Stay Safe Mobile Application

by

Nur Athirah binti Ismail

16136

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Bandar Seri Iskandar

31750 Tronoh

Perak Darul Ridzuan

CERTIFICATION OF APPROVAL

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A project dissertation submitted to the
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In partial fulfilment of the requirements for the
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Approved by,

_____

(Foong Oi Mean)

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

May 2015

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

_____

NUR ATHIRAH BINTI ISMAIL

ABSTRACT

Numbers of road accidents among children keep increasing from year to year and this has been identified as major cause for children death. Government of Malaysia finds there is need to educate these young children at their early age. Education program called 'Program Pendidikan Keselamatan Jalan Raya' or PKJR was introduced by government to all primary school throughout Malaysia. This program is an initiative between Jabatan Keselamatan Jalan Raya together with Ministry of Education of Malaysia to address the issue of road injuries and fatality. PKJR is a learning process to build strong foundation for road users on right attitudes and knowledge. Based on the problem that has been identified such as limited technology to support PKJR syllabus and mobile game on road safety not aligned with the syllabus of PKJR, a solution is suggested to counter the problems. Hence, the main objective of this project is to develop a game based mobile application in order to educate primary school children on road safety and enhance mobile games on road safety according to PKJR syllabus.

The target user for this project is children age 7-12 years old. This mobile application runs on any device supported by Android and language used will be Malay. To come out with this project, there are few phases to be carried out such as preliminary research on road safety and PKJR syllabus, designing the interface, coding and testing, and lastly implementation. To measure level of understanding of students on road safety, their answer will be the main indicator. From the user testing survey, most of the students would like to use game based mobile application in learning about road safety as additional learning tool because the children find out it is interesting to learn via mobile.

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First and foremost, I would like to express my deepest appreciation and praise to God for His guidance and blessings throughout entire Final Year Project. A special gratitude I give to my supervisor, Ms Foong Oi Mean whose contribution in stimulating suggestions and encouragement, helped me to coordinate my project.

Furthermore I would also like to acknowledge with much appreciation to all respondents and users who are giving full commitment to complete this project. Last but not least, special thanks to my beloved family and friends for all their support and helps throughout the project.

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Children use roads together with pedestrians, cyclists, motorcyclists and other vehicle users. Children who live close to the roads tend to use the roads as their playing field, thus make them particularly vulnerable in traffic. When children start to extend their world beyond the home and out into local roads, they are expose to hazards and risks. Every parent must put highest priority on their children safety. According to WHO (2008), more than 260, 000 children die as a result of road traffic crashes each year and it is estimated that up to 10 million more are injured. There is need in improving children's knowledge about traffic or instilling good attitudes towards safety.

Malaysian government committed in improving the protection of children from any harm especially on road safety. There are a number of road safety awareness program have been conducted nationwide by government agencies together with corporate organization which help in providing knowledge on road safety. Government have taken a lot of steps to educate Malaysian on road safety, not only adults but also school children. A part from providing good road facilities, government see the importance to educate its citizen on road safety in order to make Malaysia as a better place to stay.

In primary school, there is a program called, 'Program Pendidikan Keselamatan Jalan Raya (PKJR)' or Road Safety Education (RSE). This program is actually a joint initiative between Jabatan Keselamatan Jalan Raya (JKJR) with the Ministry of Education of Malaysia. PKJR is a long term initiative start from school children which aimed to produce a new generation of road users with good attitudes on the road. This is a learning process with the elements of best practice on road safety such as proper way to cross the road and know about safety equipment.

Children need to possess a range of fundamental skills in order to interact safely with traffic. Children must know dos and don'ts when they are on road. According to a report by Malaysian Institute of Road Safety Research (MIROS, 2011),"safety experts consider children as vulnerable road users due to the fact that they are inexperienced, immature and fragile." Children's small size body makes them physically more vulnerable to any contact compared to an adult. Other road users have difficulty to see the children due to the children's small physical stature. Parents also need to take responsibility to take care of the children and educate them about road safety. It is important for parents and children to understand the risks on road and importance of practicing good attitude when using road.

1.2 Problem Statement

Below are the current scenarios on road safety among school children:

- The number of road traffic deaths among children increase
- Limited technology to support PKJR syllabus to educate school children
- Existing mobile game on road safety not aligned with the syllabus of PKJR

With current scenario, children need to be educated well in term of understanding on abstract related to road safety and attitude on road. In this modern and technology world, we will use current technology to support PKJR syllabus which will make the learning process more interesting.

Children nowadays like to play games either on computer or smart phone. There is abundance of games that only provide entertainment instead of education especially on road safety. Games can be used as a medium to educate children. They can play and enjoy the game but at the same time learn something from it so they can make use of it in order to keep them safe on the road.

1.3 Objectives and Scope of Study

The objectives of this project are:

- To develop a game based mobile application in order to educate primary school children on road safety.
- Enhance mobile games on road safety according to PKJR syllabus

The target users of this project are the school children aged 7-12 years old which will benefit from the games to enhance their road safety knowledge. As the number of road accident among pedestrian age 5 to 12 years old is increasing based on statistic provide by MIROS in 2009, early education on road safety is crucial. Children must know good attitude as a road users and learn to respect other users' right. This application will be able to run on Android device. The language used for this game will be Malay.

1.4 Feasibility of the Project within Scope and Time Frame

This project needs to be completed according to the time frame given by university. Within two semesters, research and development of the project must be conducted. Research phase will be carried out during the first semester and used for thorough documentation, research and prototyping. The following semester will focus on the application development and testing. The project should be completed within the duration from January 2015 till August 2015. Hardware and software for this project such as Android Studio is freely available. The author only needs a computer and Android smart phone to code the program. This project will deliver a mobile game which is an interactive learning for school children age between 7-12 years old.

