

CHILDREN ROAD SAFETY AWARENESS: DESIGN AND DEVELOPMENT OF A ROAD SAFETY APPLICATION

Nassiriah Shaari*, Aeni Zuhana Saidin, Asmidah Alwi

School of Multimedia Technology and Communication, Universiti Utara Malaysia, Malaysia

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*Corresponding author
nassiriah@uum.edu.my

Graphical abstract



Abstract

Road safety campaigns and programs have been extensively introduced and implemented in Malaysia. However, their effectiveness is still being debated. Children especially will become the unfortunate victims of road accidents if they are unaware of the danger and precaution actions to be safe on the road. In response to that, this paper introduces an application as an alternative that inculcates road safety awareness to further support existing related programs and campaigns. Particularly, an interactive web application incorporating interactive multimedia elements has been designed and evaluated. Results on the usability test indicate a promising success and highlight aspects and issues that can be further focused for improvement and enhancement.

Keywords: Road safety, interactive application, web application, testing with children, multimedia

Abstrak

Kempen dan program keselamatan jalan raya telah diperkenalkan dan dilaksanakan dengan meluas di Malaysia. Walau bagaimanapun, keberkesanannya masih menjadi perdebatan. Kanak-kanak terutamanya akan menjadi mangsa malang kemalangan jalan raya jika mereka tidak menyedari bahaya dan langkah berjaga-jaga untuk selamat di jalan raya. Oleh itu, kertas kerja ini memperkenalkan satu aplikasi sebagai alternatif yang memupuk kesedaran keselamatan jalan raya untuk terus menyokong program dan kempen yang berkaitan yang sedia ada. Terutamanya, aplikasi web interaktif yang menggabungkan unsur-unsur multimedia interaktif telah direka bentuk dan dinilai. Keputusan ujian kebolegunaan menunjukkan harapan cerah dan menonjolkan aspek dan isu-isu yang boleh diberi lebih fokus untuk penambahbaikan dan peningkatan.

Kata kunci: Keselamatan jalan raya, aplikasi web, pengujian dengan kanak-kanak, multimedia

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1.0 INTRODUCTION

Children road safety is one of major issues in the world and in Malaysia. Various road safety campaigns and programs have been continuously introduced and launched; however, the number of

traffic accidents remains high. The Malaysian Statistic department listed traffic accident as the fifth cause of death from 2005 to 2008 [1], which marks that this area needs a huge attention. The efforts to make roads in Malaysia a safe place has been done quite extensively such as improving hazardous locations,

improving motorcycle and pedestrian crossing areas, and providing the street lightings. In the 9th Malaysian plan (2006 – 2010), the Government has allocated MYR 200 million for road safety improvement in order to reduce the traffic accident [2], which is definitely necessary from road engineering point of view. However, regardless of massive programs that have been carried out, the total fatality in road is still increasing. This is because, apart from the road conditions, human carelessness has been determined as one of the major contributors to the road accident [2], [3]. Therefore, improvement of road engineering perspectives would not be effective, if negative road safety behaviours continue. Accordingly, people's behaviour of good road safety should receive huge attention and be modified accordingly.

In uplifting road users' behaviour, Malaysia has introduced Road Safety Education (RSE), one of the road safety programs. It aims at altering road users' behaviour starting at the primary education level. In RSE, students should receive at least 8 formal education lessons of road safety throughout the year [4]. This is to ensure that the students will take more precaution on the road, as majority of students are pedestrians or passengers of any types of transportation. The understanding of road safety issues is hoped to encourage students to be more aware of and alert while on the road and adopt good road users' behaviours. Although the program has become one of Malaysia's national agenda, the implementation has received some critics, indicating the exposure of the program is not enough [4]. Practically, most road users programs have been taken from much broader perspectives [5] which might exclude any specific features that are required to educate and motivate children to be aware of the road safety issues. It remains tragic that traffic accident is listed as the main cause of death of children in Malaysia [6], hence, crafting a specific program to fulfil the needs to educate this vulnerable group is important.

In conjunction, this study initiates an alternative to the existing programs, by educating children through and interactive media. It is expected that this approach could change the phenomenon. Hence, this paper describes the design and development of the road safety application and its impacts on children's perception through a usability study.

2.0 PERSUASION FOR ATTITUDE AND BEHAVIOUR CHANGE

The use of persuasion in changing people's attitude and behaviour has been practised for a long time. This situation can be seen mostly in areas in which human change (attitude or behaviour) are important such as in marketing, communication, politics, and public relation. In these particular areas, the changes are used as measurements of success or failure of particular situations. For example, the advertisement

of product X is successful if people buy the product or have a positive attitude towards the product. Also, persuasions are now being adopted in wider areas including the information technology domain. This domain is best known as persuasive technology [7], which utilises technologies to change human attitude and behaviour. Evidences have shown that some of the attempts are successful. For examples, the online dietary recommendation and weight loss has some positive impact in its users' diet behavior [8], smokers quit from their habits by following advices of web smoking cessation [9], and children have the ability to manage their asthma by using an online game that allows them to understand the disease more [10]. These are examples on how persuasion has improved the condition of few well-defined health problems and it would be interesting to investigate the dimensions of persuasion in the road safety awareness that allow modification for more favourable behaviour.

