

## Introduction to Numbers in Mobile-Based for Early Childhood

Vika Febri Muliati<sup>1</sup>, Fesa Asy Syifa Nurul Haq<sup>1\*</sup>, Muhammad Zarlis<sup>2</sup>, Ucuk Darusalam<sup>3</sup>, Abdu Rahman<sup>1</sup>

<sup>1</sup> Universitas Siber Asia  
Jl. R.M Harsono No.1 RT09/04 Ragunan, Pasar Minggu, Jakarta Selatan, Indonesia

<sup>2</sup> Bina Nusantara University  
Jl. K. H. Syahdan No. 9, Kemanggis, Palmerah Jakarta, Indonesia

<sup>3</sup> Universitas Nasional  
Jl. Sawo Manila No.61, Ps. Minggu, Kota Jakarta Selatan, Indonesia

Correspondence e-mail: [fesasyifa@lecturer.unsia.ac.id](mailto:fesasyifa@lecturer.unsia.ac.id)

---

Submission: 13-01-2026	Revision: 09-02-2026	Acceptance: 02-03-2026	Available Online: 06-03-2026
---------------------------	-------------------------	---------------------------	---------------------------------

---

**Abstract** - Child age early in the current era, this faced on lots existing technology environment around, among them is cellphone, television, and computer. Application multimedia capable interesting attention and interest student in the learning process because served in form picture as well as animation, proven by 80% from 26 respondent agreed matter. Wrong One ability which currently develop moment age early is ability speak. Child age early demanded for can quick learn and understand numbers. But problem which happen moment this, still lots child age early which still difficult in do learning know numbers. No only it, still lots also parents who still difficulty in do teaching because that child not enough interested with the learning process. By Because it, build it system application introduction letter and number for child age early with utilise visual.

**Keywords:** Child early age; Introduction numbers; Learning know numbers

### 1. Introduction

In this Industrial 4.0 era, the use of technology has become a fundamental need in society. Some of the most frequently used technologies include cell phones, televisions, and computers. Technology and media can serve as effective tools in the learning process if used appropriately and wisely (Gunawan, 2019). It can increase students' interest in learning because the content is presented in the form of pictures and animations, as proven by 80% of 26 respondents who agreed with this statement (Wijaya & Devianto, 2019). At present, technological developments can be felt not only by adults but also by young children starting from early childhood. Data from the Central Statistics Agency (BPS) in 2022 show that almost all early childhood children in Indonesia are already capable of using mobile gadgets. A total of 33% of early childhood children use cell phones, and 24.96% can access the internet. Based on age, 25.5% of children aged 0–4 years and 52.76% of children aged 5–6 years use mobile devices (Statistics, 2022).

The brains of young kids grow in spurts known as crucial periods (Mustapha et al, 2024), one of the abilities that develops during early childhood is speaking ability. Language development is very important for children as a tool of communication that connects members of society, enabling individuals to express thoughts, feelings, and desires (Veryawan & Jellysha, 2020). Language is a systematic set of visual and verbal symbols used to convey various ideas and information (Tarigan, 2018). Several studies have shown that learning difficulties in children aged 5–6 years are often related to basic psychological processes, including understanding and using spoken or written language (Azis, 2019). Many young children still face difficulties in learning to recognize letters, which occur due to several factors. According to Ahmad's research, factors contributing to reading difficulties include physical, psychological, gender, knowledge, socio-cultural, and—most importantly—cognitive factors (Yani, 2019) and the concept of early numbers in early childhood is very important (Warmansyah et. Al, 2023).

In addition, many parents still struggle to teach children due to a lack of interest in the learning process. Several studies have attempted to develop learning media, such as Tarigan who created a mobile-based augmented reality application for introducing letters and numbers (Tarigan, 2018). Saputra developed learning media for kindergarten children aged 4–6 years (Saputra, 2019). Susilawati developed interactive media for early childhood learning to recognize letters and numbers (Susilawati & Satriawan, 2018). Mutahanah et al. created an application for recognizing letters, numbers, colors, vegetables, and fruits for early childhood education (PAUD) using the Linear Congruent Method (LCM) (Mutahanah & Pangestu, 2021). From these studies, it can be concluded that further development is still needed, particularly related to pronunciation features. Children not only need to learn

to read but also need to pronounce the letters or numbers correctly. Therefore, a letter recognition application was developed for early childhood by incorporating both visual and audio features, To develop a mobile gamebased math learning APP for the learners (Lai et al, 2018) which can be used on gadgets such as mobile phones or laptops.

## 2. Research Methods

In developing this system, the Waterfall system development method was used. The activities carried out in each stage can be seen in Figure 1. There are several reasons for choosing the Waterfall method, including its frequent use in software and information system development, the high quality of the resulting system due to its structured and sequential implementation, and its common application in creating new systems as well as in large-scale software development projects (Nur, 2019).

