

**SERIOUS GAME IN LEARNING ENGLISH  
( GRAMMAR RACE )**

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**Bachelor of Computer Science (Graphics &  
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SERIOUS GAME IN LEARNING ENGLISH  
( GRAMMAR RACE )

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for the award of the degree of  
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## ABSTRAK

Bahasa Inggeris diajar sebagai Bahasa kedua di sekolah rendah dan menengah di Malaysia. Objektif utama kurikulum Bahasa Inggeris di sekolah adalah untuk membantu pelajar mendalami Bahasa itu supaya mereka boleh menggunakannya dalam kehidupan seharian yang mana untuk melanjutkan pelajaran atau pekerjaan nanti. Beberapa masalah telah timbul dimana terdapat pelajar yang sangat lemah dalam mata pelajaran Bahasa Inggeris disebabkan suasana pembelajaran di dalam kelas yang bosan dan tidak menarik. Selain itu, kebanyakan makmal computer di sekolah tidak digunakan untuk proses pembelajaran disebabkan kurangnya bahan-bahan pengajaran digital. Oleh itu, satu penyelesaian dicadangkan iaitu dengan mencipta satu serious game untuk belajar Bahasa Inggeris dengan cara interaktif dan menyeronokkan. Kandungan Serious game ini lebih menumpukan kepada topik tatabahasa yang mana empat tajuk kecil di dalamnya ialah kata nama am, kata nama khas, dan penjodoh bilangan. Game ini terbahagi kepada tiga level iaitu, easy, medium and hard yang mana pemain perlu menggerakkan kereta untuk memilih jawapan yang betul berdasarkan soalan-soalan yang diberi. Markah akan diberi untuk setiap jawapan yang betul dan masa akan dikira sehingga berakhirnya game itu. Panduan dan nota diberi bertujuan untuk membantu pemain disamping memberi pengetahuan kepada mereka. Target aplikasi game ini adalah untuk pelajar sekolah rendah yang berumur 9-12 tahun yang mana mereka belajar Bahasa Inggeris pada tahun 3-6. Aplikasi game ini dibina menggunakan Unity dan Microsoft Visual Studio dengan kod C# untuk platform computer. Functional test telah dijalankan untuk serious game ini dimana 64 test kes dijalankan untuk menguji fungsinya dimana 100% berjaya. Satu tinjauan telah dijalankan untuk mengesahkan penerimaan pengguna dalam menggunakan serious game dalam belajar Bahasa inggeris untuk guru, ibu bapa dan pelajar dimana kedua-dua guru dan ibu bapa 94% memberikan jawapan yg positif. Untuk pelajar pula, 75% bersetuju bahawa serious game itu menarik dan menyeronokkan digunakan untuk belajar. Oleh itu, hasil kajian ini menunjukkan bahawa serious game dapat membantu pelajar untuk belajar Bahasa Inggeris secara interaktif dan menjanjikan masa depan yang baik dalam pembelajaran.



## **ABSTRACT**

In primary and secondary schools in the Malaysia, English is taught as a second language. The main objective of the English language curriculum for schools is to help students acquire the language so that they can use it in their everyday life, to further their studies, and for work purposes. The issues arise when there are students who are very weak at absorbing and learning English due to the boring and uninterested learning environment in the class. Furthermore, mostly computer labs in the school did not used for learning session because of the lack off the digitals materials. Thus, this project propose a solution to implement a serious game in order to help students to learn English language in most interactive and fun way. This serious game focus on the Grammar topics that are Common Nouns, Proper Nouns, Countable Nouns and Uncountable Nouns. This game consist of easy, medium and hard level for each topic modules which required player to move the car forward to collect answers based on the questions given. The marks will be given for every correct answer and time will be counted until they finish the game. The notes and guideline are given in order to help and give information for player. The targeted user is the primary school students in age 9-12 years old which are they learn English language syllabus in year 3-6. The game application is the web-based platform that developed using Unity and Microsoft Visual Studio with C# programming language for scripting code. Functional test was carried out for this serious game where 64 test cases were executed in order to test its functionality, which resulted 100% successfully. A survey was carried out to validate the user acceptance test of serious game in learning English for teachers, parents and students where both teachers and parents 94% positive with the game application. For students, 75% they agreed that the serious game is fun and interesting for them to learn English. Hence, the findings of this study indicate that the serious game can help students to learn English in interactive ways and have a promising future in teaching English for primary school students.