In current practice, the use of persuasion in road safety awareness program is mostly integrated in traditional mass media campaign such as television, radio, and billboard advertisements. Proper use of persuasion elements could help in promoting road safety awareness. This is because, emotional approach is suggested to be more effective in providing knowledge and awareness about road safety [11]. For example, threat was found able to modify drivers' road safety awareness [12]. Elliot (2011) suggests that liking techniques in advertisement will affect the behaviour of users. However, there is a report suggesting that mass media campaign is still unreliable to be used as major tool for promoting road safety [14]. In addition, the mass media targets very large population and is for general road users. This type of medium usually requires high production costs, and other costs incurred in the pre and post production [15], [16]. Therefore, changing road users' attitude and behaviour should be more towards self-centred approach, which can be tailored to more specific group of users rather than be generalised for the whole population. This can ensure more effective communication strategies for road safety awareness among road users especially children.

Therefore, this research is keen on proposing the children's road safety awareness website. The online environment would allow greater access to the content both in school and in home setting, thus makes the application flexible and robust. The website, employing various perspectives including the children's view, will provide insight on how positive road safety attitudes can be fostered from childhood.

3.0 DESIGN AND DEVELOPMENT OF THE ROAD SAFETY APPLICATION

The application has been built with the aim of providing road safety awareness to children so that they can stay safe on the road and they can avoid, as much as possible, being victims of road accidents. The design and development process encompasses four activities: planning –brainstorming ideas for the concept and content to be included in the road safety application; design–preparing storyboards and developing prototype in Flash; development – developing prototypes for standalone application (in Flash), and web site (embedded with the Flash application)

(<http://smmtcresearch.wix.com/roadsafety>);

implementation – developing a full fledge website once modification based on user test was completed.

To successfully instill awareness in children, that is making sure that they can know and understand ideas better, the design was strongly crafted based on the Constructivism Learning Theory that emphasizes on construction of new knowledge by the learners and a focus on active learner-centered experiences [17]

To ensure that the web application can be used not only independently, but also as an alternative supplement to Malaysia road safety education, the content in the application was based on the road safety syllabus issued by the Ministry of Education Malaysia for primary school children. For preliminary stage, this study focuses on three subjects: road furniture, types of road, and one of the important knowledge for children - how to cross the road safely.

This study aspires that students are able to know, learn, and understand the road safety materials in the web application. Therefore, the application is divided into three main modules – *Kenal*, *Belajar*, and *Faham*.

3.1 Module 1– Kenal

The purpose of this module is to introduce children to a few basic content from the syllabus that children should know. Accordingly, this module focuses on *Jenis-jenis jalan raya*; *Bahagian-bahagian jalan raya*; *Perabot jalan raya*; *Jenis-jenis pengguna jalan raya*; *Jenis-jenis kenderaan*; *Isyarat jalan raya*, and *Papan tanda dan isyarat trafik*.

With the intention of not to bore the children, the application provides multiple representation of the contents in the module such as combination of real images, text, sound, and rich virtual modeless feedback (RVMF) in which a pop-up window appears when a user points to any pointer (point of interaction). Figure 1 shows the screenshots of the *Kenal* module.



Figure 1 Screenshots of *Kenal* Module

3.2 Module 2– Belajar

In the *Belajar* (learn) module as illustrated in Figure 2, the application focuses on the universal five steps to cross the road safely. The topics are represented in animation and text narration. The animation is done in a slow phase so that the children can easily follow the steps.



Figure 2 Screenshot of the *Belajar* Module

3.3 Module 3 – Faham

To ensure and test that the children understand the material they have learned from the web application, module 3 (*Faham*) is designed as an interactive exercise module, as seen in Figure 3.

Upon clicking the *Faham* tab, users will be presented with two options of interactive activities Figure 3(a). Both are fill-in the blanks activities; user needs to drag and drop provided answers into correct boxes. Figure 3(b) illustrates activity 2 page.



Figure 3 Screenshots of *Faham* Module

4.0 USABILITY STUDY

A usability study was conducted to test the usability of the road safety application. This was done to find usability issues that may negatively affect the success of the application.

4.1 Participants

Participants were primary school children of year three to year six. Snowballing technique was used to identify and approach them. Requests for participants were emailed to department's mailing list, requesting colleagues to involve their children and their peers to involve in this study voluntarily on a set time, date, and venue.

4.2 Instruments

The instrument for the usability study consists of a set of tasks and questionnaire. The tasks were designed to help participants browse through and find related information on the application. As it tests on usability, the questionnaire was designed to cover four attributes of usability namely learnability, utility, effectiveness, and user satisfaction as proposed by [18]. Further, to measure the selected attributes, this study adapts a few items from the Computer System Usability Questionnaire (CSUQ) [19]. There are a few questions for each attribute with our scales: *Sangat setuju* (Strongly agree); *Setuju* (Agree); *Tidak setuju* (Disagree); and *Sangat tidak setuju* (Strongly disagree).

