

Developing a Simulation Game to Facilitate Acquisition of knowledge on Road Safety for Schoolchildren

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ABSTRACT

Due to rising number of traffic accidents in Malaysia, road safety program was introduced in schools as a prevention and reduction steps to educate schoolchildren on the road safety. However, the current methods used for transferring road safety knowledge are not effective since they do not stimulate and motivate children to learn and acquire the right knowledge. Therefore, we propose a simulation game called Road Train Safety Game as an alternative method to transfer road safety knowledge for children aged from 7 to 12 years old. In this paper, we report on the development of the simulation game and discuss on features of the games that promote motivating knowledge acquisition for the children

Keywords

Knowledge Transfer, Road Safety, Simulation Game, Serious Game

1.0 INTRODUCTION

For the last 3 decades, traffic accidents in Malaysia have been rising at the average rate of 9.7% per annum (Mustafa, 2003). From 2000 to 2003, 65% of fatalities worldwide involve pedestrian which 35% are children (Kareem, 2003). In Malaysia, the highest fatalities percentage is children range from age 6 - 10 (23%) and followed by 11-15 years old (Royal Malaysia Police, 2004). Considering road safety as one of its social responsibilities, Malaysia Government had introduced a national road safety plan to address this issue. With the aim of reducing traffic accidents to 30%, several road safety strategies from national to community level were introduced. An integrated safety program was introduced to both prevent and reduce future traffic accidents as well as to reduce injuries. Strategies were categorized into (1) accident prevention and

reduction (b) injury control (3) post injury reduction (Kareem, 2003). Road Safety Program were introduced in schools as a prevention and reduction steps to educate schoolchildren on the road safety. One of the proposed programs under accident reduction program is to introduce road safety education program in schools. Currently, school children are being taught about road safety through seminar, flyers, brochures, audio/visual kits and demonstrations by the respective personnel. However, there are limitations on the current methods of acquiring knowledge. The summary of those issues are shown in Table 1.

Table 1: Issues in current knowledge transfer methods on road safety

Methods	Advantages	Issue
Seminar	Can reach many people	-Lack of interaction -No hands-on experience
flyers/posters	Can reach many people	-Lack of interaction -No hands-on experience
Audio/video kit	Can reach many people	-One way interaction -limited 'hands on experience'
Demonstration	Two-way interaction Can reach many people	Not all students can participate during the practical session

As such we are proposing a simulation game that we believe can potentially counter the above limitations. Simulation game promotes a method for the children to learn based on real-life like experience yet with another additional element called fun. We believe that by letting the children acquire the road safety knowledge via simulation game can increase their enjoyment of the learning

and thus foster spontaneous understanding of the knowledge. However, the challenge that any game designers will face is to balance between learning and fun. In this case, the game to be developed must be engaging to children and most importantly facilitates components for the children to acquire new knowledge on road safety.

In this paper, we present the development on a simulation game called Road Train Safety Game (RTSG). The objective of this game is to help school children aged 7 – 12 years to acquire knowledge on road safety. We will discuss the simulation game development from three different perspectives namely game design, content design and pedagogical design (Staric, 2008).

2.0 LITERATURE REVIEW

2.5 Game

The term ‘funny game’ long before the introduction of computer and electronic devices (Abt, 1970). His references however, were limited to only board and card games.

When the evolution of computers and electronics took off, researchers redefined the term game as “a physical or mental contest that has specific rules, with the aim to amuse or reward the gamers” (Jouni & Harri, 2003; Zyda, 2005; and Heijst, Shalgi, Hoog, Jong, ;2005). Additionally, games as an interactive multimedia with dynamic elements that are under user control (Rieber, 2005)

Despite the hype on negativity of games on children, some researchers have proved that games actually help to improve children cognitive abilities (Long and Long, 1984; Silvern, 1985). Silvern (1985) studied how a child’s mind develops while playing and found out that they do use strategic thinking when encountering problem-solving scenario in the game. In their studies, Long and Long (1984) present the findings on deductive processes that took place while the children are playing the game. These proved that children will use their mental abilities while playing the game and not merely playing for the fun of it.