CHAPTER 2

LITERATURE REVIEW

2.1 Fatal Traffic Injuries in Malaysia

A report by Malaysian Institute of Road Safety Research (MIROS) showed that the number of road traffic deaths among children increasing over 10 years starting from year 2000 (see Figure 1). All age group show an increasing trend starting from year 2007. Even though there are many campaigns and programs organized by Malaysian government to educate the citizens on road safety, the road traffic death keep increasing over the year. This statistic shows that the level of awareness among children is still inconclusive. A statistic prepared by MIROS showed the increasing in road traffic death is more obvious by the rate of per 100,000 populations of age-specific group (Figure 2). For the age group 0-4 years old, it shows a tremendous increase in fatality starting from 2.7 per 100,000 populations in year 2004 to 4.2 per 100,000 populations in year 2009. For the age group 5-9 and 10-14 years old, the fatality rate per 100,000 fluctuates from year 2004 to 2006 and decline from 2007 to 2008. However in 2009, the rate showed increase in number to 3.9 and 5.8 per 100, 000 respectively.
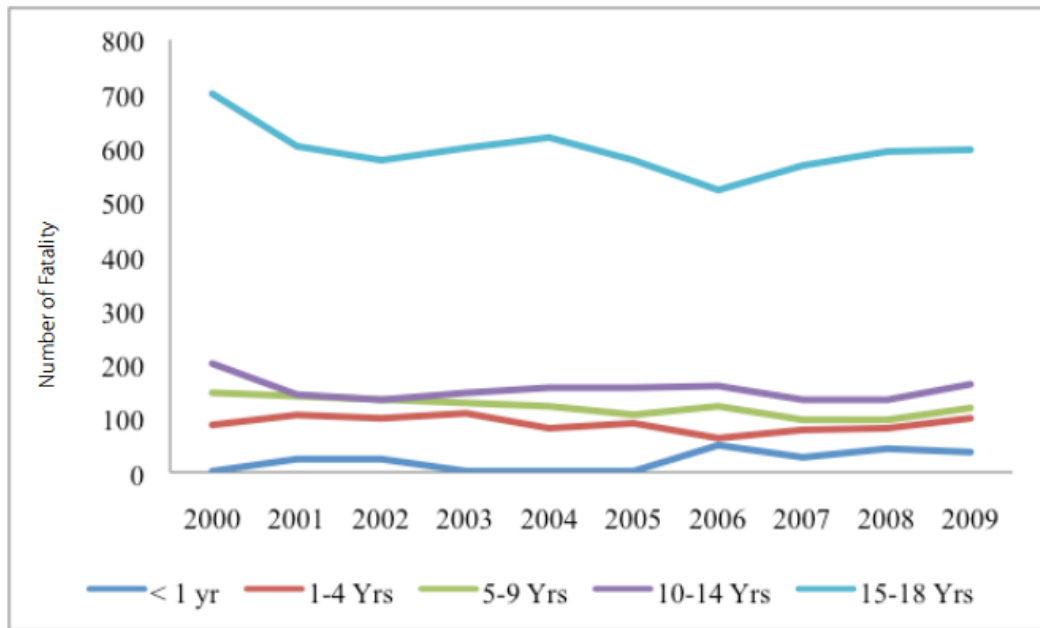
Figure 1: Number of fatalities by age group of children, 2009-2009

Source: MIROS (2011)
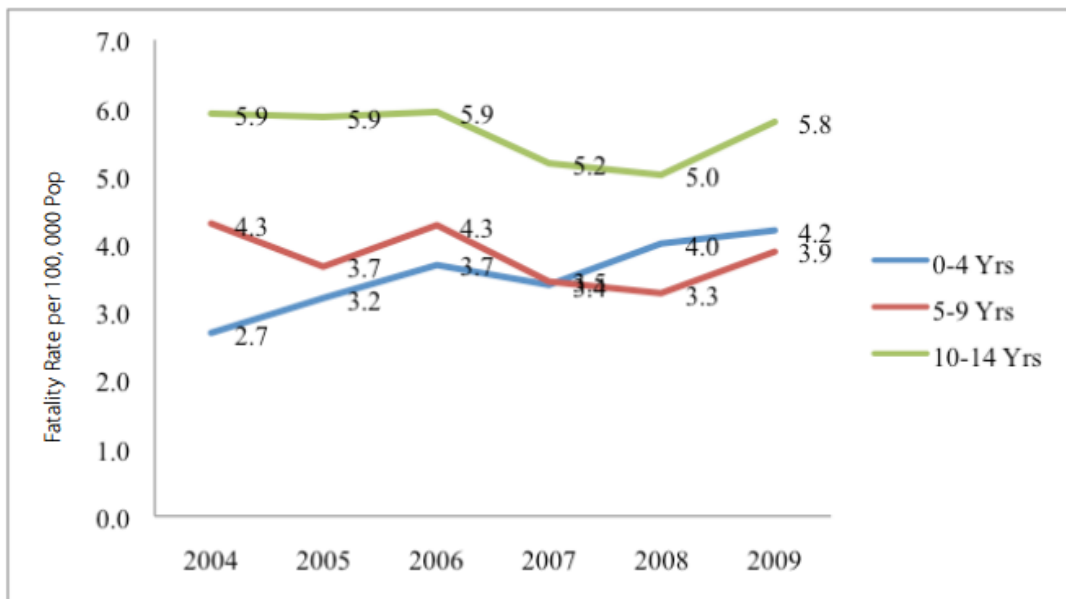
Figure 2: Fatality rate among children in 2004-2009

Source: MIROS (2011)

A report prepared by MIROS(2012) stated, a forecast on Malaysian road fatalities based on ARIMA model showed there will be increasing up to 8,760 for year 2015 and 10,716 for year 2020. In order to come out with this prediction, a few things need to be taken into account such as previous observation and the past errors to observe patterns.
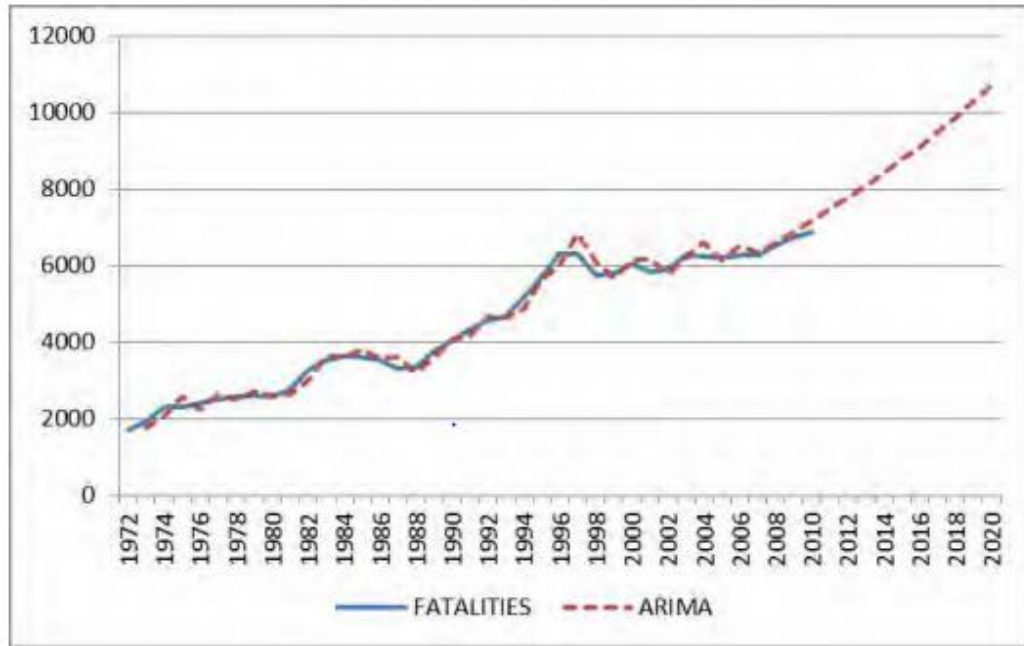
Figure 3: Fatality forecast for Malaysia

