

PAPER

Android Application for Children to Learn Arabic Alphabets and Numbers

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ABSTRACT

Mobile learning has become a new trend in e-learning that uses portable media such as smartphones. This offers a new space for creating kid-friendly educational game applications. Therefore, this helps parents fulfill their responsibility to teach kids. This study aims to develop and integrate an educational application that contains multimedia elements that inspire children and evaluate their trustworthiness. The waterfall model was used to develop the application of this study. The application includes four sections: numbers, alphabets, animals, and fruits. A survey was conducted and distributed among four experts and 20 children to validate our application. A selective sampling technique was used to choose these responders. Thematic analysis was used to analyze the data collected. According to the results, the application is appropriate for beginners who want to learn the Arabic alphabet and numbers can easily inspire them with the multimedia elements used and can be implemented in the classroom to enhance the effectiveness of the educational process. Future research could examine the effectiveness of the application across different learning styles or age groups.

KEYWORDS

mobile application, learning Arabic, multimedia, interactive educational environment, mobile learning

1 INTRODUCTION

These days, with the advancement of technology, learning can take place on a wide variety of devices, especially computers and smartphones. Smartphones have become indispensable for individuals worldwide, because of their applications that cater to diverse needs and streamline tasks [1].

Notably, educational applications have gained significant importance, aiding students in completing homework and facilitating communication with teachers for valuable feedback on their learning progress. Technology media serves as an effective learning tool for educators, including both teachers and parents. Face-to-face learning at school may not always be optimal, leading children to utilize mobile

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devices such as iPads, tablets, or smartphones for play and educational activities aimed at literacy and numeracy recognition [2, 3]. Children may find learning using multimedia fascinating, and the teachers can use multimedia technology to implement a variety of instructional strategy [4].

Developing reading and writing skills at an early age is the foundation for cognitive and academic development in later life [5]. Arabic is one of the most difficult languages around the world, and the challenges facing children in learning Arabic include the complexity of words, the multiplicity of sounds and pronunciation, the presence of vowels and diacritics, the large alphabetical sequence, and the lack of interactive educational resources. This is where technology comes in to facilitate the interactive learning process, as mobile technologies provide children with opportunities to interact with educational content by integrating learning with play, which is an effective strategy in early education [6]. Previous research has focused on the use of applications to improve reading, writing, and pronunciation skills, and some of it has addressed interactive methods to improve the quality of correct pronunciation through the use of sound and image. Despite these research efforts, there is a lack of research on the effectiveness of educational applications in improving the quality of reading and arithmetic in the Arabic language. This study aims to instruct the children on the Arabic numbers and alphabets in an entertaining way.

2 ALPHABETS AND NUMBERS BASIC LEARNING

Learning the alphabet and numbers is an essential aspect of early childhood education. It is the foundation for numeracy and literacy skills, forming the basis for more advanced learning later on. The acquisition of letter-sound correspondences in children seems to rely on their familiarity with letter names [7].

Children utilize their knowledge of letter names as a foundation for learning the associated sounds. Conversely, understanding the connections between letters and sounds is not only a foundational aspect but also a crucial prerequisite for advancements in word recognition [8]. Alphabet knowledge, therefore, constitutes a unified and stable construct in young children, proving to be a pivotal milestone in enhancing their future reading abilities, particularly in word recognition.

3 BEHAVIORISM LEARNING THEORY'S METHODOLOGY

The behaviorism concept asserts that externally visible behavior expresses learning. When a stimulus and a response are consistently associated, learning occurs. According to [9], the repetition of stimuli and corresponding responses forms the basis for the occurrence of learning.

The behaviorism learning theory underscores the significance of elements such as mechanisms, environmental factors, reactions or responses, and their respective roles. The desired behavior determines the learning outcome. According to [10], a person's personality or behavior evolves as a result of their reactions to external stimuli. Behaviorism is frequently employed in computer-based instructional methods. For instance, in a learning app on an Android device, there's a brain-testing activity that uses mobile software. It needs the learner to go through each step of learning until they completely get the idea. This process also occurs when the user interacts with a computer using an educational app [11].