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## LIST OF ABBREVIATIONS

ICT	Information and Communications Technology
IR	Industrial Revolution
KSSR	Kurikulum Standard Sekolah Rendah
GUI	Graphical User Interface
C	Countable nouns
UC	Uncountable nouns
UAT	User Acceptance Test
2D	2 dimensional
3D	3 dimensional
HDD	Hard disk drive
MAC	Macintosh
OS	Operating System
PC	Personal Computer
PSM1	Projek Sarjana Muda 1
PSM2	Projek Sarjana Muda 2
UI	User Interface



## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

This chapter, the background of study will be presented, followed by the problem statement, the objective, the scope of the project and the thesis of organization. The project background presented the main ideas of the thesis. All related information on the study are presented.

#### **1.2 Background of Study**

In primary and secondary schools in the Malaysia, English is taught as a second language. The main objective of the English language curriculum for schools is to help students acquire the language so that they can use it in their everyday life, to further their studies, and for work purposes. English is important, as with globalization, Malaysians will need to be proficient in the language and to communicate with people in other countries. The use of English in Information and Communications Technology (ICT) has also been integrated into the curriculum to enable students to gain knowledge on the Internet and to network with people both locally and abroad.(Kementerian Pendidikan Malaysia, 2004)

Essentially, a classroom ought to be an energizing spot for learning, a place where students come and spend their time and where teachers plan lessons that will inspire their students. The test scores and other types of data dwell on much of the fun and games in the classroom may be extirpate as a result. Is teaching with games, either computer games or a more traditional style like riddles, just fun and games? Can students learn at the same

time? More importantly, is it preferable to teach with games because students will be more preoccupied and therefore retain more of the material.

Besides that, children at the age of primary schools like to play than learning especially in learning English language. Indeed, even children growing up rapidly in process learning something new, they learn information quickly too. A child who is unweildy to different dialects at a young age has a lot less demanding time processing and remembering the information they receive. However, what do we have to do in attracting them to learn the secondary language? The key to this new approach is that most children need flourish in competitive environments. Moreover, they need more movement or kinaesthetic learning and that more social interaction helps many children learn. (Carlson & Stamm, 2015)

The capability of serious game that use pedagogy to implant instruction into the game play experience is applicable, because a large and growing society is adapted with playing games that can present users with realistic and imperative challenges, tremendously stimulating their information processing capabilities and capturing their concentration span for long duration. (Bellotti, Berta, & De Gloria, 2010). One of the advantages is the serious game can create interest towards the subject matter, especially in subjects that student struggle with. The good serious game test the players' sense riveting situations, providing concrete, compelling contexts where the player gets concretely involved (Bellotti et al., 2010). Moreover, most gamification systems provide a quick feedback such as leader boards or scoreboards that students can view their performances where they stand among their companion. As a result, it can motivate student to try the quiz or activity again to get a great marks and gives encouragement for further lesson engagement.

### **1.3 Problem Statement**

The issue of starting to teach foreign languages in the formal education is rather complex and besides highlighting the positive aspects of early start, several problematic areas have to be mentioned as well (Yao Sua & Raman, 2007) . Ellie state in the paper, that the second language is define as the way in which people learn a language other than their mother tongue, either outside or inside the school. (Ellie, 1997) Children who are

weak at absorbing or acquiring a foreign language in the best possible way are because there are some possible issues such as they have various language backgrounds. In addition, they also are not highly motivated and energetic and get easily frustrated if they were corrected immediately (Hashemi & Azizinezhad, 2011). There are also students who love to work alone and hate being in a group work make it hard for teacher to approach them.

Currently in education when a person mentions games, he or she is usually referring to video games. Many classrooms tend to have few computers, not enough for an entire class of students to use computers at once. Besides that, the projector is not provided because the term of cost and the space in the classroom. Many thought-provoking and problem-solving types' of computer games are time consuming and cannot be easily fit into the already full school day. However, many district computer servers block any site that has the word 'game' in it, so students cannot even log on to these at school.(Carlson & Stamm, 2015) Because of this problem, they going through the learning with some traditional games like Word List or Bingo that required materials such as stationeries, papers and books. Therefore, this kind of learning environment can bring up students to feel boring and uninterested in taking part because every day they are doing the same activities by reading and writing.