Source: MIROS (2012)

2.2 Injuries among Children

A study done by Abdul Rahman, Mohd Zulkifli, Law & Subramaniam (2005) showed that injuries happen due to road traffic accidents has been recorded as third rank which cause for admission and fifth as the reason for death. Road traffic accident has turned into one of the reason for injury and death among Malaysian children and adolescents. Abdul Rahman et al (2005) mentioned the highest injuries occurred during accident was among Malaysia citizens age 10-19 years old based on national study in 1996. That is a great lost in potential great year of future leaders among children group. Malaysian Government is looking serious into this current situation and taking as their primary concern to overcome it.

Mock, Quansah, Krishnan, Risa, & Rivara (2004) are in agreement as they has expressed concession to the injury or death in car accident is one of the main cause occur among children and adolescent in almost every country. Mock et al (2004) has suggested some actions that can be made to prevent any injury occurred by road traffic accident. They are roadway engineering techniques – what most effective design features for different kind of traffic environments, speed control- which law

enforcement are most effective; and change people's behaviour on road to a better one. Behaviour and attitude of Malaysian's road users can be change through road safety campaign and education. Thus, to change people behaviour towards betterment, right steps need to be taken.

2.3 Program Pendidikan Keselamatan Jalan Raya (PKJR)

Malaysian Government is aware of the current road traffic injuries trend. They have come out with action plan called 'Pelan Keselamatan Jalan Raya Malaysia 2006-2010' which had outline 9 strategies of road safety to overcome the problem. Education is one of the strategies besides enforcement, engineering and environmental issue. Road safety education should begin with the young in school. In the Road Safety Plan, it state that, "Education is foundation, platform and catalyst that supports all programmes to bring about the desired changes in road safety behaviour, skills and attitude." To include road safety awareness in the school syllabus, the Ministry of Transport through the Road Safety Department has introduced the Road Safety Education (RSE) Programme in collaboration with the Ministry of Education. According to Ministry of Transport in their press statement, the success of the pilot project in 2007 cause Malaysian Government to fully implement RSE in all government and vernacular primary schools during the period 2008 to 2010. This programme is a long term move to reduce the high number of road accidents and deaths. The objective of this programme is to foster understanding among children and parents about the dangers and risk while on the road, and how to practice good attitude as pedestrians and road users.

The RSE is embedded in Bahasa Malaysia curriculum. This programme is implemented through the absorption of road safety knowledge in the Bahasa Malaysia subject one time a week. The content of the syllabus of primary school road safety education is set which focus on the learning outcomes that should be practiced by students. These learning outcomes are based on knowledge and understanding, skills, practices, and attitudes and values. The result of this study based on the concept of "Cermat, Tiba Selamat" and the four main themes. The themes are attitude and responsibility, environment, identify dangers and cross safely. In "Pelan

Keselamatan Jalan Raya Malaysia 2014-2020", there is continuation of RSE programme to secondary school which will focus on Form 1 to Form 3 students. The Government is very committed to this RSE programme as it brings benefit in shaping the minds of Malaysian younger generation to create a first world road safety mindset within our society. In 2010, a study done by Universiti Putra Malaysia (UPM) showed that "the first batch of students who participated in the RSE programmes had better awareness of road safety, understands the law and recognises signs on and around the road."

According to Pietro G. D. (2009), RSE will not be effective if the aim is to reduce death and injury among children. In setting up the objectives of the road safety education or any awareness program, it should not be too ambitious. The most important thing is how to deliver the appropriate education and make it well understood by the people.

Pietro G. D. (2009) mentioned some challenges in conducting RSE. They are:

1. What if a child answers wrongly? Is it showing the failure of the program?
2. What if they have same question with the activity book learn in class, how to evaluate their understanding?
3. If there is absence during the session, what will happen?

The evaluation of RSE should take these three evaluation studies into consideration according to Pietro G. D. (2009):

1. RSE Knowledge
2. Practice Observation
3. Health Outcomes

In this project, the result will be positive if each child able to deliver their understanding through the game. For negative result, there might be some problems need to be identified and taken as recommendation for future program.

2.4 Existing Road Safety Mobile/ Online Game

2.4.1 Playing it Safe: Road Safety

Playing it Safe: Road Safety offers a fun way of learning how to stay safe on the roads for children 3-11 years old via its mini-games. The app offers two languages, English or Welsh. The game is educating the user about:

1. Choose right clothes and accessories to stay safe on the road. Children have the choice to dress character they choose in the right clothes and equipment for different activities
2. Choose the right place and time to cross the road.
3. Beat the lights. In this game, it will test children on traffic light sequence where they need to choose which light is next and see how quickly they can get through 10.
4. Road safety quiz. The character will challenge the children to test their knowledge and they will be given a minute to answer the questions.
5. Tips and advice for parents.