In addition, researchers have deduced that electronic games can aid those children who have difficulty learning some subjects and skills (Brenzika and Hovestadt, 2007; Deguchi et al. 2006; Miura and Sugimoto, 2005; Padgett et al.,2006). These researches have indicated that games helped the children to perceive their deficiencies and correct them (Aguilera and Mendiz, 2003). In addition, Aguilera and Mendiz (2003) stated that the adaptability and versatility of

electronic games as well as the player’s control over them, motivate and stimulate learning and make the games useful in cases where children have difficulties concentrating.

Some other studies have also pointed out those complex games such as simulation games are very useful and important tools for acquiring knowledge (Aguilera & Mendiz, 2003; Mandinacht, 1987). The studies also indicate that the simulation games are more directly related to the development of intellectual abilities since such games require the players to use their intellectual resources to the fullest. White (1984) and Okagaki and Frensch (1994) further support these claim by denoting that player can benefit from developing knowledge strategies, practicing problem solving and developing such skills as decision-making, creativity, spatial, critical thinking in playing simulation game. Padgett et al. (2006) discussed in their research that the simulation game offers high rate of success for knowledge transfer since they allow students and children to familiarize themselves with real situations in day-to-day life with the use of multiple modalities such as visual, spatial, auditory and physical activity. As such, Aguilera and Mendiz, (2003) conclude that of all the games available, simulation games stand out for their enormous educational potential.

2.6 Knowledge Transfer

Knowledge transfer is defined as the transmission of knowledge from one source to another source and use of the transmitted knowledge (Applehans, 1999). Goh (1998) further added that knowledge transfer only happen when there is transmission from the sender and absorption by the receiver. Goh (1998) supports this claim by defining knowledge transfer as when the receiver’s (e.g., group, department, or division) performance is affected by the experience of the sender. As according to Elias and Hassan (2004), knowledge transfer is the transmission of knowledge such as experience, lessons learned, know-how and use of transmitted knowledge. The aim or knowledge transfer is to convey the knowledge of one source to another source (Applehans, 1999) and he emphasis that knowledge transfer can not be done if it does not include the absorption at the recipient’s side. Elias and Hassan (2004) , also stated that knowledge transfer is differing than knowledge sharing because knowledge transfer must have the absorption at the recipient’s side. Knowledge transfer is considered failed if the acquired knowledge does not result in some new behavior or value added learning.

To transfer knowledge, 3 factors need to be there (Elias and Hassan, 2004)

- Where the knowledge is transferred from
- The media used in knowledge transfer
- Where knowledge is transferred to such as to apprentice.

Knowledge transfer is defined as a set of activities and approaches that are undertaken to move knowledge among those who have interests or needs in it (Elias and Hassan, 2004). The aim of knowledge transfer is to transfer source knowledge successfully to a recipient (Fataneh and Shirley, 2007) and it is only happen when there is absorption takes place by the receiver.

2.0 METHODOLOGY

3.1 RTSG Features

We adapted the game-based learning model from Garris, Ahlers and Driskell, 2002 in Figure 1. Based on Figure 1, it shows when and how the learning and transfer occurs when player interact with the RTSG. The content and context of RTSG is based on the road safety domain. It contents is designed to reduce the accident proposed by the Malaysia Government (reactive action). And we focused on the schoolchildren as the target audience since majority of the pedestrian death toll involved this particular group.

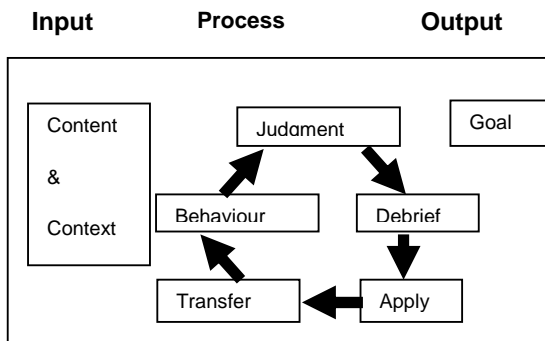


Figure 1: RTSG model [adapted from Garris et al, 2002]

Debrief offers linkage between simulation and the real world. It sets a relationship between the game events and real-world events and connects game experience and learning. This part corresponds to the scenarios provided in RTSG to encourage the learning, reflecting, understanding and applying of the knowledge.