Furthermore, learning the alphabet and numbers in children is a process of self-learning. And thus, the behavioral theory (behaviorism). The main developers of behaviorism proved that behavior could be predicted and controlled [12]. One behavior that may be achieved, controlled, and even expected is learning. Because it is possible to develop a consistent behavioral change through building a relationship between individual responses and external stimuli, learning is a widely accepted process.

4 PROBLEM STATEMENT

Children nowadays have grown up with a mouse in their hands, they use screens to interact with images and content. The Internet plays a significantly more substantial role in the lives of children nowadays. New technologies and devices such as tablets and smartphones or online communities in social networks adapt to emerging methods of gaining knowledge [13].

Through applications, children can learn to learn, count, calculate, and even gain religious knowledge. As a consequence, children nowadays find it ineffectual to learn the alphabet and numbers because they are more likely to study through Android applications. Technology applications are one of the most efficient ways to communicate. The necessity of early learning is to build a strong foundation for future learning [14]. Despite the multiplicity of research efforts on the subject under study, there is a lack of study on estimating the effectiveness of educational applications that help improve children's performance in reading, writing, and arithmetic, especially in the Arabic language. This study aims to improve children's performance in arithmetic in the Arabic language, reading, and writing in a way that attracts their attention and is entertaining at the same time.

5 OBJECTIVES

The study under consideration aims to develop an application for learning Arabic letters and numbers and improving reading, writing, and arithmetic for children aged 3–6 years in an entertaining way that attracts their attention by using multimedia elements and animated images. In addition to evaluating the effectiveness of this application through experts in this field and through feedback from children within the target age group. The following is a summary of the study objectives:

- Create an Android app to instruct kids on Arabic numbers and alphabets in an entertaining way.
- Evaluate the effectiveness of the Android application designed for childhood learning of Arabic alphabets and numbers through expert assessments and feedback from child respondents.

6 RESEARCH METHODOLOGY

This application's design is implemented through the software development life cycle (SDLC) method, employing a waterfall model. The waterfall model was used because the research requirements were clear from the beginning, as it provides an

organized and structured methodology, highlighting the importance of implementing and measuring the failure or success of each stage separately, which allows for the possibility of comparative academic analysis. The waterfall model consists of five phases namely, analysis, design, development, testing, and maintenance [15]. Since it will deal with difficulties in the development of the Android app, the analysis stage is the most crucial one. The problem statement and the study's background are determined in this stage. Additionally, to ensure quality application suitable objectives and methods are used.

The analysis phase is essential for researchers to comprehend the strengths and weaknesses of current technology applications [16]. These applications were used to assist in examining gathered data. The purpose of this study is to develop an Android App that fulfills user requirements. Thematic analysis was used because it helps in exploring individuals' experiences or views on a particular topic. This study aims to evaluate the effectiveness of the learning application of the game, which provides an analysis of their views on the proposed application.

In this stage, the researchers also conducted interviews with specialists in the field to gather information about learning Arabic numbers and alphabets. Specifically, a content analysis was performed by comparing the developed application with existing apps, focusing on identifying features that require enhancement to more closely match the preferences of the intended audience.

The application's media components were described together with the hardware and software requirements. The design process of the application involved the creation of flow charts, storyboards, graphical representations, content layouts, and navigation structures. A concept and narrative that are compatible with the preferences and requirements of the intended audience were developed to construct the storyboard. The comprehensive outcomes of storyboarding served as an initial guide for the project development phase. The main menu includes four primary modules: Alphabets, Numbers, Animals, and Fruits. Every single part illustrates how important it is for users to have practical applications. Character design, concept selection, theme development, and the integration of menu buttons and application backgrounds are all included in the graphic designs. The application's color scheme was selected with the animation's elements. During the development phase, the application was created using modern technologies.