This app allows the children to change character at any time form the main menu. There are 6 appealing and colourful character. This give freedom to children to choose character that helps to keep their interest throughout the game. Children will have their own trophy shelf where they collect trophies from games they are played. This app will record high score of each game and children may try to beat it next time.
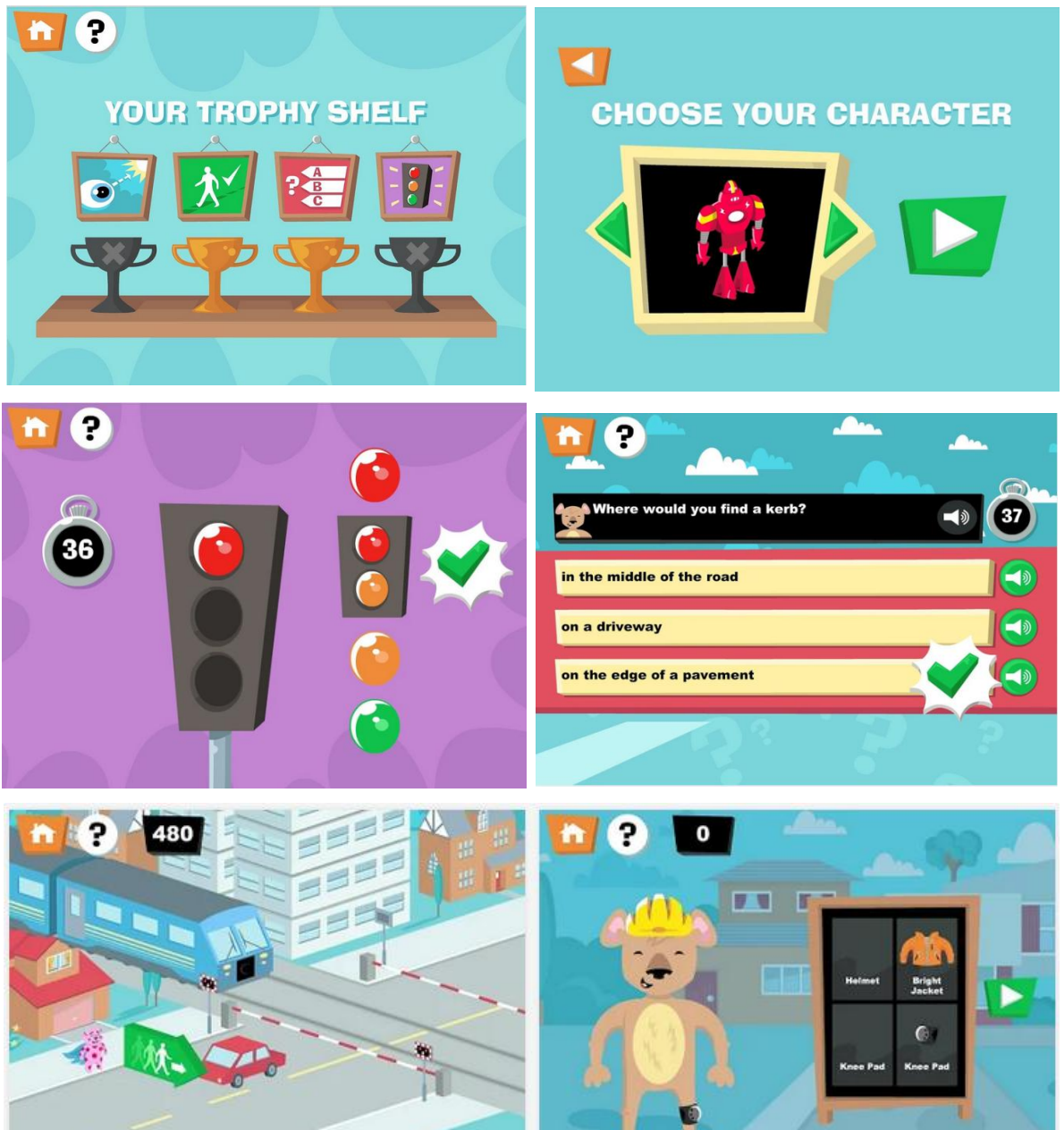
Figure 4: Interfaces of Playing it Safe: Road Safety application

Source:https://play.google.com/store/apps/details?id=air.co.uk.desq.swwitch&hl=en

There are good reviews from users regarding this application. Leanne Duffield said that, "Lovely little games and characters. Great games for kids with really cute characters." A user, Sophie Adams suggested this mobile game to his friend, Brill as it will help his kids be really good drivers.

2.4.2 Ruben Road Safety Game

Ruben Road Safety Game is an application that promotes messages by Ruben on street wellbeing mainly for children 3-7 years old. There are four Ruben's messages, which are:

1. Be bright Dress Bright
2. Seat Yourself Right, Buckle in Tight
3. Stop, Look, Listen and Link
4. Helmet on Right and Tight

Figure 5: Interfaces of Ruben Road Safety Game application

Source:
https://play.google.com/store/apps/details?id=com.apps.rubenroadsafetygame.menu&hl=en

A review made by Wayne Borst, he said that "My kids love ruben. Anything that teaches my kids about road safety gets 5 stars from me. Thanks guys." Another comment by Lulu Jennings, she said "Cool. It is so cool."

2.4.3 3M Streetwise

3M Streetwise, a site which introduce the interactive learning on road safety education which targeted the primary school pupils as it users. This online resource is from United Kingdom (UK) and the content was written by teachers together with the assistance from the Department for Transport and Brake, the road safety charity. Due to a fact that road accidents one of the main cause of accidental death among young children, 3M decided to make its community programme focus more to child road safety.

Figure 6: 3M Streetwise Website

Source: http://www.3m.co.uk/intl/uk/3mstreetwise/pupils-streetwise-game.htm

2.5 Mobile Game-Based Learning for Children

During these days, it is common to see young children use tablets or smart phone to play games. This scenario had raises a question regarding the most effective ways to deliver contents to these children. Mobile education game will bring benefit to the children if they can learn while playing game. A report by John K. & Angela M. (2004) mentioned that almost 68% of children playing games on their phone every week thus become the most frequently used interactive media among children. By having educational mobile game, it can help young children to escalate the learning process in this digital era.

2.5.1 Advantages of Mobile Game-based learning for children

- Utilizing "dead time"
  According to Boyes M. (2011), mobile learning can happen during "dead time"- a time in which productivity level of someone or something is very low. User can access the mobile apps anytime and anywhere from the smart phone while waiting for meal to ready or travelling. User can make full use of the "dead time" by doing things that bring benefit to them.