In addition, we adopted the game characteristics that is important for transferring knowledge in RTSG as shown in Table 2 (Johnston, 1993; Baranauskas, 1999; and Malone, 1981)

Table 2: Description on RTSG characteristic

Characteristics	Description
Goals	to ensure the players able to understand the road safety
Rewards	Extrinsic reward is given to players when they successfully 'apply' the knowledge
Motivating	Encourage players to continue to do the activity provided in the game
Interactivity	Provides interaction to player
Rules	Predefined rules identified based on the requirements given by the National Plan on the Road Safety
Scenario	The 'virtual world' where the activity is embedded
User control	Allow player to control the game play
Fun	Enhanced the learning process (Cordova, 1996)

Scenario is the situation created by the authors to 'mimic' the real situation on the road. Three different scenarios were created to allow player to acquire and apply the knowledge that they learnt during the game play.

Rules are the law and regulation of the RTSG. It simulates the real rule and regulation of the road safety in Malaysia. Player needs to agree with the rules and regulations to get score and move forward to higher level.

Goals are objectives and aims of playing the RTSG which to teach school children on road safety.

Extrinsic Rewards are given to player who is successful in encounter challenges throughout the game play. Player are allowed to choose golden coins, light reflector, get more chance and awarded as a hero.

Challenges are given to player to test on the internalization of knowledge that they acquire during the game play. In all scenarios, there will be different challenges given to the player.

Chance is given to player during the game play. The idea of giving chance is to allow schoolchildren to learn from their mistakes and improve.

Interactivity is provided to the player to control the game play. Player is allowed to maneuver and move the character during the game play.

Fun . based on research done by Cordova, fun element can enhance the learning and also increase effectiveness.

3.1 RTSG Development

The content of RTSG is designated based on the real environment and situation on the road. Authors

refer to the rules and regulations on road safety suggested by Jabatan Keselamatan Jalan Raya. Since this RTSG is designated for schoolchildren aged 7 to 12 years old, authors add elements of color, fun, sound and instruction. This game is designed for single player and can be played offline.

We adopted prototyping-based methodology for the development of the RTSG. RTSG is developed using Game Maker 7 Lite Edition software. This software is chosen because it has built in game engine such as character motion and score calculation.

4.0 RESULT & DISCUSSION

Three different scenarios been developed to simulate the real environment namely school, playground and home. These particular environments are chosen because these are the place where majority of the accidents happened.



Figure 2: RTSG sample interface

The first scenario (Figure 2) simulates a situation of player to walk to school. Along the way there will be cars, motorcycles and bigger mode of transportation and player need to attempt tasks such as crossing a busy road, takes bridge, cross at the traffic light as shown in Figure 3.



Figure 3: RTSG sample interface

The score will increase every time player completes the task appropriately. If they failed to complete accordingly, their score will be deducted. And for player who failed their attempt in the RTSG, they will be directed to a tutorial page that debrief player on the road safety. Player are given three chances during the game play, hence it gives player opportunity to improve.



Figure 4: RTSG sample interface

4.0 CONCLUSION

Current safety education in Malaysia involves a range of classroom-based methods, including seminars, visual displays (posters, etc.) and demonstrations. While progress has been made in broadening the availability of such activities, the effectiveness of the particular teaching modes has been questioned (Sharpley, 2003).

The RTSG simulation game provides an alternative to existing modes of road safety education for 7 to 12 year olds. As compared to the existing modes, RTSG provides more interactions, gives hands-on experience to the players and engage the players with the activities.

RTSG was developed to simulate the 'real' situation in a controlled environment because conducting the real situation is too risky and costly. By playing the RTSG, player is allowed to 'experience' and learn from this 'artificial' experience. Engaging player in this RTSG perhaps increase their opportunity to 'learn-by-doing' because they are allowed to performing specific job procedures and faced possible consequences in a controlled environment.

One of the key features of RTSG is that it creates a fun and engaging environment which will help them to move forward and enhance their learning process. RTSG was designated with conflicts, challenges and three different scenarios to allow player to apply the knowledge that they 'gained' in different domain and context. And player is not allowed to move forward to the next level unless

they have completed the current level. Hence, it allow player to 'make' and learnt from their mistakes.

5.0 FUTURE WORKS

The RTSG will be tested to school children age 7 to 12 years old during the Road Safety Campaign in North Malaysia. A quantitative method will be used to determine the effectiveness of using RTSG as knowledge transfer method. The RTSG also will be made online to increase access to the RTSG.

Additional research will be undertaken by the senior author in partial fulfillment of PhD requirements. She can be reached at mazyanti@petronas.com.my.

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