

# Visual Approach of a Mobile Application for Autistic Children: Little Routine

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**Abstract.** With the rise of mobile technology, visual approach can be implemented in mobile applications in order to help Autistic children. Nonetheless, those mobile applications that does not entirely uses actual pictures in their visual approach method that helps these children with their core drawback, which is the lack of independence. Therefore, this paper aims to present a visual approach of a mobile application, Little Routine, to assist autistic children. Requirement gathering is conducted through literature review of research papers, interviews and observations. At the same time, the methodology is based on rapid application development (RAD). Little Routine has been developed based on the requirements from the experts and literature. The tool used to develop the prototype is App Inventor and Android Software Development Kit. Later, usability test was conducted with a specialist, teachers and children to examine the effectiveness of the mobile application. The results showed that the respondents were satisfied with the mobile application. It is hoped that the application will assist autistic children in their daily routine.

**Keywords:** Mobile application · Autistic · User testing · Visual approach

## 1 Introduction

Mobile application is rising as a common trend in world's development. People's productivity can be increased with the aid of smart phones and tablets, as it is easy to use. Therefore, using mobile application, many developers create apps that give benefits and assist people every day. This can also be a platform to aid disabled group such as autistic children. Autism is a developmental disability that happens in the first three years when a child is born. It is known as a neurological disorder that influences the growth of the brain, resulting in struggles with learning, communication, and social interaction [1]. Nonetheless, visual are their area of strength.

Hence, this project aims to present a prototype through visual approach for educating autistic children. The prototype is an interactive application that teaches the children based on their daily surroundings. This mobile app will act as a tool for autistic children to enhance their independence skills. This will improve other major drawbacks as well like communication and social skills.

## 2 Literature Review

### 2.1 Technology and Education

Understanding towards technology has been growing for the past decades. People are more driven to use technology everyday which enable to increase their efficiency. Thus, technology has now come up to assist other sectors, including education sector.

Additionally, mobile technology has penetrate the education market, as well as making disabled student's lives simpler. For an autistic child, it is essential to keep them interested in learning, as they are easily distracted. Therefore, with the aid of mobile technology devices like iPad or tablets, they can be more focused and motivated to learn. Most autistic kids respond well to the visual display that tablet offers and even though sometimes technology is inconvenient, with tablet, it is definitely easier for kids with autism than without it [2].

### 2.2 Understanding Autism and Autism Spectrum Disorders

Autism Spectrum Disorders (ASD) are a group of disorders with complex neurological growth and major characters, which include social and communication limitation, sensory impairments and repetitive stereotype behaviour [1]. ASD is not an uncommon sickness; it affects approximately 1 in every 165 persons [3]. It is also known as a life-long disorder with no exact cure. However, with fast intervention and excellent educational practices, the disorder may see a rapid improvements.

Autistic children face countless obstacles daily; however, their complications in socializing are most challenging [4, 5]. Social interaction difficulties include trouble in peer interaction, drawback in using and understanding non-verbal communication, and restricted imitation of other's actions and sounds [6]. Effective social skills are crucial to build successful interactions in home and society [9]. Nonetheless, this particular project aims to develop the independent skill of autistic children.

Developing the skills of autistic children is quite a challenge as each of them has different symptoms and unique in their own ways. Thus, the major areas of education that must be concentrated are communication, social, and independence. Communication is highly important to sustain one's life. However, most autistic children are having difficulties in languages skill, whereby it is hard for them to digest what others are saying [7]. By enhancing language, it can aid in developing socialization and interactions of autistic children with other people [8].

### 2.3 Learning Theories and Approach

There are various approaches and treatments, which include Applied Behaviour Analysis (ABA), Social Communication, Emotional Regulation and Transactional Support (SCERTS) and Visual Approach [10]. ABA is the strategy, application, and assessment of environmental adaptations to produce socially meaningful enhancement in human behaviour [11]. ABA approach comprises the practice of direct observation and evaluation. However, SCERTS encourages a broad educational approach that provides an

opportunity and sequence of progressive goals by concentrating on significant, realistic progress within daily routines at school, home, and in the society [12]. Visual Approach uses pictures or other visual items to communicate with autistic children as they are visually oriented [13]. Autistic children go through their daily routine by visual supports. It eases them to recall what happens afterward. Most applicable visual items used are by using actual pictures. Actual pictures helps the children to understand better and able to relate with their surroundings. Visual approach has been implemented in many mobile applications however, those apps do not entirely uses actual pictures in their method.

## 2.4 Previous Related Works

There are several development of mobile application for autism that have been done over the past few years. However, these works have minor setbacks in assisting autistic children.

The Choiceworks app is a learning tool for assisting children to accomplish their daily routines (morning, day and night). This app is aimed for caregivers to offer clear and reliable support to child's independence, and emotional directive either at home or in public [14]. Still, some setbacks the interface include too crowded with many elements and symbols, which can be confused.

Proloquo2go is another communication application designed for autistic children. The idea is an alternative communication solution for children, to help them by constructing sentences using symbols, which will enhance their communication skills [15]. However, this particular app only focuses on communication and lack routine assessments that can improve their independent skills.