- Ability on decision making
  John K. & Angela M. (2004) said games can support the development of logical thinking and problem solving skills among young children as games often required a trial-and-error approach to finish challenges. Children will use their thinking abilities when doing some reasoning for the solution needed for particular games. An education game is the effective tools for teaching as they use action instead of explanation, according to Kebritichi M. & Hirumi A. (2008). By having this interactive way of learning, children are able to understand more.

CHAPTER 3

METHODOLOGY

3.1 System Architecture
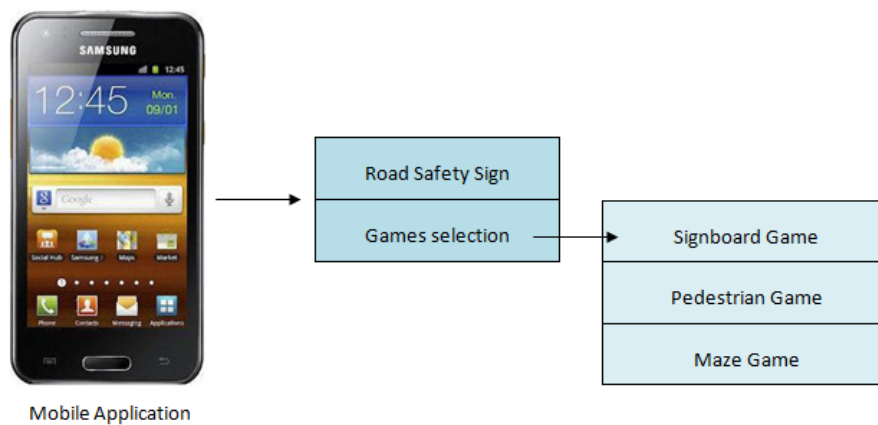
Figure 7: System Architecture

The system architecture for this game-based mobile application is shown in Figure 7. From the figure, the students start the communication with the system by accessing the mobile learning application through Android mobile devices. Each of the students has to go through home page before proceeding to the individual game such as signboard, pedestrian and maze game.

3.2 Project Methodology

For this project, agile methodology will be used in the mobile development. In agile, the developer can revisit the complete Software Development Life Cycle (SDLC) as a result of providing iterative incremental work that is shippable at end of every iterative work. Agile methodology adapt to changes, designed to cope and adapt to new ideas from the outset. In addition, it able to identify deviations early besides saves cost, time and efforts by following iterative incremental work delivery.

Figure 8: Agile Methodology

3.2.1 Project Initiation

First phase for this methodology is the project initiation. During this phase, the requirements of the project is discussed and documented. The functionality will be listed out and make sure it is clear on how the application will perform. The functionality must align with the project objectives. Besides, the target user and scope for this mobile application is defined and analysed during this phase.

Categories	Requirements
Mobile Application	• The application supported by Android. • Game consist no bugs or error.
Design	• The picture and language use suit the children of age 7-12 years old. • Games are interactive and easy to understand. • Games should be able to solve by target users.

Table 1: Project Requirements

3.2.2 Project Planning

Second phase is project planning. During this phase, the estimated time for the project, tools required to accomplish this project was defined.

3.2.2.1 Time estimation

This project is estimate to be completed in August 2015.

3.2.2.2 Tools required

- Personal computer with Windows platform
- Android Studio to develop the mobile application
- Smartphone with Android OS

3.2.3 Project Design

The next phase for this project is to come out with the design for the game-based mobile application. This is important phase because the development of prototype

must follow the requirements. This project will be using story board to show the flow of the games. Other important elements to be selected during this phase are suitable character, background music and sound effect for the game that suit target users.

3.2.4 Project Development
The fourth phase is to start developing the mobile application. First thing to do is creating UI of the game followed by coding of the game.

3.2.5 Project Deployment
To evaluate the prototype, it can be tested with the potential users to measure the functionality and the capability of the prototype. If the prototype is working well and fulfil the requirements, then the mobile application will be released.

3.2.6 Project Closing
The closing phase will be done in August 2015 after all discussions and findings are documented. All the documentation will be compiled and submit as in dissertation.

3.3 Interview

An interview session was arranged with school teachers and parents to get more information on how the learning process on road safety goes in the school and feedback on development of mobile application on road safety. By conducting this session with the expert, it helps to deliver this project successfully.

1st Respondent

Name: Aminah bt Jaafar

Title: Senior Assistant of Student Affairs

School's name: SK Dalam Wang, 09100 Baling, Kedah Darul Aman.

According to the interview, Ms Aminah said it has been 2 years the school not received the PKJR exercise book because there is no command from ministry. From previous experiences, students will do the exercises book once a week during Bahasa Melayu subject. Sometimes the teachers bring students to school field to do practical

on road safety based on PKJR syllabus. From her point of view, it is good to have mobile application to test school children understanding on road safety. She mentioned that the instruction for each game must be straight forward and easy for school children to understand.

<u>2nd Respondent</u>

Name: Salmah bt Yacob

Title: English Teacher

School's name: SK Jelapang, Taman Meru, 30020 Ipoh, Perak Darul Redzuan.

From the interview, Madam Salmah said the school's headmaster really stress out about road safety during school's assembly. School children needs to be reminded about safety because most of them are unaware of danger on road. Teachers will include the practical of road safety during 'Pendidikan Kesihatan' subject. Madam Salmah said mobile application on road safety is a good idea because it can help improve the learning process among school children. Student will be more interested to learn about road safety via mobile apps compared to only doing exercise in the book. In this proposed application there is part where student need to identify signboards available on the road and Madam Salmah suggested using a simple signboard where student can easily identify them.

<u>3rd Respondent</u>

Name: Leiza bt Zainol

Spouse: Mydicasmy b Mahiyudin

Children: Aiman Hamzah b Mydicasmy (12 years old)

Address: No. 64, Lorong Saderi 1/3, Taman Saderi, Lunas, 09600 Kulim, Kedah

Darul Aman.

Madam Leiza and her husband do aware about the PKJR syllabus being implemented in the school. She said, this syllabus has a good impact on her son. The awareness about road safety of her son has improved since this syllabus was introduced. Sometimes Madam Leiza guided her son to complete the exercise in the book. She agrees with the idea to have a mobile application to educate school children on road safety. Her son likes to spend hours to play games on his tablet. Most of the games he regularly played are Fruit Ninja, Subway Surfer and car racing which do not give much value to him. The games only provide entertainment and enjoyment to him but do not help to broaden his knowledge.

