Ceria: Jurnal Program Studi Pendidikan Anak Usia Dini
Volume 14, Number 2, 2025 pages 304-320
P-ISSN: 2301-9905 E-ISSN: 2775-409X
Open Access: https://jurnal.umt.ac.id/index.php/ceria/index

Development of Mobile Learning based on Block Programming Android as a Source of Basic Learning

Ida Royani[1], Muhamad IchsanNurjaman[2], Al Juska Sasni Akbar[3]
[1] Pendidikan Guru Anak Usia Dini, Univ. Muhammadiyah Bogor Raya
[3]Pendidikan Bahasa dan Sastra Indonesia,
Univ. Muhammadiyah Bogor Raya
[3]Administrasi Pendidikan, Univ. Muhammadiyah Bogor Raya
e-mail: *[1] aljuska05uika@gmail.com, [2]m.ichsan@umbogorraya.ac.id.
[3]iroyani1104@gmail.com

ARTICLE INFO

Article history:
Received: June 11, 2025
Accepted: July 11, 2025
Available online on:
July 31, 2025

Keywords:
Mobile Learning; Block Programming; Learning Resource Development; Educational Technology; Learning Management

ABSTRACT

This research aims to develop mobile learning-based learning resources with Android block programming approach to improve the effectiveness of learning management in basic education. The research method used is Research and Development (R&D) with the 4D development model (Define, Design, Develop, and Disseminate). In the Define stage, a needs analysis of students and teachers in the use of mobile technology for learning is conducted. The Design stage includes designing an interactive, block programming-based mobile application that is easy to use by educators and learners. Furthermore, the Develop stage involves making a prototype of the application as well as limited trials to assess its feasibility and effectiveness. In the Disseminate stage, the application was tested more widely and socialized to users with further evaluation. The results show that block programming-based mobile learning can increase learning interactivity, improve learning resource management, and increase student involvement in

the learning and playing process. The implication of this research contributes to innovation in the digitalization of learning management that is relevant to the development of educational technology in the digital era.

Introduction

The development of digital technology has brought significant changes in the world of education, especially in providing more flexible and interactive learning resources. In the current digital era, the use of mobile devices as learning media is increasing (Akbar et al., 2023). This is supported by various studies that show that mobile learning can increase student engagement in the learning process and facilitate wider access to learning resources. Thus, the integration of mobile technology in education becomes an urgent need, especially in the context of basic education.

One of the main challenges in implementing mobile learning is how to design learning resources that are not only engaging but also able to increase learning effectiveness. The block programming approach is one of the innovative solutions in the development of Android-based learning applications. Block programming allows users, especially students and teachers, to understand programming concepts and application operations in a simpler way through a block-based interface that can be visually organized. Thus, this technology can be used to create a more interactive and fun learning experience.

Primary education is a crucial early stage in shaping students' cognitive abilities and thinking skills. Therefore, innovation is needed

in the provision of learning resources that can help students understand basic concepts more easily. Mobile learning based on block programming can be an alternative that bridges this need, by providing an engaging learning experience and supporting concept reinforcement through digital exploration and interaction.

Based on the perspective of Educational Administration, the implementation of block programming-based mobile learning also provides benefits for the effectiveness of learning management (Akbar et al., 2023). This technology can help teachers organize and present learning materials in a more structured manner, manage digital assessments, and monitor student progress more accurately. Thus, this mobile-based application is not only beneficial for students, but also provides support for teachers in optimizing the teaching process.

Several previous studies (Akbar, 2021) have shown that the use of mobile learning can increase students' engagement in learning and positively impact their learning outcomes. However, there are still few studies that specifically develop block programming-based learning resources designed according to the needs of basic education. Therefore, this research seeks to fill the gap by developing and testing the effectiveness of a block programming-based mobile learning application in the context of primary education.

The research method used in this study is Research and Development (R&D) with the 4D development model (Define, Design, Develop, and Disseminate). This model was chosen because it can

ensure that the developed application is truly in accordance with user needs and has optimal quality before being widely distributed. Each stage in the 4D model will provide a strong foundation in ensuring that the resulting mobile learning application can provide real benefits for students and teachers.

