

Technical Evaluation on FIQIR Road Safety from Expert's Perspective

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Abstract— An earlier paper of FIQIR Road Safety had been published in Journal of Technology whilst in this paper; FIQIR is focusing on technical aspects evaluation from the expert's view. The experts were one from multimedia industry and three academicians from Multimedia School. The feedback from experts collected through a questionnaire set. The questionnaire includes contents, navigation or interactivity, presentation of the prototype and the use of animations as aspects to be observed by selected experts. According to multiple previous studies, they are important criteria to be considered during evaluation of usability. Results obtained shown that ten (10) aspects over fourteen (14) observed by the reviewers were above the average score of 4.00 according to the Likert scale. Further enhancements will be carried out towards the prototype based on the findings of this study.

Index Terms— Interactive multimedia; Road safety; Technical evaluation.

I. INTRODUCTION

Road safety is an important issue around the world. Therefore it has been debated among participants in Global Ministerial Conference on Road Safety [1] during United Nation Conference 2010 that led to a declaration of a decade Global Action Plan for Road Safety [1]. As for Malaysia, Road Safety Plan 2006-2010 has been implemented and executed. In fact, some amendments and improvements have been added in the latest road safety plan 2014-2020 as they had learned lots from previous experience [1].

Every country has taken proactive actions by outlining systems and program to ensure that their citizens are safe when dealing with road and transportation. Road safety need to be educated among citizens and should be started as early as possible [2]. Each country has its own road safety education program at different levels. Guide book, reading material and posters are among items provided for this purpose. In Malaysia, Road Safety education has been introduced to the students in Primary School. The Ministry of Education (MOE) with the cooperation from Department of Road Safety, Ministry of Transportation, which also known as Jabatan Keselamatan Jalan Raya (JKJR) has designed an exercise book for road safety education among school children [1]. They had come out with different book for each year starting from Year Two until Year Five as shown in Figure 1(a), (b), (c) and (d) which focused on common things regarding road safety education.



Figure 1: The Road safety text book for (a) Standard 2, (b) Standard 3, (c) Standard 4 and (d) Standard 5

This book is given to each student that enrolls in government primary school throughout Malaysia [1]. Even though the exercises provided resembles to what the students see or experience every day, it still have some weaknesses. As traffic is dynamic and road safety involves with dynamic attribute, therefore a dynamic approach need to be embedded in road safety education so it will fulfill the objectives. Books provide static contents so students are not so excited to go through the contents. Besides that, there is no monitoring or dedicated class for road safety learning in schools. This initiates an idea to have an interactive application so the learning process will be more excited. Herein FIQIR is a prototype for Road Safety interactive application. Prior to this, a pilot has been carried out which focused on the contents in book for Year Two. [2].

Generally, any applications developed need to be validated and verified to ensure it meets the user needs and requirements. Therefore a various level of testing need to be carried out before it can be delivered to the actual users. Evaluation towards FIQIR Road Safety started with technical evaluation by the experts so the result obtained could be used as guide for products improvement before it being tested among students. Previous researches have been done in measuring usability [3-6] and have been referred for FIQIR evaluation.

This paper is organized in five (5) sections. Section I will give an introduction of the study followed by Section II that focused on related works. Section III explained the methodology used while Section IV describe the results together with the discussion. The conclusion is placed at Section V.

II. RELATED WORK

This part summarized on related works within the area of study. How the relation between user engagements with the exploitation of multimedia is discussed. The role of multimedia application in information delivery also reviewed. Multimedia evaluation criteria also surveyed as guide to construct the evaluation instruments. Conclusion of this section will be the main input in the next part of the writing where it provides the guidelines on how to conduct evaluation and what to evaluate.

A. *Multimedia as Information Delivery Medium*

Recently, one of the approaches to deliver information effectively is through computer games. Computer games have been applied in many domains such as biomedical, health science, training, education and entertainment. In education domain for example, games have been recognized as being a good tool to promote learners to actively participate in learning activities [7-10]. Furthermore, Studies on a game-based learning have been recognized as being a good tool to motivate learners and promoted an effective way to trigger students' learning interests [11-14]. In addition, some researchers [11-14] have indicated that a game-based learning approach might provide a good chance to stimulate children's abstract thinking during the process of cognitive development, and further foster their higher order thinking ability [15]. As a result, it becomes an interesting and challenging issue that lead many researchers developing games to be used in education or for learning purposes [16].

Previously, [17] stated that by using game-based learning approach, learning achievements among student are increased significantly. This shows that computer game based instruction can effectively promote students' nutrition knowledge. Research from [18] reported that teachers and students could adapt well to this kind of approach as a learning tool and they will convey positive sign of interest in utilizing it in the future.