Developing a game is a heavy issue, especially when the pedagogical objectives where one is heading in the background of the game or what we name "serious game". (Darwesh, 2016) In our country, there is not much serious game for educational purpose especially in learning English for primary students. We know that many games has been developed from another country but it is the content suitable for primary students in Malaysia? It is the element of the games are safe for them to play or similar with the primary school English language syllabus? Whatever it is, to find the good games is very difficult.

On the other hand, we are entering the era of the Fourth Industrial Revolution 4.0 (IR 4.0), which is expected to transform the way we live, work and play (Zainon, 2018) . The mission of 2020 is to establish an educational system with excellent quality that will realize the hidden gems of the individual and fulfil the aspiration of the 'One Malaysian nation'. The Education ministry's articulation of the vision for ICT (Information and Communication Technologies) in education focuses on three major

parts, which are first, ICT provided to all students so that is used as an enabler to reduce the digital gap between schools. Secondly, ICT used in education as a teaching and learning tool, as part of a subject and as a subject by itself; and lastly ICT used to increase productivity, efficiency and effectiveness of the management system (Lubis, 2009). The problems risen up when mostly primary schools especially in city area equip with ICT infrastructure and facilities through the ICT initiative in education outlined in the Educational Strategic Planning Blueprint 2001 – 2010 but it is not used due to lack off the digital teaching materials. These are the difficulties to attain the high quality service for IT teaching-learning process in smart schools.(Paper, Masrom, Teknologi, & Incubator, 2012) Thus, serious game for learning English was proposed in order to solve the issues that arise.

#### **1.4 Goal & Objective**

The goal of this project is to develop a serious game that can help primary school students in school to learn English language in most interactive and fun way.

Objective:

- I. To study the features and characteristics of serious game application in learning English for primary schools.
- II. To design and develop a web based game application of serious game in learning English for primary schools.
- III. To validate the user acceptance on game application in learning English for primary school students.

## **1.5 Scope**

The following is the scope of the project:

- I. The game modules content of English language syllabus that is grammar topics that aiming into four subtopics, which are common nouns, proper nouns, countable nouns, and uncountable nouns.
- II. The target user of this game is the primary student in age 9-12 years old, which is, they learn the English language syllabus in Year 3-6.
- III. The game is the web-based platform that using C# programming language for scripting code.

## **1.6 Thesis Organization**

This thesis consists of three (3) chapters.

Chapter one (1) started with the introduction of the thesis. It is include the introduction, the explanation of the problem statement, the goal and objectives that need to be achieved, the scope of project and the thesis of organization.

Furthermore, in the Chapter two (2), it contains the literature review about the game application information in general. This chapter will discuss about the existing educational game in the previous study. The comparison of strength and weakness with the existing game can be used as a guideline to complete this project.

In chapter three (3), the explanation about the method, the technique or approach and the methodology will be describe briefly. This chapter include the introduction, methodology, hardware and software requirement, and Gantt chart.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter is about the study of the project generally. It deliberate the current problem or solution done by the existing game applications. This chapter explains in detail about serious game, serious game in education, review on serious game in education and the comparison between existing educational games with the proposed one.

#### **2.2 Serious Game**

Serious games often referred to as “educational games” or “edutainment”. There was a huge enthusiasm in serious games because they run interference for the learning process, by engaging the player and increasing his motivation. Eck argue that, “games are effectual not because of the developing system, but because of what they express and what students are doing as they play a game” (Eck, 006). One of the advantages of serious game are they can put knowledge and skills into practice. Moreover, this type of game can build problem-solving skills and improve user performance behaviour.

Serious games have been used in a variety of sectors including the military, health care, education, and business. In addition to game designers and developers, the development of serious game requires close cooperation with domain experts. The key issue in serious games is the relationship between the game and the content of education. The pedagogy must, however, be subordinate to story. The game design often depends on a detailed approach based on the ideas of designers and developers, as it is difficult to integrate some knowledge into the games while maintaining the fun factor in the first place.

