

Improving Quality of Experience (QoE) in Malay Language Autism Identification Assessment

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Abstract: Autism can be described as "pervasive developmental disorder" that involves the functioning the part of the brain. Autism is considered a neurological disability and not a psychiatric disorder. Therefore, one purpose of this project is to develop a game-based learning application through visuals to attract interest and help autistic children to learn. Identifying Autism amongst Malaysian citizen especially children nowadays are a prominent issue. The usual practice of Autism screening test in the Malaysian school system is by teacher's observation and intervention. This usually time consuming and less accurate. Moreover, Autism children enrolling in a normal education system will encounter many problems to the teacher and to the children itself. Therefore, a mobile-based application for Autism screening test named Kiddo Autism is developed. Multimedia elements as well as Gamification Based Learning are implemented in this application to enhance visual and auditory senses among children during screening test. Apart from that this application can be used as learning tool for Autism children to learn alphabet letter and phonic. A usability study has been conducted towards possible students with autism using Mean Opinion Score (MOS). Result from the study shows that 93% of respondents agreed that the application achieved its objectives and feel that the application able to enhance the QoE of children during the screening test.

Keywords: QoE; Autism Learning Application; Children; Mobile Devices.

1. Introduction

Autism is a neurological disorder that affects brain development and affects a person's ability to communicate and interact socially and learn like a normal child. This makes it difficult for autistic children to understand the knowledge learned at school. Children with Autism are usually smart and hardworking. However, they have difficulties in behaviour, personality, and other symptoms, thus,

having problems coordinating to write, behave as well as speak is quite difficult to do everyday tasks. Around 10 to 15% of Malaysians are born with Autism symptoms [1].

The standard routine of autism initial screening tests in Malaysian schools is fully managed by a school member especially teacher. Yet not every autism-like student can be associated with this condition since the pupil needs to check out by their parent first. Distinguishing autism among students manually is a difficult task. The pupils need to be identified first whether they already with autism symptoms. It is nearly difficult to classify autistic children at the early stage of primary school. Children with autism symptoms typically have problems learning the names and sounds and have erratic behaviour [2]. Due to these difficulties, autistic children could not understand what has been taught by their teachers [3]. These difficulties are worsening if autistic children are left behind. Teachers might assume autistic children as slow or unintelligent [3].

Various approaches can be accomplished to detect autism among pupils. One of the approaches is by screening pupils with autism symptoms by a special test that can be performed at school. This kind of screening test is very important as a preliminary test for autism. If a symptom of autism is detected, the child will be suggested to a psychologist for further examination to validate autism symptoms. The key objective of this study is to enhance the quality of experience of autism screening tests by developing mobile-based applications using various media elements. The normal paper-based test is typically less time intensive and less appealing and can create discomfort in the course of the test. The quality of experience (QoE) metric will be used to assess the user experience. Children frequently bore themselves during long-term tasks and prefer not to carry out the activities [4].

2. Kiddo Autism QoE Framework

Diagnosis tests can be described as the apparent recognition of flawed disease which is hard to identify. Usually screening examinations can be done by tests, exams, and other techniques to evaluate the symptoms of the disorder. This process is not measured as a diagnosis directly toward autism. The test subject should be discussed to a psychologist for additional diagnosis and essential treatment if the result is positive or questionable.

Figure 1 shows the framework of Kiddo Autism QoE Evaluation. There are 4 steps in the framework: test in progress, data stored in a server, evaluation, and available result. First, the Kiddo Autism application is given to the pupils for test subject. After that all the essential data from the assessment is stored on the dedicated server that provide as a storage. The next step is to manage and evaluate all data in the server. After that evaluation from the teacher or instructor is presented to establish whether the student has a autism symptom or not [5]. This framework is based on frequent analysis, design, and evaluation phases. Consequently, the assembled findings from the final assessment can be used to enhance various elements of the developed mobile application.

