).

Elementary school students can benefit by integrating English language skills and digital literacy. Improving their English proficiency will help them communicate better globally. At the same time, digital literacy will equip them with the necessary knowledge and skills to adapt to ever-evolving digital technologies (Akbar, 2017; Hart et al., 2021). In addition, developing English language skills while increasing digital literacy also supports the implementation of the 21st-century skills curriculum, which includes critical skills, creativity, communication, and collaboration (Kadek et al., 2022; Prabawa & Restami, 2020; Talmi et al., 2018). Students will learn to become intelligent, critical, and responsible users of digital technology while developing their English language skills. In implementing this approach, teachers must design balanced learning between English materials and aspects of digital literacy. Teachers also need to provide appropriate guidance on the use of technology and facilitate reflection and discussion on digital ethics and responsibility (Fearnley & Amora, 2020; Mutohhari et al., 2021). Overall, by combining the development of English language skills with increased digital literacy, Elementary School students will be ready to face the challenges of an increasingly digital and global future.

The research results above show that mobile learning based on Android games can increase student learning activity and motivation. By using mobile learning, students can learn whenever and wherever they are, not fixated on the place and time where students carry out activities (Agustini et al., 2020; Cahyani et al., 2021; Sutrisni et al., 2022). Game-based mobile learning is becoming increasingly popular now that mobile devices support multimedia content, location awareness, augmented reality, and connectivity. However, technical features do not make a game engaging or pedagogical (Almeida & Simoes, 2019; Sutrisni et al., 2022). Using mobile learning can also overcome the limitations of time allocation for specific materials and train students to learn independently from the resources provided.

Implementing mobile game applications in English learning in elementary schools can increase student engagement. With engaging game aspects, students tend to be more eager to learn, which can result in improved English comprehension. Additionally mobile applications allow students to learn outside the classroom environment, thereby promoting more flexible learning. This can help students who have different learning styles. However, this research has limitations, one of which is that mobile devices or the internet can limit the effectiveness of using this application, especially in schools that have limited technological infrastructure. In addition, careful evaluation is needed to ensure the effectiveness of mobile game applications in improving English comprehension. It may take time to collect accurate data and results.

## 4. CONCLUSION

The study shows that digitizing mobile learning English teaching materials based on Android games can effectively increase student learning motivation and enthusiasm. Using smartphones as a means of learning media positively impacts students' interest in learning. The students responded well to the application’s use because of the way it was used, like playing a game, but it contained learning material. However, the development of digitizing mobile learning English teaching materials based on Android games still needs to be redeveloped by adding elements of images, videos, and pictures to look more attractive.

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