### **2.3 Serious Game in Education**

Serious games in education refer to the use of computer games to raise awareness about educational topics and to develop new knowledge and skills by enabling students to engage and participate in situations that would otherwise be impossible to experience. (Corti 2006) In education, it can apply to many topics such as learning English, Mathematics, Science, Bahasa Melayu etc. For example, serious game in learning English as a foreign language in primary school in Denmark pay a lot of attention to the roles of games in e-learning. The project begins with the work of academics with companies to explore, develop and implement game prototypes using the products and experience of commercial game designers to develop knowledge about serious game challenges, educational design and evaluation for innovation. (Meyer, 2009)

Moreover, serious game in learning Mathematics is using b-learning that define structured learning opportunities that use more than one learning or training method, inside or outside the classroom. This definition includes different methods of learning or teaching such as reading, discussion, guided practice, games, case study, problem solving and simulation and different methods of delivery like live classroom or computer mediated. The different scheduling which are synchronous or asynchronous and different levels of guidance either it is individual, instructor or expert leader, or group. Combined approaches reflect the following factors. (Álvarez-Rodríguez, Barajas-Saavedra, & Muñoz-Arteaga, 2014)

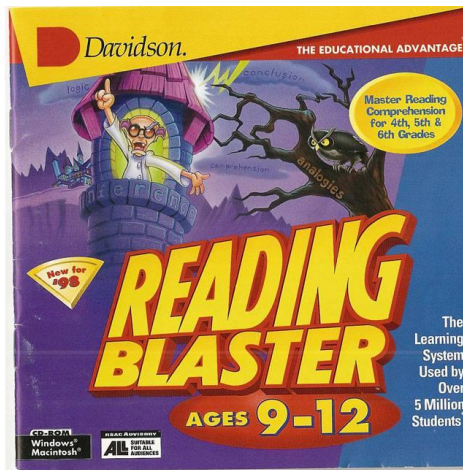
Serious game used for learning by students, children and teachers. When teachers constantly seek ways to educate their students in a fun way, parents can rest assured that their children benefit from learning and as well as having fun. This game can be great for teachers and parents.

### **2.4 Review on Serious Games in Education**

There are three existing games and the comparison between three different games that will be discuss. Those three of existing system are Reading Blaster Ages 9-12, Spelling Bee and Fun English.

### 2.4.1 Reading Blaster Ages 9-12

Figure 2.1 shows the Reading Blaster Ages 9-12, a great mystery adventure game designed for children to practice reading, grammar, spelling, critical thinking, analogy, and vocabulary. Children will surely enjoy the feeling that they are a detective and are looking for evidence throughout the mansion. A piece of evidence is obtained for each completed activity.



**Figure 2.1** Reading Blaster Ages 9-12 front page.

The game's activities include building phrases in a memory graveyard game, practicing synonyms and antonyms by jumping on moving spirits to find the right words, working on understanding and critical thinking by solving logical word puzzles, building a bridge by finding words that relate to one another and more.

Solving the mysteries is the most fun and venturesome mode in this game. There are more than 75 tasks to solve, each with several word-related games. The player needs to uncover clues in this game by completing games, decoding notes and finding hidden objects. The clues give the player hints about the lost items that each lost person has to deal with, so finding them is crucial to save your friends.

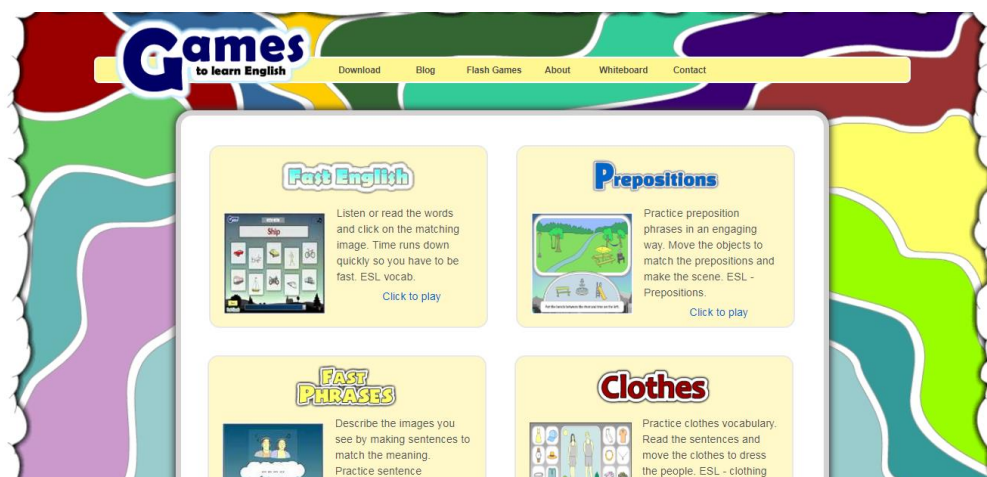
The disadvantages of this game are less content related and more gameplay based. In terms of content and the overall aspect, this game is great, but it has a few quirks that take away pleasure. The biggest flaw can be seen with solving the mysteries. Each mystery is almost identical and no new plan of attack or new actions are required to solve it. The clues are in the same place and the player must play the same games to get tips.