## 3 Little Routine

The developed mobile application is called "Little Routine". The main idea of Little Routine is to teach and assist children with autism to recognize and learn daily activities, as well as routine in various places at home, such as in bathroom, living room, kitchen and bedroom by adopting visual approach. It uses pictures and video to communicate with autistic children as they are visually oriented as supported by [13]. The tool used to develop the prototype is App Inventor and Android Software Development Kit. Figure 1 shows the flow of the prototype app that comprises routine activities. Figure 2 displays the main page of the app, which shows a picture of a house. The app interface has minimal elements with sound effects and the app applies colourful actual pictures. Figure 3 shows the routine selection page, whereby children can choose which routine location they want to perform. There are four options, which are bathroom, kitchen, living room and bedroom.

Figure 4 displays one of the routine examples, which is the bathroom routine. The interface is simple and easy to understand for the children. They have to click on the picture of which routine they want to learn whether it is the bathtub, toilet, sink, and toothbrush. Each of the picture will then be directed to a video. Figure 5 displays the

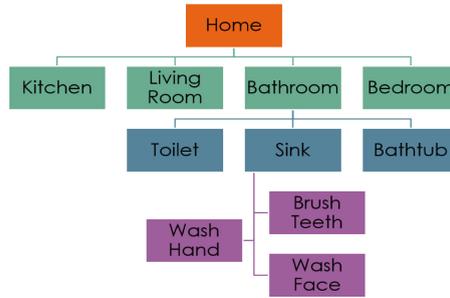


Fig. 1. Flow of prototype

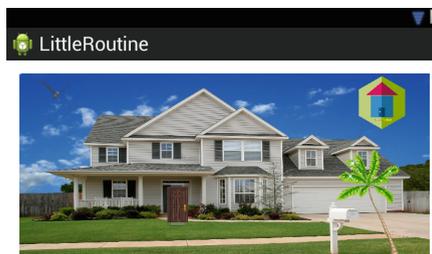


Fig. 2. Main page home



Fig. 3. Routine selection page

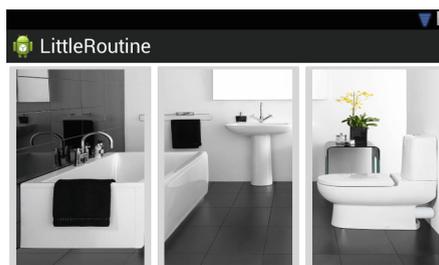


Fig. 4. Bathroom routine recognition



Fig. 5. Routine training video

next phase of the routine, which is the routine training page. This page shows an easy way to perform child’s everyday routine through an interactive video display.

### 4 User Testing

User testing has been conducted with a total of 10 participants. It has been divided into 3 categories that is one specialist, 4 teachers and 5 students. The details of the testing and results are discussed below.

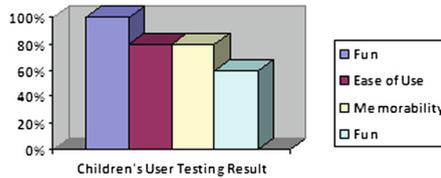
User testing done with the specialist was the first cutover phase. The specialist had observed the design of the prototype. The comments include: The application should focus to overcome one specific setback of the child; use few animated pictures and symbols; simple interface design. As a result, this project managed to come up with a second version of the mobile application. The application now focuses on developing the child’s independent skills and only uses actual pictures with a simpler interface.

Four teachers were involved in the user testing process. It is believed that it is important for teachers to test the application as they know best what the children need. Figure 6 displays the result from the user testing involving teachers. From the user testing, 80 % of the teachers claimed that the application is very helpful to be used by the students. 60 % of them said that the application is interactive. Furthermore, 80 % agreed that the application is easy to use and they would all use it again.

Another user testing was done by observing autistic children to further comprehend the effectiveness of the application prototype. Since the target group of this application is limited, only 5 students were involved in the user testing process. Figure 7 displays the result from the user testing. Since the children are unable to respond verbally, the testing was done by observing their facial expressions. It was found that 4 of the



Fig. 6. Teachers’ user testing result



**Fig. 7.** Children's user testing result

students played with the application continuously. However, 2 of them did not understand the video shown in the application. Unfortunately, 1 of them did not follow or imitate the routine shown. Overall, the results are supported by the claim by [8] that using toys, objects, and routines will attract the child to communicate.

## 5 Conclusion

The paper discussed a mobile application prototype based on visual approach to educate autistic children. Thus, a prototype named 'Little Routine' has been developed. Little Routine is a mobile application targeted to attract and motivate autistic children to learn daily routine skills, as well as to enhance their independent skills. Based on the user testing, it is found that most of the teachers are very interested with the application. They also believed that the application is definitely helpful to aid autistic children as the 80 % responded well during the user testing. This mobile application strives to support and assist autistic children in enhancing their daily activities, especially in their independent skills, which subsequently gives an impact on their communication and social abilities.

The next recommendation is to add more routines in the application which allow them to learn and explore more knowledge by themselves. The next phase of Little Routine will include routines at school, playground and other places.

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