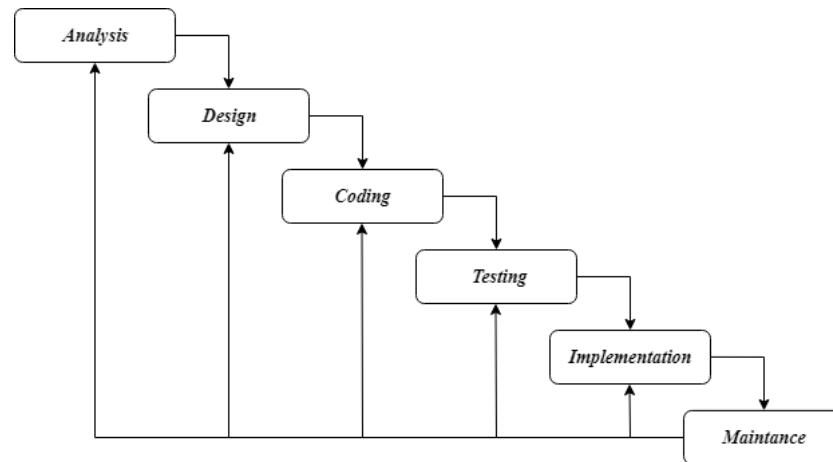


Figure 1. Waterfall Method

There are several activities involved in implementing the Waterfall method, namely:

1. Analysis  
This stage begins with analyzing user needs for the system. The data were obtained through interviews with parents of early childhood learners. The results indicate that parents tend to use mobile devices as a learning medium for their children.
2. Design and Coding  
At this stage, the system design is carried out based on the analysis results. The design process includes the use of a Use Case Diagram as the basis for system development.
3. Testing and Implementation  
This stage involves system testing using the black-box testing method to ensure that the system functions according to the specified requirements.
4. Maintenance  
In this stage, feedback is collected from users of the application through questions and answers. This feedback is then used to evaluate whether further development or improvements to the system are needed.

## 3. Result and Discussion

The data obtained in this study came from interviews with twenty parents of children aged 1–4 years. The results showed that early childhood children had already been given mobile devices by their parents. Eight parents stated that they gave mobile phones to their young children so that the children would not be fussy, while many others believed that the use of mobile phones could support learning, especially when children listen to and watch educational videos. The interview consisted of five questions, adapted from a study conducted by Zaini and his team on parents' perceptions of the digital technology era among early childhood (Zaini & Soenarto, 2019). The questions were as follows:

1. What is your child's age?
2. Has your child been given access to mobile viewing?
3. Why do you give your child a mobile device?
4. How many hours per day do you allow your child to use the mobile device?
5. At what times do you usually give the mobile device to your child?

Based on the interview results, a mobile-based system was developed to support children in continuing to learn while using mobile devices. This system incorporates both visual and audio elements to facilitate learning activities. The system consists of a number-introduction menu and an "About Us" menu.

- a. The function of the number-introduction menu is to support early childhood learning by providing voice features for pronunciation and pictures to visually represent the numbers.
- b. This menu functions to introduce the developers or creators of the system.

Based on the system analysis carried out, a system design was developed to support early childhood learning in recognizing numbers. The next stages are design and implementation. The system design was created based on the functions identified during the analysis stage or the overall functional requirements of the system. As part of the system design, a Use Case Diagram was created to represent how the application functions. The resulting Use Case Diagram for this system can be seen in Figure 2.

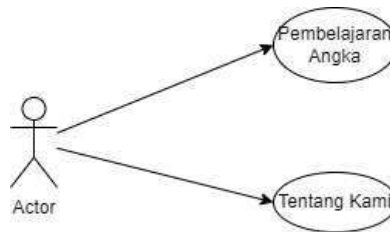


Figure 2. Use case diagram

The figure 2 illustrates a simple use case diagram for a mobile-based learning application designed for early childhood education. In this diagram, the Actor represents the user of the application, which can be a child, parent, or teacher. The actor interacts with two main use cases: Number Learning, this use case represents the core functionality of the application. Through the Number Learning feature, users can access interactive content to introduce numbers to early childhood learners. The learning process may include recognizing numbers, counting activities, and simple interactive exercises delivered via a mobile device and About Us, this use case provides general information about the application. The About Us section typically contains details about the purpose of the application, developers, educational goals, and guidance for users. The arrows indicate that the actor can directly access and interact with both features. Overall, the diagram shows a straightforward interaction model, emphasizing ease of use and accessibility, which are essential aspects of mobile-based learning applications for early childhood education.

Table 1. Description Use case Diagrams

Actor	Use Case Name	Description of Use Cases
Users	Learning Number	This use case used for displays learning number
Users	About Us	This use case used for displays Information related maker system

The coding, testing, and implementation stages were carried out simultaneously because temporary or iterative testing was required during the coding process before the system could be fully implemented. The system's home page displays the number-learning feature and the "About Us" section. The appearance of the home page can be seen in Figure 3.

In Figure 3, the image represents the initial interface of a mobile-based learning application aimed at early childhood education in recognizing numbers. The use of cartoon characters with bright colors and high contrast (green and yellow) demonstrates a child-friendly visual approach, which is well suited to the cognitive and affective developmental characteristics of early childhood. The simple display with dominant visual elements helps attract children's attention and minimizes cognitive load when they first interact with the application.