There are little to no differences between games, so although there are 75 in total, it feels the same to solve them (Dylan, n.d.)

## 2.4.2 Games to Learn English

The goal of this site is to provide students with a pleasant and fun way to practice English. Many other similar sites are more aimed at providing teachers with resources to give to their students, but the intention of this site is to be an independent resource for language learners. For example, the main page shown in Figure 2.2 only has a short summary of each game and the games themselves are very easy to understand and interact with. However, some text descriptions and longer text explanations of the games are necessary for the search engines to better index the site.



**Figure 2.2** Games to learn English website.

The games goal is relatively at a low level of English with all the content being around elementary level. The vocabulary content probably more like introductory of learning English or pre-elementary school level. From the game about information, this site has been published since 2010 and all games are originally flash based. More people, however, use the web on phones and tablets that have no flash. Therefore, it is quite hard to play games using Flash Player. (Dwyer, n.d.)

### 2.4.3 Fun English Kids Learn English

Fun English is a mobile application game that combines a structured English course with entertaining and engaging games shown in Figure 2.3. Each English course teaches the basic vocabulary and presents words in a variety of contexts to help learn and retain. Fun English uses the American and English accents of the male and female voices. The voices use different tones and expressions to enable the students to notice the subtleties of the speech.

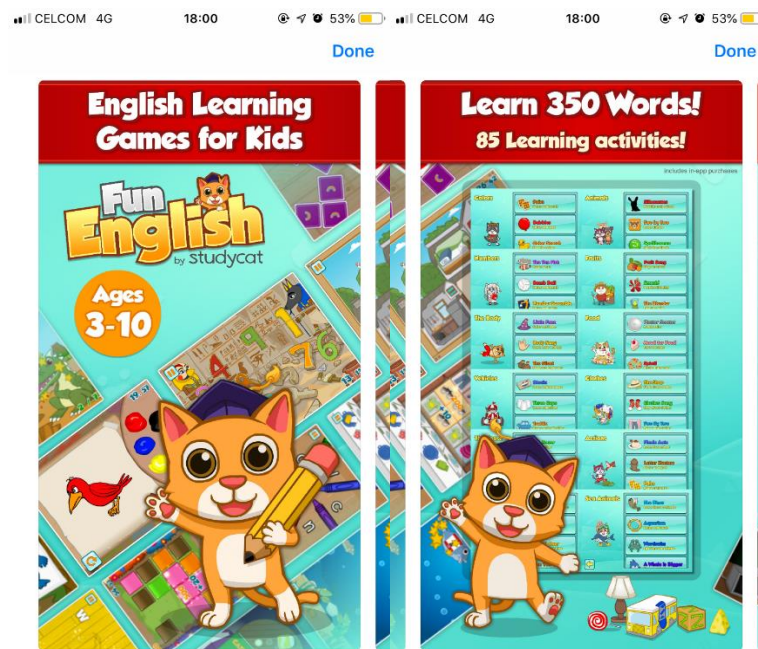


Figure 2.3 Fun English page.

The features of the game are they are having six or more unique games in each fun-packed lesson. They also have original music, songs, sound effects and beautiful cartoon artwork. However, to play all the games, you must purchase the lessons either individually or save money by purchasing the multi-lesson packages. It is a bit disadvantage for children who want to play the games.

## 2.5 Comparison between Serious Game in Education & Proposed Serious Game

Based on the study of the existing serious games in education, a comparison has been made in term of game features such as objective, platform, operating system requirement, content module as connectivity. The existing game also will be compared with the proposed game to identify the similarities and differences. Table 2.1 show the comparison among three existing of educational games with the proposed one.