The stages of Research and Development (R&D) are (1). Define stage, the research will identify the needs and characteristics of users, including the challenges faced in implementing mobile learning in basic education. (2). The Design stage will focus on designing applications that are attractive, easy to use, and in accordance with the principles of digital-based learning. Furthermore, stage (3). Develop stage will involve prototyping the application and initial testing to get feedback from users. Finally, (4). the Disseminate stage will test the application on a wider scale and evaluate its effectiveness in supporting the learning process.

The results of this study are expected to contribute to the development of innovative and technology-based learning resources, especially in improving the effectiveness of learning management at the basic education level. With the block programming-based mobile learning application, students can learn in a more interactive and explorative way, while teachers can more easily manage learning digitally. In addition, this research also provides insights for education managers and policy makers in developing policies that better support the implementation of technology in learning. By understanding the

benefits and challenges in using block programming-based mobile learning, schools and educational institutions can design more effective strategies in integrating technology into the curriculum.

The successful implementation of mobile learning in basic education is also highly dependent on the readiness of infrastructure and digital skills of teachers. Therefore, this research will also explore the supporting and inhibiting factors in the use of mobile learning applications in schools. Thus, the solution will not only focus on technology development, but also include aspects of training and mentoring for teachers in utilizing the application optimally.

Methods

The design used in this research is Research and Development (R&D), through a quantitative approach. According to Sukmadinata (A. J. S. Akbar, 2022), research and development is a study to produce new products or improve existing products. The resulting product can be in the form of software, or hardware such as books, modules, packages, learning programs or learning aids.

This type of research is a process used to develop and validate educational products. The research and development method is also defined as a research method used to produce certain products and test the effectiveness of these products (Efgivia, 2019). In the field of education, R&D is a process of developing educational tools carried out through a series of research using various methods in a cycle that goes through various stages.

The steps taken in this stage include initial analysis, learner analysis, learning objectives analysis, concept analysis, and task analysis. (2) The Design Stage is a stage in product planning that involves making the initial product (prototype) or in the form of a product manufacturing arrangement. In this stage, there are four steps that must be taken, namely compiling tests, media selection, selection, and initial design. (3) The Develop stage is a stage where researchers carry out development in order to develop products and conduct product validity tests. The following steps are taken at this stage, namely media review by experts, product revision, expert validation, and product trials.

The research instruments used in this study consisted of (1) questionnaires and questionnaires used to collect data from validation sheets and reviews of media and material experts and student response sheets. (2) Test instrument sheets that are applied to determine the learning outcomes of students before and after using the developed media. (3) Observation used by researchers to identify problems in the field. (4) Interviews conducted to obtain further and in-depth information. (5) Documentation used to obtain learning documents from teachers in the form of lesson plans, syllabus and student presentations.

Furthermore, the data obtained through various research instruments used were analyzed. Data analysis techniques used in this study include descriptive qualitative and descriptive quantitative analysis. Qualitative descriptive analysis was used to analyze the results

of the review by experts. While quantitative descriptive analysis is used to analyze the results of expert validation and the results of students' responses. Analysis of the results of expert validation is used to determine the feasibility of the media developed through expert judgment. The eligibility analysis criteria used are as follows:

Table 1. Interpretation Criteria for Expert Validation Questionnaires

Rating Scale	Scale Assessment
0% - 20%	Very unfeasible
21% - 40%	Not feasible
41% - 60%	Fairly feasible
61% - 80%	Feasible
81% - 100%	Very worthy

Source: (Riduwan, 2016)

Based on table 1.1, we can know that the assessment scale is used as a reference in determining the feasibility level of the mobile learning product developed. The assessment was conducted by experts using a validation instrument consisting of several aspects, such as content quality and objectives, instructional quality, and technical quality. The score range of the validation results was then converted into feasibility categories based on the guidelines from Riduwan (2016), which classifies scores into five categories: very inappropriate (0%-20%), inappropriate (21%-40%), quite feasible (41%-60%), feasible (61%-80%), and very feasible (81%-100%).