The game based learning approaches have been applied to various learning activities and have demonstrated the ease of use and usefulness features through computer games [19-20]. Terrell and Rendulic [21] stated that using computer games for learning in elementary schools can increase the internal

motivations and learning achievements of students. Whilst Yun et. al. [22] indicated that through computer games which focus on nutritional education in primary and secondary schools, the learning motivations and learning achievements of the students can be increased, and their competences and knowledge can be promoted. In [23], Papastergiou revealed that children's learning interests are effectively promoted, and they are guided to actively improve their food and drink habits through computer games.

B. *Multimedia Application Evaluation*

Evaluation is a process that critically examines ongoing or completed project or program. It is a process where all the information of project is collected and analyzed. Evaluation is an activity that carried out a judgment about a project. The result can be lead to improve its effectiveness, and/or to inform programming decisions [24]. As for multimedia application, evaluation is executed to serve a few intentions. One of them is to measure the usability level of application evaluated [25].

Previous research has been used several approaches such as Evaluation of Multimedia, Pedagogical and Interactive software (EMPI) [26] and usability testing [27]. EMPI was designed to assist user in evaluating multimedia learning software by listing several evaluation criteria. EMPI used six approaches : 1) general feeling- incorporate images offered by the software, 2) computer science quality- evaluation of the technical realization, 3) usability- ergonomics of the interface, 4) multimedia documents- evaluation of multimedia elements, 5) scenario- wiring techniques to design information, 6) didactical module- integrate pedagogical starter, tutoring and situation. Crozat and Trigano [26] used questionnaire that allows the marking of each previously quoted criterion.

Research has done by [27] figure out the concept of usability testing which purposely to provide a means in identifying problem area, and the extracting of information concerning problems, difficulties, weakness and identify area for improvement. The items of usability testing are learnability, performance effectiveness, flexibility, error tolerance and system integrity and also user satisfaction. Data collection techniques for usability testing include observation, interview/verbal report, thinking-aloud, questionnaire, video analysis, auto data logging program and software support.

Another research listed instructional and conceptual design, interface and graphic design and user attitudes and affect [28] as three domains to be evaluated. Introductory objectives and directions, navigations and orientation, interactivity, sequencing and consistency between learning objectives and content of instruction are items in group of instruction and conceptual domain. Whilst for evaluation criteria for interface and graphic design, the items are color, frames, text, and types of media, animation and graphics. Last domain consists of effectiveness, efficiency, usefulness, degree of interest, enjoy ability, appeal, degree of user-friendliness, relevancy and degree of engagement.

III. METHODOLOGY

This study applied a suitable methodology based on previous research and is discussed briefly in this section. The

instruments named Penilaian Teknikal Permainan Komputer (PTPK) in a form of questionnaires have been constructed. The criteria included in the PTPK are contents, navigation/interactivity, application presentation and animation. In terms of scaling, Likert scale of 1 to 5 is used to compute each of the criteria in every aspect. Previous works reported in [26-28] has been used as a guide for the selection of the criteria. Therefore, as conclusion, hybrids types of criteria are selected as the evaluation carried out not only focus either on usability or technical or interface only.

A group of academicians at School of Multimedia in Universiti Sultan Zainal Abidin (UniSZA) has been involved in the pilot study towards PTPK in order to verify the reliability of items in the instrument. Then, a session is conducted for technical review of the prototype in Multimedia laboratory. The instruments, PTPK, have been given to the experts' panel before the presentation session started. A brief session given to guide on each aspect that need to be focused by the experts. Each of the functionality of the prototype is demonstrated to the experts during the presentation. The experts are free to ask anything during a 30 minutes presentation session.

A. Questionnaires Setting

The instrument is constructed with the inclusion of hybrid criteria within four main aspects. This is due to the purpose of the evaluation is to identify strength and weakness of the prototype. They are a combination of usability, technical and interface evaluation criteria. Since the study is not focusing only one criterion, so contents, navigation/interactivity, application presentation and animation has been selected to be included in the evaluation instruments.

B. Presentation Setting

The prototype is presented in 30 minutes session. It started with a briefing of each of modules available followed by details explanation for each of the supporting components. Examples of activities also shown to show that the prototype completely works as expected. A question and answer (QA) session is made available after the presentation. The prototype consists of three main modules. First module, named Watch is a module prepared in 2D animation showing a journey of a little girl named Aima. In this animation, Aima is walked to school. Along the way she met with other types of road user where she will explain each of the users that she bumped with. For strengthening purposes, module named Learn, is provided. In this module, the user will be exposed to main categories of signage in Malaysia. While for testing what has been gained by the user from the prototype, a module named Play is presented. In this module, user can have a quick test of multiple choice questions, fill in the blank also drag and drop type. Navigation buttons and control also demonstrated throughout the session.