**Table 2.1** Comparison between serious games in education.

FEATURES	GAMES			
	Reading Blaster Age 9-12	Games to Learn English	Fun English Kids Learn English	Grammar Race *proposed game
Objective	To develop the critical thinking skills of students as they learn to read for details, find the main idea, draw conclusions and create a vocabulary for reading in this title.  Using contextual clues	To provide students with a place to practice English in a pleasant and fun manner. The aim is to be a resource that can be used independently by language learners.	To provide beginners with an increasing number of games to enhance their natural language skills. Players test their dexterity when they learn all language	To provide a place for students to learn grammar effectively and in a fun way. The goals are to improve students' thinking and problem solving skills while playing.

	and parts of speech rules, students discover words and build understanding skills for reading.	Aim at a relatively low level of English with elementary content.	building blocks.	
Platform	PC – Mac and Windows	PC – Mac and Windows	Mobile – iPhone, iPad and iPod Touch	PC – Mac and Windows
Operating system	Apple MacOS 7.1 or later, Microsoft Windows 3.x, Microsoft Windows 95, Microsoft Windows 98	Apple MacOS 7.1 or later, Microsoft Windows XP, Microsoft Windows 7 and later	iOS 8.0 or later	Apple MacOS 7.1 or later, Microsoft Windows 7, 8, 10 and later
Module Content	Topic's content : Sentence structure Parts of speech Grammar Definitions	Have 14 mini games on the website and in each game they have variation of topic content.	Give 2 free lessons : Colours Animals	Topic's content : Common Nouns Proper Nouns Countable Nouns

	<p>Synonyms and antonyms</p> <p>Reading for detail</p> <p>Drawing conclusions</p> <p>Using context clues</p> <p>Sequencing and ordering</p> <p>There is no time taken.</p> <p>There is no mark.</p>	<p>Type of mini games :</p> <p>Fast English</p> <p>Clothes</p> <p>Prepositions</p> <p>Fast Phrases</p> <p>Concentration</p> <p>Past Tense</p> <p>Bubbles – practices grammar and word order</p> <p>Spelling Bee</p> <p>Phrase making</p> <p>Falling clouds - practices grammar and word order</p> <p>Big Describer – Read the description and click on the matching image.</p> <p>Phrasal verbs</p>	<p>Available for in-app purchase :</p> <p>Numbers</p> <p>Food Vehicle</p> <p>The Body</p> <p>Fruits</p> <p>Clothes</p> <p>The House</p> <p>Sea Animals</p> <p>School Bag Lesson</p> <p>Actions</p> <p>Time taken during the game.</p> <p>There is no mark but it show the time taken at the last page.</p>	<p>Uncountable Nouns</p> <p>Level :</p> <p>Easy, Medium, and Hard for every topic modules.</p> <p>Time were taken when player play the game.</p> <p>The score showed after player finished play the game at the scoreboard.</p>
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		<p>Animal Mystery – Guess the animal by constructing questions to get clues.</p> <p>Conditional sentences</p> <p>Hangman – Guess and spell the word.</p> <p>There is time limit for every task.</p> <p>The score and time taken showed at the scoreboard page.</p>		
Connectivity	Required to download only	Online	Required to download only	Required to download only

## **2.6 Summary**

Briefly, this comparison shows that how the game application proposed can offer differently from other existing application. There three existing game applications has their own advantages and disadvantages features in terms of modules content, platforms, operating system requirements and connectivity to play the game. The advantages of the proposed game are mostly the topics content taken from the English textbook and it can be played without internet connectivity. Thus within this shortcoming features this system will implement several function that only focus on the important parts like game content, score marks, time taken and game environments that suitable for primary school students in learning English.

## **CHAPTER 3**

### **METHODOLOGY**

#### **3.1 Introduction**

This chapter explains the methodology used in the game Grammar Race development. Methodology acts as guidelines for this project to achieve the goal and meet the requirements of the customer.

In this game project, the ADDIE model will be used to develop this game application. The ADDIE model is the general process that instructional designers and training developers traditionally use. The phases of ADDIE model consist of Analysis, Design, Development, Implementation, and Evaluation. However, this sequence does not require strict linear progress through the steps. Educators, educational designers and training developers find this approach very useful, as it facilitates the implementation of effective training tools through clearly defined stages.

#### **3.2 ADDIE Methodology**

ADDIE is a framework of concepts. This model is the most commonly used framework for teaching design and can help educators and trainers develop a course or training programme. The ADDIE model consists of five steps that are analysis, design, development, implementation, and evaluation. It is a strategic plan for the design of courses and can be used as a blueprint for the design of educational games and other teaching activities.