3.4 Gantt Chart

No	Project Activities	Week													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	**Project Initiation**														
	Preliminary research for project title	▓	▓												
	Identify problems and propose solution	▓	▓												
	Identify objective and scope of study	▓	▓												
	Submission of project title proposal			▓											
2	**Project Analysis**														
	Research on the preceeding studies				▓	▓	▓								
3	**Project Planning**														
	Selecting the tool to be used						▓	▓							
	Selecting the programming language to be used						▓	▓							
	Define methodology approach for the project							▓	▓						
4	**Project Design**														
	Prepare storyboard for the game								▓						
	Design the application architecture								▓						
	Design the interface								▓	▓	▓				

5	**Submission of Interim Report**												🟧				
6	**Preparation for Proposal Defence**													🟦			
7	**Proposal Defence**														🟧		

Activities	🟦
Milestone	🟧

Figure 9: FYP I Gantt Chart

No	Project Activities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	**Progress Report**															
	Draft progress report	■	■													
	Review progress report		■	■												
	Submission of progress report			▧												
2	**Project Development Phase 2**															
	Coding and testing				■	■	■	■	■	■	■	■	■	■		
	User Acceptance Testing (UAT)								■	■						
3	**Pre-SEDEX**									▧						
4	**Submission of Technical Report**										▧					
5	**Update Research Paper**															
	Consolidation of research paper									■	■	■				

6	**Submission of Draft Dissertation**																	🟧					
7	**Viva**																			🟧			
8	**Submission of Final Dissertation**																						🟧

Activities	🟦
Milestone	🟧

Figure 10: FYP II Gantt Chart

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Road Safety Education Game

Figure 11: Home Screen

This section discuss on the overview of the prototype for road safety game. The language used for this application is in Bahasa Melayu since PKJR is embedded into Bahasa Melayu subject in school. The mobile application homepage contains a button which is "mula"/start.

Figure 12: Game Selection Screen

In this mobile application, there are three chosen games for the development of the mobile learning application shown as below.

- **Game 1: Signboard –** For this game, student need to match signboards with the correct meaning.
- **Game 2: Pedestrian –** This game requires student to arrange the alphabet to form a correct word that describing the picture.
- **Game 3: Maze** – Student need to find a way to go to finish line and along the way student need to answer few questions related to road safety.

Each of games is following the guideline and syllabus from the PKJR.

Figure 13: Signboard Game Screen

For the first game, the concept is drag and drop. Student needs to drag the signboard and match it with correct meaning. A temporary message will appear to show whether student has answer it correctly or not. This game is basically for children to understand the signboards which is some abstract on the road.

Figure 14: Pedestrian Game I

Figure 15: Pedestrian Game II

Figure 16: Pedestrian Game III

Figure 17: Pedestrian Game IV

For the second game, student needs to analyze 4 pictures and identify what it is. Student has to fill up the box with correct alphabet to form a correct word that describing the picture. This game enables the student to understand on correct way for walking and crossing the road.
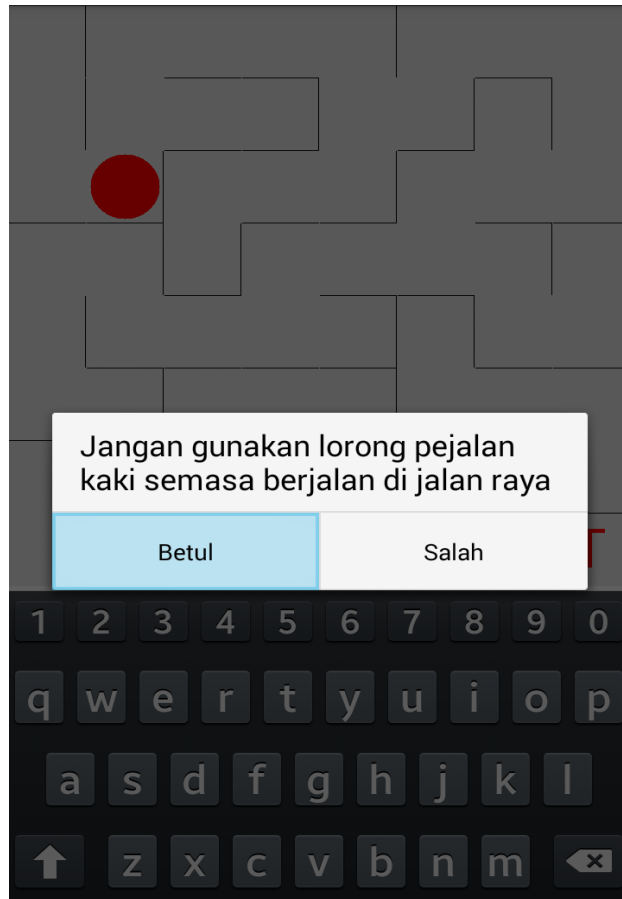
Figure 18: Maze Game

Another game available on this application is maze game. Student needs to move the ball to finish point and along the way there will be 4 questions for student to answer. There will be two options of answer for student either right or wrong. They need to identify the correct answer. To move the ball, student needs to use WASD keys; W-up, A-left, S-down and D-right. This game will add some excitement in this application.

4.2 System Evaluation

There are two types of testing that has been done throughout the project that are system and user acceptance testing.

4.2.1 System Testing

System testing is done after the integration of the all scenes which are the home page, menus and game scene. The testing has been done to check for the functionality of each component. The results of the system testing are tabulated in table below:

| Testing/Result	Pass	Fail	Remarks
Menu buttons functions correctly	/		
Buttons link to other screen	/		
Game Scene:			
Appear correctly	/		
Answer checking	/		
Game sound	/		
Game Content:			
Following PKJR syllabus	/		
Easily understood	/		
Game language	/		