The application of this scale aims to provide an objective interpretation of the results of expert validation, so that decision making on product feasibility can be done systematically. In the context of this

study, the material expert validation results showed an average percentage of 97%, which is in the "very feasible" category. Thus, the Let's Learn and Play (MarBel) application is considered very feasible to be used as a mobile learning-based basic learning resource, both in terms of content, instructional, and technical.

Results and Discussions

A. R&D Development Model

Researchers use a procedural model, which is a descriptive model that describes the flow or procedural steps that must be followed to produce a particular product. The development model refers to the research design used in this study is the **4-D model development research design** or adapted to the 4-P model according to Thiagajaran (Anggriawan, 2009). The development model includes 4 stages, namely the defining stage (Define), design (design), development (develop) and dissemination (disseminate).

1. **Define stage**: contains activities to determine what products will be developed, along with their specifications.
2. **Design stage**: contains activities to design the product that has been determined.
3. **Development stage**: Contains activities to make designs into products and test product validation repeatedly until the product is produced in accordance with the specifications set.
4. **Dissemination stage**: contains activities to disseminate products that have been tested to be utilized by others. In this study, only

limited dissemination was carried out, namely by disseminating and promoting the final product of MarBel Androird media on a limited basis to Principals and Elementary School teachers.

B. Development Procedure

The development procedure in this study uses the 4D model with define, design, development and dissemination. In this study, the dissemination stage was carried out on a limited basis.

The following are the development steps that will be carried out at each stage:

A. Define Stage; This stage aims to establish and define the learning requirements.

B. Design Stage; After getting problems from the defining stage, then the design stage is carried out. This design stage aims to design a MarBel Androird media that can be used in learning activities in kindergarten. This design stage includes:

C. Development stage (Development); This development stage aims to produce MarBel Androird media that has been revised based on expert input and trials for Early Childhood Students.

The steps in this stage are as follows:

a. Expert Validation

This expert validation serves to validate the theme content in MarBel Androird media before testing, then the validation results will

be used to revise the initial product. The MarBel Androird media that has been prepared will then be assessed by expert lecturers in terms of material, media and development design, so that it can be seen whether the MarBel Androird media is feasible or not. The results of this validation are used as improvement materials for the perfection of the MarBel Androird media developed. After draft I was validated and revised, draft II was produced. Draft II will then be tested on students in the development test stage.

b. Trial Test

After expert validation, the development test was carried out to several students, then a field trial was conducted to determine the results of the application of MarBel Androird media in playing activities in the classroom. The results obtained from this stage are in the form of revised MarBel Androird media.

c. Practicality

Practicality is something that is practical or efficient. The practicality of MarBel Androird media was tested in the learning process by the teacher. At this stage, the teacher filled out a questionnaire to find out the level of practicality and ease of teachers in delivering material through MarBel Androird learning media.

d. Effectiveness

Effectiveness comes from the word effective which means having an effect or effect. Meanwhile, effectiveness means the success of a particular action.

D. Development stage (Development)

The development stage produces the final form of the media being developed. Researchers realize the design according to the initial design and field needs. The final product made has an attractive color, features, and design.

Figure 3.1 MarBe Home Page

Figure 3.2 MarBel Main Menu

The main menu display above has three menus, namely, Learning which contains learning material for animal names, recognizing numbers, recognizing letters and recognizing colors. Play which contains interesting games for children such as catching fruit, painting, number balloons, and coloring. Video kids which contains interesting YouTube videos for basic learning. The Learning Menu view contains

learning materials consisting of animal names, recognizing numbers, recognizing letters and recognizing colors. There is a home button to go to the Main Menu.

Figure 3.3 Animal Recognition Page

The animal recognition page is a page that contains a line of animals which when touching or clicking on one of these animals will sound the name of the animal. There is a home button to go to the learning menu page.