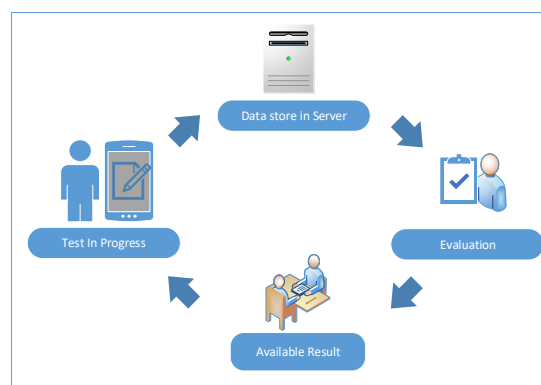


Figure 1. QoE Kiddo Autism Framework

2.1 Testing Environment

Figure 2 shows the Kiddo Autism application. This application is developed as a screening tool for screening autism for pupils in school. In this application, pre-school or lower secondary students aged from 6 to 12 years old are the mark test subject as they are in the early stage of learning and having school experience. As for the apps, the language that is used is Malay language where it is the main the official language of Malaysia. The first objective of this application is to assist alphabet identification and phonic. The second objective is to motivate autism child to learn and read and the last objective is to screen autism children.



Figure 2. QoE Kiddo Autism Learning Module

The first step in this application is letter identification as it is an important step before children begin reading and writing. The activity in this module is recognizing and memorizing. Then, the process is repeated several times to enhance learning process [6]. This letter identification and phonic module uses blended and multisensory style which utilize multimedia elements such as text, graphics, audio, and animation approaches. Another approach used in this application is Gamification Based Learning. This approach will ensure children having fun, thus enhance quality of experience during screening test. Children could also give more concentration as well as less pressure during screening test. The result of the activity is saved after the game for further analysis and evaluation.

In general, usage of multimedia elements to convey or display information to the targeted user could enhance quality of experience [6], [7]. Usage of multimedia elements in application such as Kiddo Autism were used widely in areas especially education since it can increase children's motivation therefore increases learning performance [6]. From recent study, multimedia usage also may increase autism children performance in learning and assessment [7]. Multimedia elements such as interactivity in application for autism children can be deemed as an important factor of accomplishment in teaching and learning [8].

2.2 Screening Test

Screening testing are design to be used on each test subject. Each test will get more in-depth test with possible autism candidate. Also, this process is not proposed to be diagnostic on certain level. However, it may show the symptom earlier for teacher or tutor to handle the children's disability towards learning. Moreover, for those with maybe obtained positive result should be referred to a psychologist for further opinion and necessary treatment to solve this problem. Autism screening tests are intended to give a dependable outcome to quantify possibility of autism symptom of the children. The characteristic of autism symptom to be screened are difficulties in comprehending a reading word by word and difficulties in associating letters and sounds.

2.3 QoE Evaluation Towards Test Result

In order the screening test to work properly and efficiently, a validation of QoE from teacher or tutor that has given to the children via Kiddo Autism will be evaluated. **Table 1** shows the direct matrix of Mean Opinion Score (MOS) for the evaluation.

Table 1. Mean Opinion Score (MOS)

MOS	Quality	Impairment
5	Excellent	Imperceptible
4	Good	Perceptible but not annoying
3	Fair	Slightly annoying
2	Poor	Annoying
1	Bad	Very Annoying

Essentially, Quality of Experience (QoE) is a quality level as observed by the user, in this case for a teacher or tutor experience which is crucial to find a importance recognition between the users and efficiency of application [8]. Moreover, it regulates the designated features rendering to application perspective that fulfil the user experience. We used a direct matrix that reflect factors that reliably affect the user experience of the multimedia experience. MOS is used to ascertain users QoE in term of user judgment towards application usage [8]. To access the whole information and find the precision in magnitude is quite difficult in general. In addition, requiring complex result for verifying how a person can be autism or not. We also have conducted an acceptance test where the participants of this testing were teachers of autism pupils in special education classes. Reactions from numerous essential criteria on content, triangulation and interfaces of the application are required in this testing. Result from the test will give the final assumption whether the children are having learning difficulty because of autism or not. To define the user experience towards application and accuracy of screen test, the categorization is shown in **Table 2**.