IV. RESULTS AND DISCUSSIONS

Table 1 portrayed the overall result for of the evaluation. Each of the aspects evaluated consists of more than one criterion.

Table 1
Result on Expert Review

Aspects	Criteria	R1	R2	R3	R4	Average
Contents	Delivery Approach	4	4	4	5	4.25
	Easy to understand	4	4	4	4	4
	Provide examples that clear and realistic	4	4	3	5	4
Navigation / Interactivity	Interactivity in application	4	4	3	4	3.75
	Understandable navigation	4	4	4	4	4
Application Presentation	Attractive Screen Design	4	4	5	4	4.25
	Attractive colors, text, graphic and images	4	4	5	4	4.25
	Consistency and functional icon	3.5	4	4	5	4.125
	Instructions and guide	3.5	4	4	4	3.875
	Suitable audio usage	4	4	5	4	4.25
	Suitable sound effects	4	4	5	4	4.25
Animation	Attractive color and texture	4	4	4	4	4
	Movement smoothness and transition	4	4	3	4	3.75
	Special Effects	3.5	4	3	4	3.625
Total Average						56.375 / 14 = 4.027

The label of R1, R2, R3 and R4 is given to each of the expert's reviewer respectively. Overall average score of 4.027 has been obtained for the prototype according to the expert review. Therefore it meets the standard according to [25] where the criteria for the subject to be measured must show the average value of at least 4 on a Likert scale of 1 to 5. So it can be claimed that FIQIR Road Safety has proved that it fulfill the need of usability. Details of results for each aspects of evaluation will be discussed in particulars within the next part.

A. Aspect 1: Contents Perspective

Delivery approach for the contents is the main stress in this aspect. It is purposely identify the suitability between delivery approaches with the level of user. It also examine whether the contents is understandable or not because it is related to the usability issue. The contents also evaluated in terms of providing a clear and realistic example. As a result, the feedback has been summarized in the graph format as shown by Figure 2.

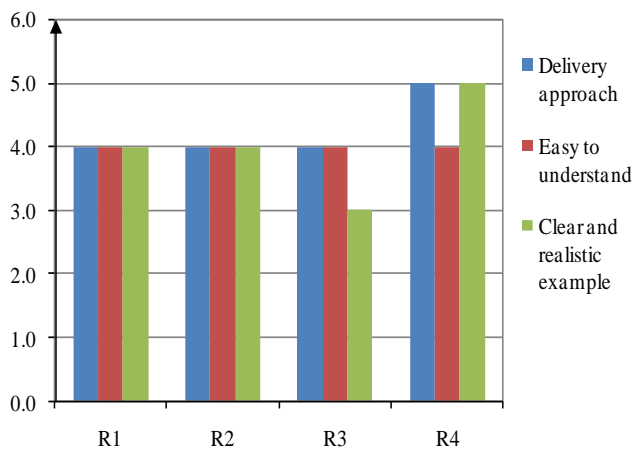


Figure 2: Result on contents aspect

The average result for contents, according on expert review is 4.25, in term of delivery approach. Meanwhile, an average of 4.00 is obtained for both easy to understand and provide examples that clear and realistic. From this result, it can be concluded that these entire three (3) criterion has been fulfilled by FIQR Road Safety prototype even though it only at minimum level.

B. Aspect 2: Interactivity and Navigation Perspective

Interactivity and navigation are the second aspect examined by the experts. Interactivity is defined as the activity carried out simultaneously by two parties to achieve the same purpose [29] while Dewan Dictionary [30] state that interactivity as an action or active communication between each other, it responses between two or more parties. In multimedia application, interactivity is provided through navigation. Navigation is the lowest level of interactivity within multimedia application. For this aspect, reviewer need to identify whether the interactivity exists in the prototype and the navigation provided easy to understand by the potential user. Reviewer’s response is recorded in the graph as shown in Figure 3.

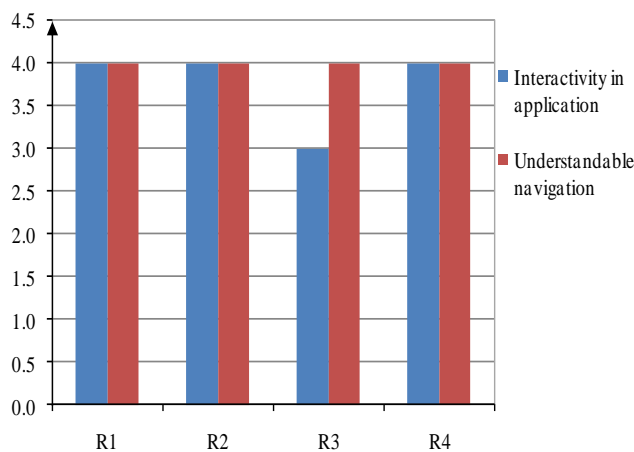


Figure 3: Result on interactivity and navigation

In term of existence of interactivity, this criteria scores 3.75 which is below that acceptable standard. Therefore, further

improvement need to be applied before it can be delivered and tested against actual user. For understandable navigation provision, the score is 4.0 respectively in averages. It can be conclude, it achieve the minimum standard required.