Figure 3.1 shows the phases of this development process. The steps starts with the analysis in the process of defining what is to be learned in the game. Secondly, design



is the process of determining how to learn. Third, development is the process of creating and producing materials for learning. Fourthly, the implementation process is the process of releasing the model sample to act as a thing to be replicated and the last one is the evaluation, which is the process of determining the feedback of the game. (Kurt, 2017)



**Figure 3.1** Phase of ADDIE model

The designer identifies learners, content and delivery needs during the analysis. The designer's aim is to match the modules ' form and content with user requirements and preferences. During design, the designer uses analysis information to create the storyboard and game flow that address the goals and objectives of the game. The development phase deals with the tools and processes for creating the game. The implementation phase deals with game modules execution. The evaluation phase shall determine the user's results and feedback. (Culatta, 2018)

In project planning, it describes the tasks and steps required to plan and schedule the activities to be carried out in order to complete a project successfully. This project contain 5 phases of method should be done in a duration of 10 months. Moreover, the schedule have 2 milestones that are milestone 1 is to submit the PSM1 full report and the other one is submitting the game application and PSM2 full report. The details will be shown in the Gantt chart in Appendix A.

### 3.2.1 Analysis

In this phase, the planning and requirements of the Grammar Race game were collected and combined to minimize the development time. During this phase, an online survey questionnaire was distributed thru Google Form for primary school teachers and parents who have children in primary school. Based on the data analysis from the questionnaire sample in Appendix B and C, there are some problems the children faced in learning English.

Looking to the data and results from the questionnaire sample in Appendix B, mostly teachers have state that the most difficult topics for students to learn is Grammar. The feedback also showed that students have low skill in speaking compared to writing and reading. This is because speaking skill needed high knowledge and confident when to speak. All the teachers more favourable using PC platform than the others because mostly school has the lab computer.

Furthermore, there also some good feedback we got from the parents. They also feel that serious game is a good thing to help their children in study. Same with the teachers, in Appendix C, some parents also stated that mostly their children having problems in Grammar topics. The skills their children lack of are writing and speaking. They also suggested to create the game that can build skills and self-confidence. As a result of analysis, the game objective, learning objectives, game levels and user characteristic are specified.

#### i. Game Objective

The main objective of Grammar Race is to play car race while learning Grammar. The subtopics that have chosen are common nouns, proper nouns, countable nouns, and uncountable nouns.

#### ii. Learning Objectives

The overall learning objective of the game is to make the player learns four subtopics of Grammar, which are proper nouns, common nouns, countable nouns and

uncountable nouns through visualization and sentences. To specify into levels, the learning objectives are as following below:

**a) Common nouns** – to develop player abilities to know what common nouns in Grammar and its rules to use in word, phrases and sentences.

- i) Easy – to make the player to recognize the nouns of people, things, animals and places based on the image given.
- ii) Medium – to make the player to recognize what nouns to use based on the image given.
- iii) Hard – to make the player to identifies suitable nouns to be used in a sentence.

**b) Proper nouns** – to develop player abilities to know what proper nouns in Grammar and its rules to use in word, phrases and sentences.

- i) Easy – to make player recognize which one the proper nouns based on three words given.
- ii) Medium – to make the player to identify suitable proper nouns for image given.
- iii) Hard – to make the player to identify the wrong proper nouns used in sentence given.

**c) Countable nouns** – to develop player abilities to know what countable nouns in Grammar and its rules to use in word, phrases and sentences.

- i) Easy – to make the player to recognize the countable nouns of people, things, animals and places based on the image given.
- ii) Medium – to make the player to identify the suitable collective nouns used for countable nouns in a sentence given.

iii) Hard – to make the player to recognize the countable nouns of people, things, animals and places used with collective nouns based on the sentence given.

**d) Uncountable nouns** – to develop player abilities to know what uncountable nouns in Grammar and its rules to use in word, phrases and sentences.

i) Easy – to make the player to recognize the uncountable nouns of people, things, animals and places based on the image given.

ii) Medium – to make the player to identify the suitable collective nouns used for uncountable nouns in a sentence given.

iii) Hard – to make the player to recognize the uncountable nouns of people, things, animals and places used with collective nouns based on the sentence given.

iii. Game levels

This game provide three levels, which are easy, medium and hard for each topics. The three difficulty levels in the game are up to the player to choose as well as the topics.

iv. User Characteristic

The user characteristic of this game is primary school students' age between nine to twelve years old that study in year three to six. Students in year three, has started to learn the uses of Grammar in their English textbook Year 3. Basically this game is suitable for them to learn and explore the topics deeper.