4.3 Procedure

The usability study was carried out in a computer lab. Four testers managed the test session. It began with a briefing session, explaining the procedure of the study and introducing the web application. Then participants were given five minutes to freely browse the application. This was done to familiarize them with the computer and mouse. Then, the participants were given and asked to perform a set of tasks using the road safety application and their activities were observed, in 30 minutes. After completing the tasks, they were given a set of questionnaire to answer with the help of the testers (when required). After collecting the questionnaire, a debriefing session was conducted, thanking participants with a token of appreciation for their time and effort,

4.4 Data Collection

Answers from the tasks and questionnaires were recorded in Microsoft Excel. Then, simple statistic tests were performed.

5.0 RESULTS AND DISCUSSION

12 children aged between nine and 12 took part in the usability study. From observation, participants were excited while using the road safety application. Tasks and questionnaires were completed sooner than the estimated time. After completing the test, most of the participants browsed through other modules and tried other activities. This shows a good promise that the application manages to attract and

capture participants' interest. A few participants were found repeating the five steps of safe road crossing.

Analysing the results in detail shows that overall, the road safety application receives high scores on the tested attributes. Majority of participants scored each items of the four attributes as strongly agree and agree, as seen in Figure 4.

For positive results, combining the score for strongly agree and agree gives a round up total score of 90% for all attributes. Whereas, the highest negative score for disagree and strongly disagree is 13%, which was given for utility attributes. Although the negative

score is low, it is worth looking after for future enhancement.

Since the number of participants was small, no authoritative conclusion can be made for the usability of the application. However, the study has shed some light on the usability attributes of the application that worth deeper attention and the need for a more comprehensive user study.

This study also has not provided nor tested the effectiveness of persuasive elements that could better instill awareness of road safety among children.

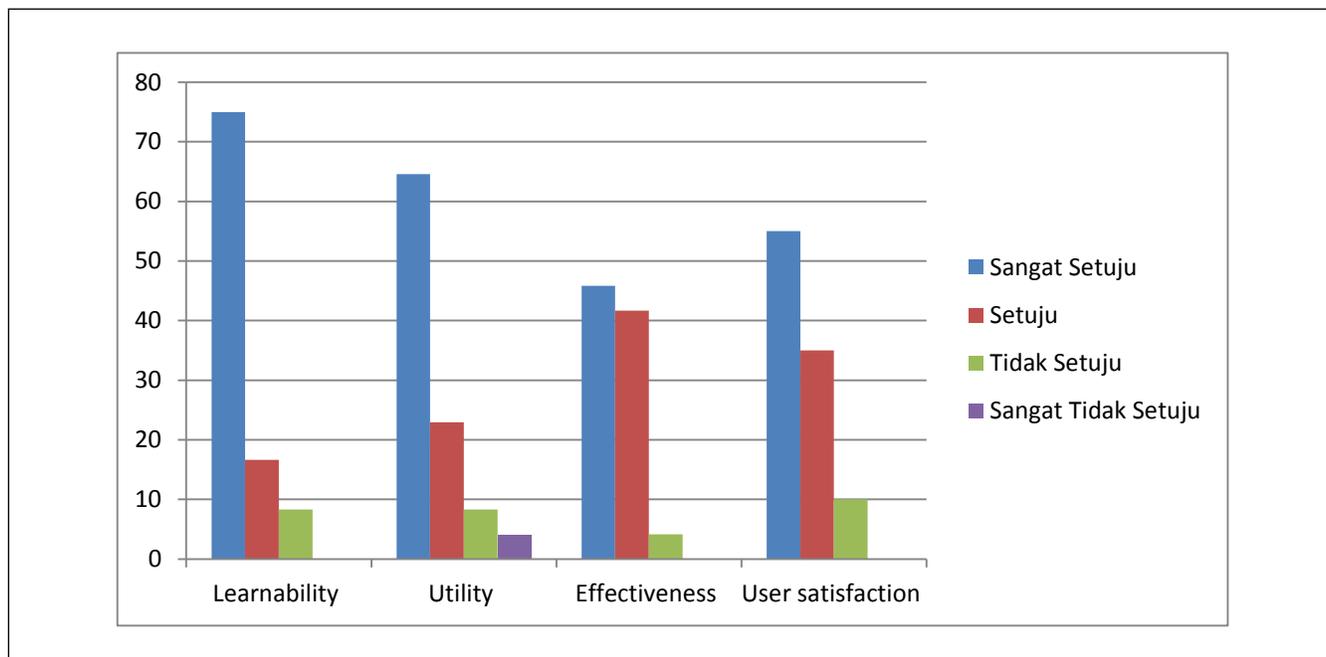


Figure 4 Summarized result of the usability test

6.0 CONCLUSION

This paper outlines road safety issues and the importance of having road safety awareness program/application for children. A development of web application for road safety is discussed. A usability study has been conducted, which reveals that in overall, the web application receives positive feedback. A few issues were observed and called for application enhancement. It is hoped that the application could help the government in promoting road safety awareness among school children.

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