Table 2: System Testing Result

4.2.2 User Acceptance Testing (UAT)

The system had been tested with school children when the system was almost completed. The system is tested by 10 students under my instructions. Students aged between 7-12 years old was selected as the novice users for this user testing. The testing is to introduce the students with the road safety mobile application and also to measure the effectiveness of the interactive learning which is the road safety game.
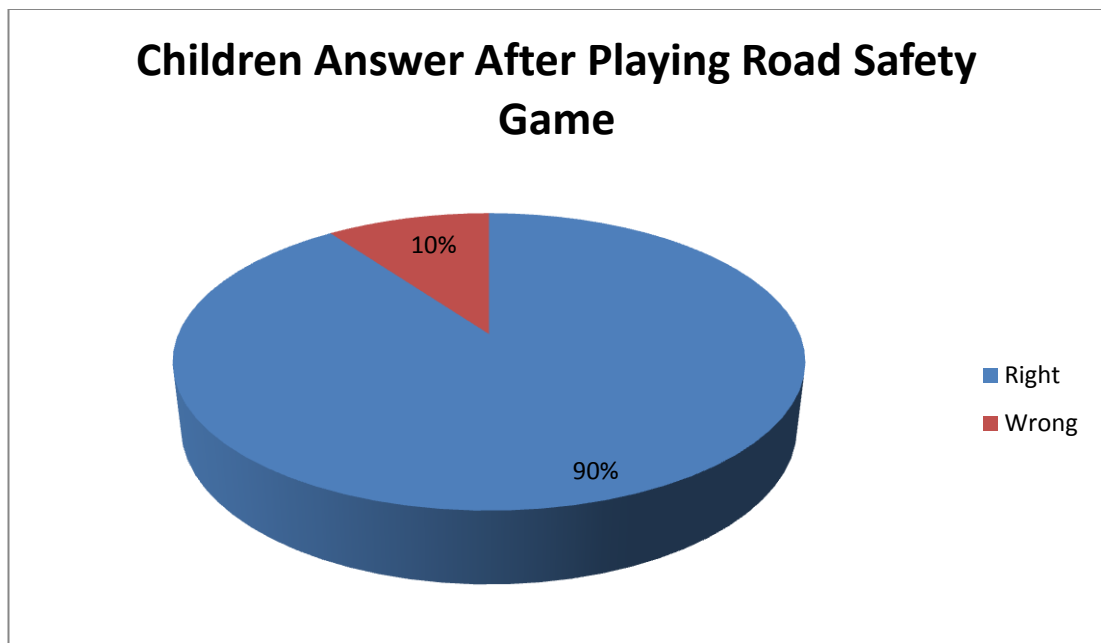
Figure 19: Children's Score

The students' answer has been recorded after they play the game. Right answer indicated that children successfully enjoy their interactive learning. They learnt and understand based on the syllabus of PKJR while playing games. Only one student aged 7 years old which contributed 10% of 10 children not able to answer correctly because she is not familiar with the signboard available in the game.
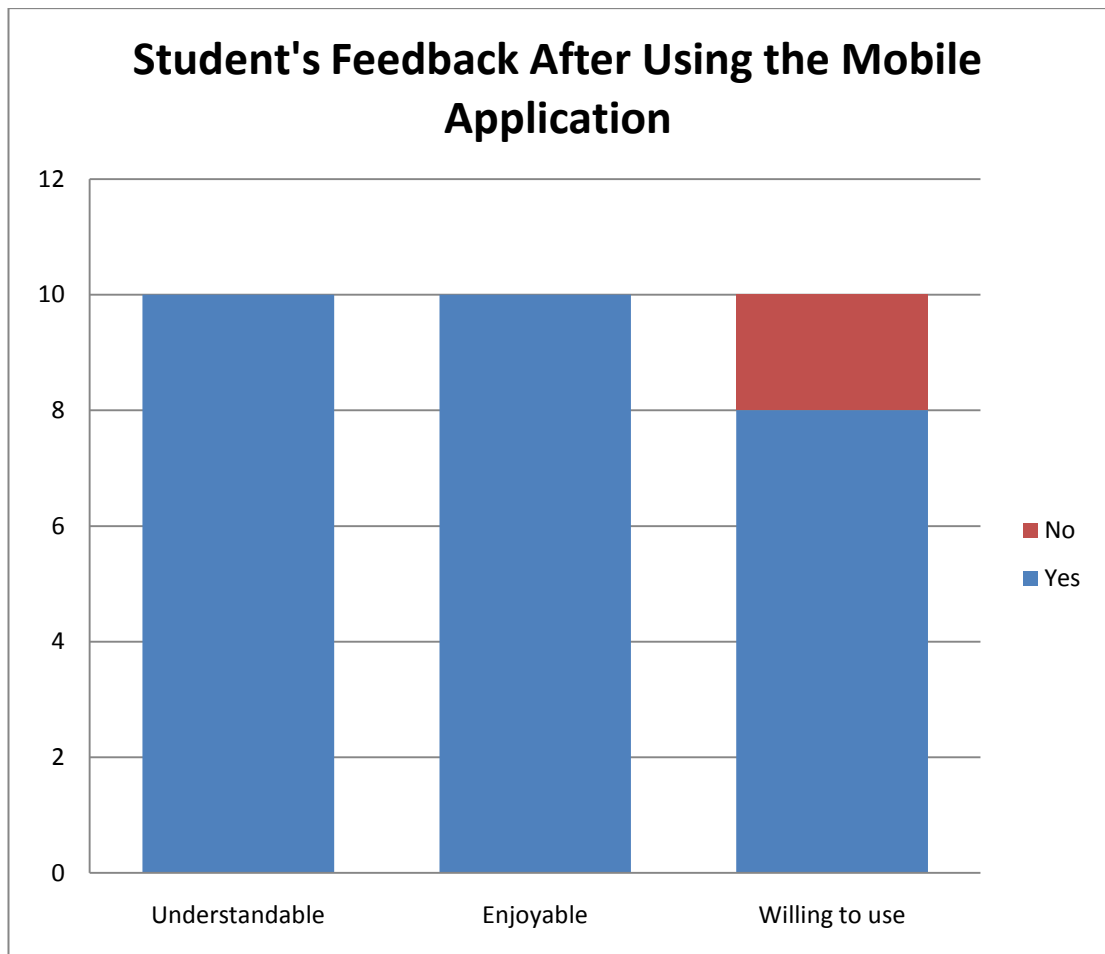
Figure 20: Students' Feedback Result

The bar chart in Figure 6 shows the result of the user acceptance testing. All of the school children agreed that the content of the interactive learning is understandable and comprehensive for them. They enjoyed play with the game and learn something from it. They are familiar with the games because they had learned it in class and the application is an additional tool for the students to learn and improve their performance in learning about road safety. Most of them hope that more interactive games will support their learning process, but some of the children prefer to learn from their teacher. Most of the students also want to try the application again if it is available in the future as additional learning tool to learn about road safety. However, there is a limitation for those who do not have smart phone and their parents not allowed them to use smart phone at their age.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

With the alarming number of road accidents involving children, having a foundation understandings on road safety is important. Learning about the road safety itself at the young age is very crucial for children. Thus, Stay Safe Mobile Application is seen to be a tool to educate young children about road safety and they can practice the good attitude of road users. Moreover, with this new approach of learning, learners may increase their interest of learning about road safety in the effective learning environment by using mobile application as additional learning tools.