Figure 3. Display Main Page

#### Number-Introduction Interface

When the user selects the number-introduction menu, the system will display the numbers starting from the interface shown in Figure 4. The system will automatically produce audio output that corresponds to each number displayed.



Figure 4. Page Screen Display

Figure 4 shows the core of numeracy learning on a mobile application, specifically in the subject of counting with a focus on recognizing the number “1.” The presentation of a single number in large size and high contrast demonstrates the application of the principle of focus and clarity, which is very important for early childhood so that they can recognize the shape of numbers visually without distraction. This approach is in line with the cognitive development stage of children, where learning is done gradually from the simplest concepts. In relation to research, this image shows how mobile media can be used effectively to introduce number concepts through simple, interactive, and repetitive visualizations. This type of design has the potential to improve early numeracy understanding, strengthen children's memory of number shapes, and foster an interest in learning to count from an early age through technology that is familiar to children's daily lives.

#### 4. Conclusion

Based on the research stages carried out, it can be concluded that the number-introduction system can be applied to early childhood learning. In this study, the system was designed specifically for early childhood, beginning with number recognition. For future studies, the system can be further enhanced by adding letter, shape, and color recognition features, and it can also be developed using augmented reality combined with audio output. Despite its potential benefits, this study is limited to number recognition features and has not yet

incorporated comprehensive learning evaluations of children's learning outcomes. Therefore, future research is recommended to expand the application by integrating letter, shape, and color recognition features, as well as incorporating augmented reality and interactive assessment components. Further empirical testing involving a larger sample and experimental methods is also suggested to measure the effectiveness of the application on early childhood numeracy development.

## References

- Azis, M. (2019). Analysis of Difficulties in Learning to Read and Write Early Childhood Education in Fun Islamic School Playgroups. *Al Athfaal: Scientific Journal of Early Childhood Education*, 2(2), 100–112.
- Gunawan, W. (2019). Android-Based Application Development For Hijaiyah Letter Recognition. *BSI Journal of Informatics*, 6(1), 69–76.
- Lai, A. F., Shih, S., & Hong, C. R. (2018, July). Developing a mobile-based digital math game for learning number and calculation in elementary school. In *Proceedings of the 2nd International Conference on Education and Multimedia Technology* (pp. 9-13).
- Mustapha, M. F., Ab Hamid, S. H., & Zulkipeli, A. F. (2024). Guessing Number: A Game-Based Mobile Application for Children Learning Numbers. *Applied Mathematics and Computational Intelligence (AMCI)*, 13(3), 1-12.
- Mutahanah, M. I., & Pangestu, I. D. (2021). Application Of Recognition Of Letters And Numbers, Colors, Vegetables And Fruits For Early Children Based On Smartphones Using The Linear Congruent (LCM) Method. *Journal of Media Infotama*, 17(1), 23–29.
- Nur, H. (2019). The Use of the Waterfall Method in the Design of Sales Information Systems. *Journal of Informatics and Management STMIK*, 3(1), 1–10.
- Saputra, S. (2019). Development of Learning Media to Recognize Letters and Numbers for Kindergarten Children. *Semantic Proceedings*.
- Statistics, C. B. (2022). *Central Bureau of Statistics - Education Statistics 2022*. <https://www.bps.go.id/publication/download.html?nrbfveve=YTgwYmRmOGM4NWJmJjhhNGU2NTY2NjYx&xzmn=aHR0cHM6Ly93d3c>
- Susilawati, B., & Satriawan, D. (2018). Building Interactive Media for Early Childhood Learning in Recognizing Letters and Numbers. *Scientific Journal of Early Childhood Education*, 1(1), 1–16.
- Tarigan, A. P. (2018). Letter Recognition Application for Early Childhood Based on Augmented Reality. In *Institutional Repository of the University of North Sumatra*.
- Veryawan, & Jellysha. (2020). Improving Children's Language Skills Through Scrambled Games. *Atfaluna: Journal of Islamic Early Childhood Education*, 3(1), 13–22.
- Warmansyah, J., Yuningsih, R. ., Selva Nirwana, E. ., Ravidah, Putri, R. ., Amalina, & Masril. (2023). The Effect of Mathematics Learning Approaches and Self-Regulation to Recognize the Concept of Early Numbers Ability. *JPUD - Jurnal Pendidikan Usia Dini*, 17(1), 55–81. <https://doi.org/10.21009/JPUD.171.05>
- Wijaya, H., & Devianto, Y. (2019). Application of Multimedia in Basic English Vocabulary Learning with the ADDIE Method. *International Journal of Computer Techniques*, 6(1), 57–63.
- Yani, A. (2019). Difficulty of Beginning Reading in Early Childhood in the Perspective of Reading Readiness Analysis. *Indonesian Journal for Educational Studies*, 2(4), 113–126.
- Zaini, M., & Soenarto, "Parents'". (2019). Perceptions of the Presence of the Digital Technology Era among Early Childhood. *Journal of Obsession: Journal of Early Childhood Education*, 3(1), 254–264.