The preliminary testing occurred concurrently with the development phase, aiming to ascertain the fulfillment of project objectives concerning the criteria of meeting consumer needs. In this phase, acquiring expertise on enhancing the application's performance is essential. As mentioned in [17], two types of evaluation were identified: formative evaluation and summative evaluation. Formative evaluation was applied in this study at every stage of the development process, with a design phase evaluation at each stage.

The purpose of the application evaluation was to decide whether Android Basic Solution Principles' functionality matched with the project requirements. Following consumer usage of the product, a summative evaluation was conducted based on user reactions. The findings from the evaluation were taken into account, and any shortcomings in the application were addressed to align with the users' needs. User responses were evaluated through a combination of interviews and questionnaire surveys. The participants comprised 20 randomly chosen children ranging in age from three to six years. Early childhood learning specialists and experts in application-based technology development evaluated the lessons learned via the application. The survey comprises questions that ask experts to

assess how interface design and interaction are applied. The questionnaire used in the study contains various questions in order to ensure the effectiveness, accuracy, and attractiveness of the application content, and to ensure the validity of the content and usability. The frequency of “yes” responses was used to analyze the responses.

The survey is divided into four sections. **Section A** contains four questions focused on the content of the respondents as shown in Table 1. **Section B**, as presented in Table 2, consists of four questions addressing the application design while **Section C** includes four questions related to interaction design as shown in Table 3. Finally, **Section D** comprises four questions concerning interface presentation according to Table 4. Following the survey, the system underwent a maintenance phase, during which the application was presented to all users, including the supervisor and the panel of reviewers responsible for grading the program. During this stage, any identified flaws and defects in the application were addressed and rectified. The application underwent an evaluation to gauge its effectiveness for community use, especially among children. The Arabic Numbers and Alphabets Basic Learning Android Application was created to serve as a resource for individuals to learn Arabic alphabets and numbers conveniently, anytime and anywhere. The process of evaluation has the potential to indirectly promote community awareness regarding the need for foundational education. The effectiveness of the questionnaire was tested with a small group of children who use the application, and preliminary and subsequent tests were conducted for the application before and after its use. The results of the effectiveness test were analyzed by five children aged 3–6 years who used the application, and the results were satisfactory and effective. These results provided a brief introduction to the research results, as they highlighted the compatibility between the research tool and the research objectives, which provides a main indicator for evaluating the suitability of the application for the intended educational outcomes of learning Arabic letters and numbers.

In summary, there are different teaching methodologies used in classrooms, and yet, there are persistent gaps between student knowledge, learning objectives, and the methodology used. The application mentioned in this study can create a consistent learning environment for students at an early age, thus reducing the challenges that may be encountered during future classes, especially in the early grades.

7 RESULTS

The professionals who were surveyed involved instructors from Al-Zaytoonah University of Jordan (ZUJ), along with 20 children between the ages of three and six, randomly selected from three schools to represent the target audience. The data collected were analyzed based on the percentage of frequency values. Four instructors participated to evaluate the worth of the application. Two professors from the Faculty of Science and Information Technology, and two professors from the Faculty of Arts. The two professors from the Faculty of Science and IT were responsible for assessing the application’s user interface, multimedia presentation components, and interaction designs. The professors from the Faculty of Arts were tasked with evaluating the content of the application. Figure 1 presents the main menu interface of the Android application, which consists of four menus: Numbers, Alphabets, Animals, and Fruits. Figure 2 shows examples of the application interfaces.



Fig. 1. Application main menu



Fig. 2. Application interface

Table 1 presents the results of the application content analysis conducted by the four experts who evaluated the functionality of the Android app. Specifically, for question 3, which assesses whether the content of the Android application aligns with users' varying cognitive levels, one of the four experts expressed disagreement, this answer could be interpreted as they expecting to set levels for different abilities of children. Overall, Participants indicated that the material is organized.

With all 4 experts agreeing that the information is presented accurately. Moreover, the specialists agreed that the language and content employed were clear, simple, and easy to learn. Moreover, the content aligns the learning objectives, and helps to boost the user knowledge.