The game should be aligned with the syllabus of PKJR to make sure that the learning objective of PKJR can be obtained through this initiative. The technical area for this project mainly focuses on the games that developed using Android Studio. By having satisfied of the overall requirement, this project has been successfully delivered and tested on the effectiveness of interactive learning towards the primary school children. Besides, it is showing a positive result, this method of learning can be implemented to the PKJR syllabus in the future.

The development of Stay Safe Mobile Application could be enhanced in the future in order to add its capability to be preferred learning environment for primary schools. More research on road safety interactive game should be done. Future work for this project is to have more games for each level that would test and educate young children on road safety. By having more games, it will help to cover all syllabus in PKJR. This will definitely enhance the games to be more interactive and complex in terms of learning about road safety.

REFERENCES

Norlen M., Wong, S.V, Hizal Hanis H, Ilhamah (2011), An Overview of Road Traffic Injuries Among Children in Malaysia and Its Implication on Road Traffic Injury Prevention Strategy, MRR 03/ 2011, Kuala Lumpur: Malaysian Institute of Road Safety Research.

Norizam, A.M. (2012, November 5). *10,602 murid terlibat nahas jalan raya.* Retrieved from http://ww1.utusan.com.my/utusan/Pendidikan/20121105/pe_08/10602-murid-terlibat-nahas-jalan-raya

Mohd Nasir, M. N. Fitri (2014). Children Road Safety Education via Web. Universiti Teknologi PETRONAS.

WHO (2008). World report on child injury prevention. Retrieved February 15, 2015, from www.unicef.org/eapro/World_report.pdf.

Rohayu S, Sharifah Allyana S.M.R, Jamilah M.M & Wong S.V. (2012), Predicting Malaysian Road Fatalities for Year 2020, MRR 06/2012, Kuala Lumpur: Malaysian Institute of Road Safety Research.

Ministry of Transport. 16 Feb 2015 <http://www.mot.gov.my/Newsroom/Press%20Release/Road%20Safety%20Education%20in%20Schools.pdf>

Kementerian Pengangkutan Malaysia. (2006). *Kandungan Kemahiran Pendidikan Keselamatan Jalan Raya.*

Jabatan Keselamatan Jalan Raya (2006), Pelan Keselamatan Jalan Raya Malaysia 2006-2010, Putrajaya: Kementerian Pengangkutan Malaysia.

Jabatan Keselamatan Jalan Raya (2014), Pelan Keselamatan Jalan Raya Malaysia 2014-2020, Putrajaya: Kementerian Pengangkutan Malaysia.

Pietro, G.D. (2009, September 16). Road Safety Education in Schools. Can we measure its success? 4th IRTAD Conference (pp.418-425). Seoul, Korea: GRSP Malaysia.

DESQ Limited. 21 Feb 2015
<https://play.google.com/store/apps/details?id=air.co.uk.desq.swwitch&hl=en>

Waikato Regional Council. 21 Feb 2015
<https://play.google.com/store/apps/details?id=com.apps.rubenroadsafetygame.menu&hl=en>

3M Streetwise. 21 Feb 2015 <http://www.3m.co.uk/intl/uk/3mstreetwise/pupils-streetwise-game.htm>

Boyes, M. (2011, December 17). 24 benefits of mobile learning, by Marcus Boyes. Retrieved February 23, 2015, from http://insights.elearningnetwork.org/?p=507

Abdul Rahman, H., Mohd Zulkifli, N., Law, T. H., & Subramaniam, K. (2005). Car Occupants Accidents and Injuries Among Adolescent in A State in Malaysia. *Proceedings of the Eastern Asia Soceity for Transportation Studies,* Vol. 5, pp. 1867-1874.

Mock, C., Quansah, R., Krischnan, R., Risa, C. A., & Rivara, F. (2004, June 26). Strengthening The Prevention and Care of Injuries Worldwide. *The Lancet,* Vol. 363, pp. 2172-2179.

John, K., and Angela M. Literature Review in Games and Learning. A NESTA Futurelab Research report - report 8. 2004. <hal-00190453>

Mridula, V. (2012, February 9). 10 Advantages of Agile SDLC. Retrieved March 10, 2015, from http://blog.bootstraptoday.com/2012/02/09/10-advantages-of-agile-sdlc/.

Aminah, J. Senior Assistant of Student Affairs. SK Dalam Wang,Kedah. Personal Interview. March 14, 2015,

Salmah, Y. Teacher. SK Jelapang, Perak. Personal Interview. March 15, 2015.

Leiza, Z. Parents. Kulim, Kedah. Personal Interview. March 14, 2015.

Ahmad Nor, B. and Mohamad, R.(2014). *Cermat Tiba Selamat,* (5), Kuala Lumpur, Dewan Bahasa dan Pustaka.

APPENDICES

APPENDIX 1 QUESTIONNAIRE FOR INTERVIEW

<u>Questionnaire</u>

Name:

Position:

1) How PKJR being conducted in school? Is there any practical on road safety being carried out?
2) Do you find this syllabus relevant in today's situation?
3) Is it good to have game-based mobile application on road safety?
4) What features to be added in this application?

APPENDIX 2 PKJR EXERCISE BOOKS

APPENDIX 3 RESPONDENTS

Respondent 1

Respondent 3

Respondent 2

APPENDIX 4 UAT SESSION

Children Feedback Form

Question	S1		S2		S3		S4		S5		S6		S7		S8		S9		S10	
	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Do you learn something from the interactive game?	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	
Do the road safety game are interesting?	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	
Do you want this interactive game to support the learning of PKJR?	✓		✓		✓			✓	✓		✓			✓	✓		✓		✓	

APPENDIX 6 MOBILE APPLCATION DEVELOPMENTS (SCREENSHOTS)