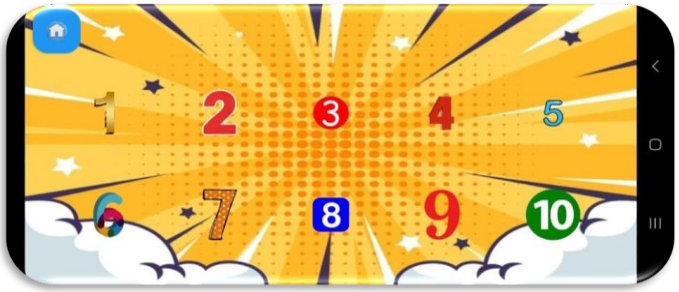

Figure 3.4 Getting to know numbers page

This number recognition page is a page that contains rows of numbers from 1-10 which when touching or clicking one of the numbers will sound the name of the number.

There is a home button to go to the learning menu page.

Figure 3.5. Play Menu Page

The Play Menu view contains learning games for early childhood consisting of Capture Fruit, painting, number balloons and coloring. In it there is a home button to go to the main menu page.

After the android-based interactive learning media is completed, expert review and validation are carried out. The results of the review are used for product improvement. While the validation results are used to determine the feasibility level of the android-based interactive learning media developed before being tested on students. Validation was carried out by material experts and media experts with the results in the following table:

Table 2.1 Material Expert Validation Results

Let's Learn and Play (MarBel)

Variables	Acquisition Score		%
	Expert 1	Experti 2	
Average aspects of content quality and objectives	4,7	5	97%
Average aspects of instructional quality	4,6	5	96%
Average technical quality aspects	5	5	100%
Average material expert validation results	4,7	5	97%

Based on the results of the material expert validation in table 2.1 above, it can be seen that some minor aspects were improved to improve the application, especially in terms of instruction to be more adaptive to students' learning styles. Although high scores have been obtained, improvements are still made to the instructions for use, navigation between pages, and text readability. This is in line with the principle of continuous development in the 4D model, where the develop stage not only focuses on initial implementation, but also on overall quality improvement based on validative feedback.

E. Disseminate Stage

The final stage in the 4D model is dissemination, where the MarBel application is socialized to target users, namely elementary school students and teachers. Based on the validation results that show high scores, the application is feasible to be distributed and tested on a wider scale. The dissemination plan includes an introduction at the MGMP (Musyawarah Guru Mata Pelajaran) forum, teacher training, as well as uploading the app on an open digital platform. The high validation score is a strong foundation in the process of promoting and adopting the app in the primary education environment. The MarBel app validation results show that the block programming-based mobile learning approach has great potential to improve the quality of basic learning. High scores on all aspects of validation indicate that the application is not only easy to use, but also effective in delivering the material. The 4D development model is proven to be able to produce

educational products that are systematic, feasible and applicable. This application can be an example of the application of educational technology that is adaptive, innovative, and relevant to the needs of digital era learners.

Conclusion

The results showed that the development of mobile learning applications based on Android block programming through the 4D model (Define, Design, Develop, and Disseminate) is very feasible to use as a basic learning resource, with expert validation results reaching an average of 97%. The Let's Learn and Play (MarBel) application is considered superior in content, instructional, and technical aspects, and is able to increase learning interactivity, student engagement, and effectiveness of learning resource management. This research proves that the use of mobile-based technology developed systematically can be an innovative solution in supporting the digitalization of basic education in the era of industrial revolution 4.0 and society 5.0.

References

Akbar, A. J. S. (2022). Efektivitas Media Pembelajaran Bangun Ruang Terhadap Hasil Belajar Matematika. *Educate : Jurnal Teknologi Pendidikan*, *7*(1), 103. https://doi.org/10.32832/educate.v7i1.6319

Ali Mudhlofir. 2016. *Desain Pembelajaran inovatif (Dari Teori ke Praktik*). Jakarta: Rajawali Pers

Akbar, Sa'dun. 2013. *Instrumen Perangkat Pembelajaran*. Bandung: PT. Remaja Rosda Karya.

Akbar, A. J. S. H. S., Efgivia, M. G., & Safitri, A. S. (2023). Evaluation of Distance Learning Program Based on Learning Management System During New Normal Covid-19. *1st UMSurabaya*

Multidisciplinary International Conference 2021 (MICon 2021), 664–670.