C. Aspect 3: Presentation of the Prototype Perspective

This part contains multiple criterions. It deals with how the prototype is presented to the user. Among items evaluated within this aspect are attractive screen design, attractive colors, text, graphics and images, consistency and functional icon, instruction and guide, suitable audio usage and lastly, suitable sound effects. All this items contribute to the easy feeling while the user go through the prototype, so it need to be provided so the user will have an engagement with the prototype. Figure 4 portrayed the summary of findings for application presentation aspect from the perspectives of reviewer.

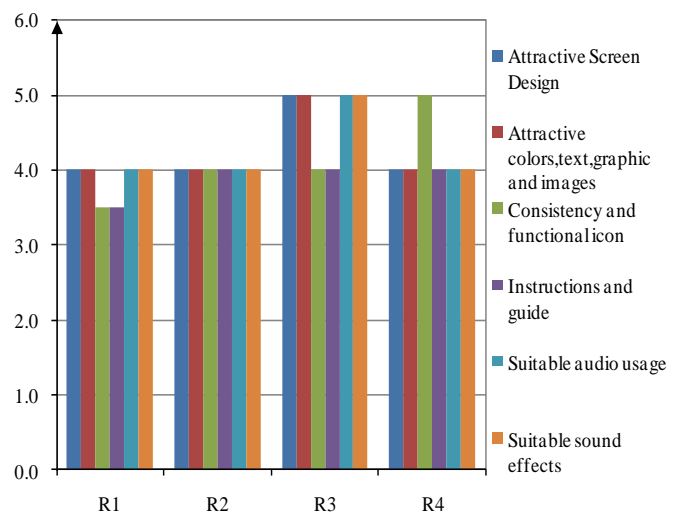


Figure 4: Result on application presentation aspect

A score of 4.25 obtained for attractive screen design and attractive colors, text, graphics and images. For consistency and functional icon, the score is 4.125. Therefore, according to Nielson (1993) these criteria fulfilled the requirement. A result of average scores 3.875 for instructions and guide, indicates that this criteria need some improvement. With a score of 4.25, the item suitable audio usage and sound effects, hence it meets the standards referred.

D. Aspect 4: Animation Perspective

Animation is a vital part in multimedia application [7]. It has a capability in providing visualization to the user. Visualization help in increasing the understanding compared with the traditional method of information delivery [7]. Attractive colors and texture used, the smoothness of movement and special effects are items listed in this group of evaluation aspects. Feedback collected from the reviewer has been summarized in Figure 5.

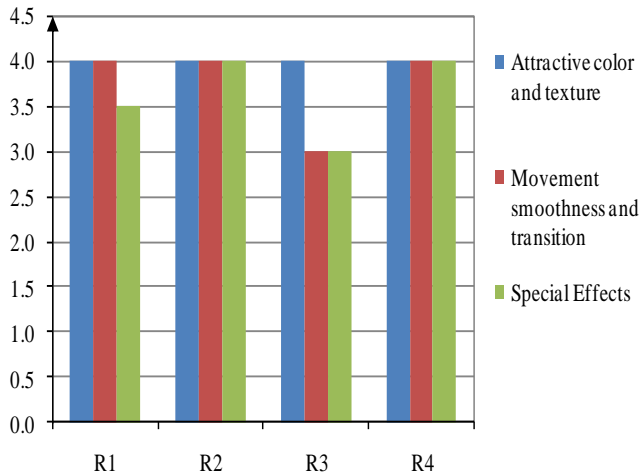


Figure 5: Result on animation aspect

Result obtained for attractive color and texture is 4.00 so this item has no problem at all for FIQIR Road Safety prototype. Differently with the items of movement smoothness and transition and special effects. The average result is 3.75 and 3.625 respectively. The result indicates that a crucial improvement needed for last two criteria in order to ensure this application meets the minimum requirement of standards.

V. CONCLUSION

FIQIR Road Safety is a prototype that developed as supporting tool for road safety education. Before it can be widely used, the strength and weakness of the application need to be evaluated so improvements can be made before it can be delivered to the potential user. Due to that reason, technical aspects evaluation of the application has been conducted from the expert perspective. The result obtained will be used as a guide to improve the application. Most of the items evaluated receive a score of 4.00 and above. Unfortunately, four items has been identified scores below 4.00. These four items need to be carefully revised and improved so it can meet the minimum requirements of standard before it can be delivered and tested within actual or potential users.

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