Table 1. Application content analysis

#	Question	Answers	
		No	Yes
1	The application content aligns with the learning objectives.	0	4
2	The application content is shown clearly.	0	4
3	The application content corresponds to various user's abilities.	1	3
4	The application content offered helps to boost the user knowledge.	0	4

Table 2 presents the analysis of expert's acceptance of content design. The results indicate unanimous agreement among all respondents regarding the suitability of the content as per the analysis of content design. In specific, question 1, assesses whether the material used is well-organized, one of the four experts expressed disagreement, this answer could be interpreted as them expecting a certain logic, or a more appropriate division and arrangement. In contrast, all of the four experts assess that the phrases used are basic and easy to understand, the color palette used is suitable, and the application provides factual information.

Table 2. Analysis of the app design

#	Question	Answers	
		No	Yes
1	The application material is well-organized.	1	3
2	The phrases used in the application are basic and easy to understand.	0	4
3	The color palette used in the application is suitable.	0	4
4	The application provides factual information.	0	4

Table 3 shows the evaluation of the multimedia features. On the one hand, three out of four experts agreed that the visuals utilized in the application can capture user's interest, the negative feedback from question 3 indicates that the images may not be entirely suitable for all children's tastes. On the other hand, every expert acknowledged that the graphics used can help children easily understand, the background music is appropriate, and the graphic can increase children's attention.

Table 3. Analysis of the app interaction

#	Question	Answers	
		No	Yes
1	The application's graphic representations can help children easily understand.	0	4
2	The background music that is used in the application is appropriate.	0	4
3	The images used in the application can catch the children's attention.	1	3
4	The application graphics can increase children's interest.	0	4

According to Table 4, the interface display consists of four questions. After studying the interface design, two out of four experts remarked that the text positioning in the application interface is consistent, this feedback can be explained by the fact that the application contains dynamic text boxes that change size based on the size of the content. However, for the other questions, the experts acknowledged that the graphic's location is consistent in the application's interface, and the interface design of the application is interesting and well-designed.

Table 4. App interface design analysis

#	Question	Answers	
		No	Yes
1	The graphic's location is consistent in this Android application interface.	0	4
2	The interface design of the application is well-designed.	0	4
3	The text position is consistent in the interface of the application.	2	2
4	The interface design of the application is interesting.	0	4

Table 5 presents the analysis of children's acceptance of content design. Through structured interviews with 20 respondents, all children were included in the study. The results indicate unanimous agreement among all respondents regarding the suitability of the content as per the analysis of content design.

Table 5. Analyze respondents' acceptance of the content design

#	Question	Answers	
		No	Yes
1	Submission of an interesting subject.	0	20
2	Organized and engaging content.	0	20
3	The lesson's content is appropriate for my level of comprehension.	0	20
4	I understood the lesson's subject clearly.	0	20

Table 6 analyzes respondents' acceptance of interaction design. Utilizing structured interviews with a sample of 20 respondents, every question in the analysis of interaction design reveals unanimous agreement among all respondents, affirming its suitability.

Table 6. Analyzing respondents' acceptability of interaction design

#	Question	Answers	
		No	Yes
1	The animation is appropriate for the target age group.	0	20
2	The control button functions well.	0	20
3	Interesting usage of music.	0	20
4	Sounds are able to hear clearly.	0	20
5	The visual elements provided improve the attention of users.	0	20

The analysis of interface design is shown in Table 7, employing structured interviews with a cohort of 20 respondents, every aspect of the analysis of interface design indicates unanimous agreement among all respondents, affirming the suitability of the layout displayed on the application screen, and interface design is interesting. In specific, for question 5, while most respondent find the color appropriate and attractive, two respondents who disagree on the background color may find it too dull or too bright for them.

Table 7. Analysis of interface design

#	Question	Answers	
		No	Yes
1	The graphics chosen are appropriate.	1	19
2	The colors chosen are appropriate.	1	19
3	The layout displayed on the application screen is suitable.	0	20
4	Interesting interface design.	0	20
5	Appropriate background color.	2	18

8 DISCUSSIONS

The Android application was developed using the waterfall model as a guide. The development process was divided into five stages: 1. analysis, 2. design, 3. development, 4. testing, and 5. maintenance. Thematic analysis was chosen to analyze the data, because it allows for a detailed and flexible approach to understanding qualitative data, which makes it ideal for this study to explore how children, teachers, and parents experience the Arabic alphabet and numbers learning application.