Akbar, A. J. S. (2022). Efektivitas Media Pembelajaran Bangun Ruang Terhadap Hasil Belajar Matematika. *Educate : Jurnal Teknologi Pendidikan*, *7*(1), 103. https://doi.org/10.32832/educate.v7i1.6319

Akbar, A. J. S. H. S., Efgivia, M. G., & Safitri, A. S. (2023). Evaluation of Distance Learning Program Based on Learning Management System During New Normal Covid-19. *1st UMSurabaya Multidisciplinary International Conference 2021 (MICon 2021)*, 664–670.

Akbar, A. J. S. M. A. M. B. (2021). Implementasi Parenting Dalam Demokrasi Society Program Belajar Dari Rumah (Bdr) Sekolah Dasar Dramaga Bogor. *Jurnal Teknologi Pendidikan*, *6*(1), 82–90. https://doi.org/10.32832/educate.v6i1.3939

Anggriawan, F. S. (2009). *Pengembangan Learning Management System (LMS) Sebagai Media Pembelajaran Untuk Sekolah Menengah*. *ellis*, 1–10.

Efgivia, M. G. (2019). Pengaruh Media Blanded Dan E-Learning Terhadap Hasil Belajar Mahasiswa Pengembangan Media Audio Mahasiswa Semester IV TP UIKA Bogor. *Educate: Jurnal Teknologi Pendidikan*, *4*(2), 85–96.

Akbar, A. J. S. M. A. M. B. (2021). Implementasi Parenting Dalam Demokrasi Society Program Belajar Dari Rumah (Bdr) Sekolah Dasar Dramaga Bogor. *Jurnal Teknologi Pendidikan*, *6*(1), 82–90. https://doi.org/10.32832/educate.v6i1.3939

Akbar, A. J. S. (2022). Efektivitas Media Pembelajaran Bangun Ruang Terhadap Hasil Belajar Matematika. *Educate : Jurnal Teknologi Pendidikan*, *7*(1), 103. https://doi.org/10.32832/educate.v7i1.6319

Akbar, A. J. S. H. S., Efgivia, M. G., & Safitri, A. S. (2023). Evaluation of Distance Learning Program Based on Learning Management System During New Normal Covid-19. *1st UMSurabaya Multidisciplinary International Conference 2021 (MICon 2021)*, 664–670.

Akbar, A. J. S. M. A. M. B. (2021). Implementasi Parenting Dalam Demokrasi Society Program Belajar Dari Rumah (Bdr) Sekolah

Dasar Dramaga Bogor. *Jurnal Teknologi Pendidikan*, *6*(1), 82–90. https://doi.org/10.32832/educate.v6i1.3939

Anggriawan, F. S. (2009). *PENGEMBANGAN LEARNING MANAGEMENT SYSTEM (LMS) SEBAGAI MEDIA PEMBELAJARAN UNTUK SEKOLAH MENENGAH*. *ellis*, 1–10.

Efgivia, M. G. (2019). Pengaruh Media Blanded Dan E-Learning Terhadap Hasil Belajar Mahasiswa Pengembangan Media Audio Mahasiswa Semester IV TP UIKA Bogor. *Educate: Jurnal Teknologi Pendidikan*, *4*(2), 85–96.

Azhar Arsyad. 2013. *Media Pembelajaran*. Jakarta: PT. Raja Grafindo Persada

Permendikbud No. 22 Tahun 2016 tentang Standar Proses Pendidikan Dasar dan Menengah.

UNESCO. (2021). *Education for Sustainable Development*. United Nations Educational, Scientific and Cultural Organization.

Marzano, R. J., & Kendall, J. S. (2007). *The New Taxonomy of Educational Objectives*. Thousand Oaks: Corwin Press.

Hasanah Hisbiyatul dan Rudy Sumiharsono, 2017. *Media Pembelajaran.* Jember: Pustaka Abadi.

Hujair AH Sanaky. 2009. *Media Pembelajaran.*Yogyakarta: Safiria Insania Press