Table 2. Classification of Screening Test Result for Kiddo Autism

Identify as autism candidate?	Result	
	Yes	Positive
	No	True

In **Table 2**, result shows two possibility either “Yes” or “No”. Additionally, it has positive and negative result as well. If the result “Yes” and the Positive result is True, the student might be having autism and were recognized by the screening test using this application. If the result “Yes” but Negative (False) on screening test, the applicant did not have the autism. Next, if the Result is “No” and result from screening test Positive is “True”, the candidate might have a autism. Finally, if the Result “No” with Negative (False) result from screening test, then the candidate completely did not have a autism at all.

3 Result and Discussion

Firstly 10 respondents who are experts in multimedia content and approach are involves in this study. MOS scale from 1 (Bad) to 5 (Excellent) is used in to evaluate the content, approach, multimedia elements and general items such as user friendliness, interesting, valuable, supportiveness and attractiveness.

The MOS assessment based on the application’s multimedia elements result is shown in **Figure 3**. In term of design, all respondents agree that this application is designed with proper multimedia concepts (Interface design = 4.3), Navigation design (mean = 4.1) and sound implementation (mean = 3.9). Figure 5 shows the MOS evaluation of content and methods. The question given in the questionnaire basically to interpret the combination between QoE of educator or teacher experience and the screen testing that has been conducted in the test.

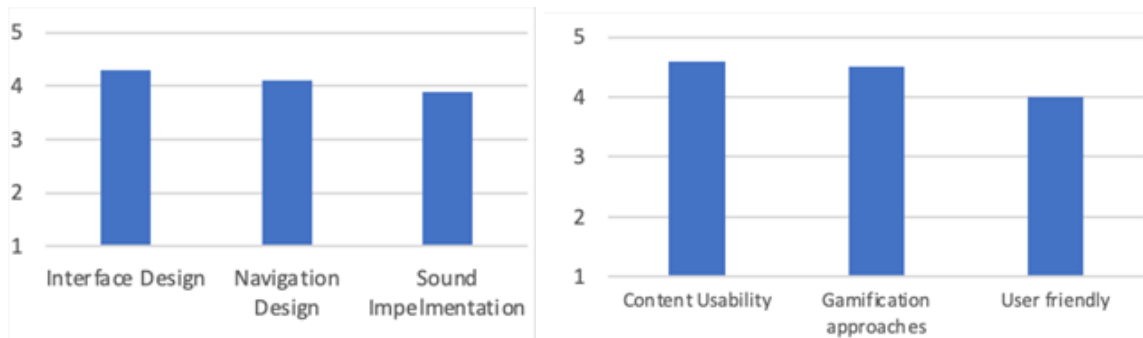


Figure 3. MOS Evaluation based on Multimedia Elements

Based on analysis it shows that majority of the selected children that tested using Kiddo Autism application have the possibility of being autism. Total of 10 question has been given to the 10 selected children to obtain the result. From the test, 70% students are assumed autism with the certain symptom. This result is consistent with the screening test done by the educator or teacher using the application. The characteristics are similar with the learning history. This concludes that the result from Kiddo Autism application have similarities with the teacher or tutor QoE final analysis result.

4 Conclusion

In this paper, research outcome on autism screening test quality of experience among children is presented. Autism in general is not a disease that cannot be cured. Intervention that requires every group of community work together to solve this problem is needed to overcome this difficulty. Although the number of individuals had this disability is quite small relatively, the affected children future may be affected if there is no awareness to solve this problem. Kiddo Autism application with gamification method has proven to enhance the quality of experience during screening test. This application also will help teachers and instructor to detect student with autism problem at the early stage of their lives.

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