During the design phase, an Android application for teaching children the Arabic alphabet and numbers was created using Android Studio, Adobe Photoshop, and Adobe Animation. The application was developed by combining textual, audio and graphical components. In the design phase, all instructional materials are created using suitable hardware and software [18].

The results of this study show that the respondents' (children's) curiosity was successfully aroused by the application's design. Most of them agreed that the application's background and design are suitable for the intended audience.

Therefore, with this Android app facilitating the learning of numbers and alphabets for children, parents need not be concerned about providing smartphones with engaging and valuable educational content at any time and place [19].

According to [20], individuals residing in an interior area devoid of schools, teachers, and students leverage wireless technology to enhance the accessibility of information. Technology is essential for conveying all instructions and information while also making the learning process easier. Materials in this study's application are supplied in the form of images, animations, texts, and audio. According to [21], the learning facility provides improved technological approaches to education. The utilization of multimedia elements pertains to incorporating visual graphs to enhance the appeal and comprehension of information.

According to [22], textual representation constitutes a crucial element in multimedia software aiming to convey its content. Text serves as the most efficacious means of communicating ideas to users.

The purpose of the text was to provide students with easily understandable information. The animation in the application creates a sense of motion. Employing animation serves as an optimal strategy to captivate and involve children effectively [23]. As pointed out by [24], animation constitutes a form of technology-driven education that can offer children a holistic learning experience. The application also uses audio as a media format. One of the most prevalent mediums used in computer-human interaction is audio.

In our application, the incorporation of sounds enhances the interface, making it more apparent and engaging. As indicated by [25], audio within a multimedia presentation plays a pivotal role in establishing an atmosphere conducive to the appropriate learning method. It is worth noting that with the widespread and early use of mobile phones by modern generations, educational content on smartphones has become interesting for children, as they can learn through a medium that, from their point of view, is a tool for entertainment and amusement, which increases their internal desire to repeat this educational content, and with this repetition, the information becomes fixed in their brain.

Compared to previous studies and with the emergence of the results of this study, the importance of interactive elements in increasing the efficiency and effectiveness of the educational process emerged by attracting the attention of learners through sound and image. One of the most important reasons for the positive results of this application is that the content of the application is suitable for attracting the attention of children in their cognitive development stage, as the application contains attractive visual content for their ages. This increases their desire to repeatedly use this application, which contributes to increasing the memorization and consolidation of information. Since the content of the application supports basic skills in an interactive and easy-to-understand way, this explains the positive results of this study. However, the age group is a limitation of this study, as this study evaluated the application on a specific age group, and future research can enrich this study on a different age group.

9 CONCLUSION

This study addressed the development and evaluation of an application for learning Arabic letters and numbers for children aged 3–6 years. The main contribution of our study lies in the successful development through the use of multimedia and practical implementation of learning aids that operate on the Android system for teaching children's Arabic letters and numbers by providing an easy-to-use and easy-to-access application. Particularly in the Arabic language, this study contributes to the advancement of children's education. Providing an educational tool that contributes to improving the learning process for children, by using innovative educational strategies such as learning through play or interacting with multimedia. The affirmation from experts and the children involved in the survey reinforces its potential as a valuable tool for enhancing children's learning. It was found that the application is suitable for children and increases their interaction with its content due to the availability of interactive elements that attract their attention. These results indicate that the availability of interactive elements in educational content increases children's interest in this content and increases their desire to repeat it, which contributes to better memorization of information. Although the study was limited to a specific age group, this limitation constitutes important insights for future research, as it is recommended to conduct more research on a different age group or

using different learning methods. In general, this study emphasizes the importance of using technology in innovative educational fields in order to facilitate learning the Arabic language and enhance children's reading, writing and arithmetic skills.

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