### **3.2.2 Design**

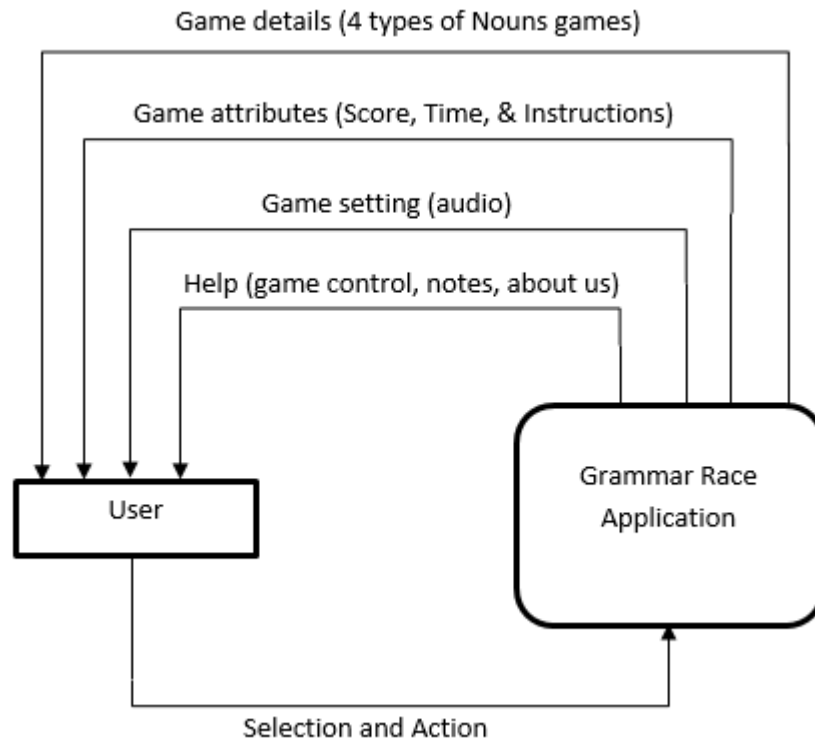
Design phase specify a requirement in a details and create the game design is the most important during this stage. In this phase, all the requirement and decisions collected during the analysis phase will be used for the game system designing process. In design, the game overview, game content, game mechanics and game technology will be discussed.

#### **3.2.2.1 Game Overview**

Game overview will discuss about the whole story overview of the game.

The name of this game is Grammar Race. Taken from the English word “grammar” since our main topic is learning grammar and word “race” is because the concept of this game is racing. Grammar race is an educational game in learning English. It will developed in collaboration with the KSSR English textbook published by Ministry of Education. This game aimed at children at nine years of age that they are in year three. (English Year 3, 2012) The objective of this game is to teach students Grammar topics that is similar with their English learning syllabus at school. This game contain grammar modules such as common nouns, proper nouns, countable and uncountable nouns for children to learn. For every modules, it has three levels, which are easy, medium and hard.

The game space simulated closely to the real life. For example, the race track theme will be snow, beach, Halloween, jungle, village and park. It provided each car with different colour characters that will make the game looks fun and exciting. In the game, the user has to move the car forward to select the answer that will floating on the road based on the question given. The mark will be given for each correct answer (1 correct answer = 1 mark). If the answer is wrong, the mark will not be given. There also some rewards on the race that there are some hidden marks in the answers. The hints and notes provided so that it will easier the player. The race will end when the entire question has given and the time also taken. At the finish line, it will show the player’s score. In this way, they rapidly expand their grammar skills.



**Figure 3.2** Grammar Race context diagram.

Figure 3.2 above shows the context diagram for Grammar Race. The interaction between user and the game application shows that when user play the game, the game will display the selections of games and game attributes such as the score, time, instruction, help, setting and notes to user. In conclusion, Grammar Race can help to solve student’s issue in learning grammar effectively and rise up their enthusiasm to learn and exploring more new thing in English subject.

### 3.2.2.2 Game Content

Content is the space of game and everything that fits inside of it. The game content will explain the genre of the game, game characters, game flow, storyboard, game control, and level designs.



i. Genre





The genre on Grammar Race is a serious and education game. It is also a racing game.

ii. Game Characters

The main character in this game is a car. Table 3.1 shows the cars with different colours.

**Table 3.1** Car characters

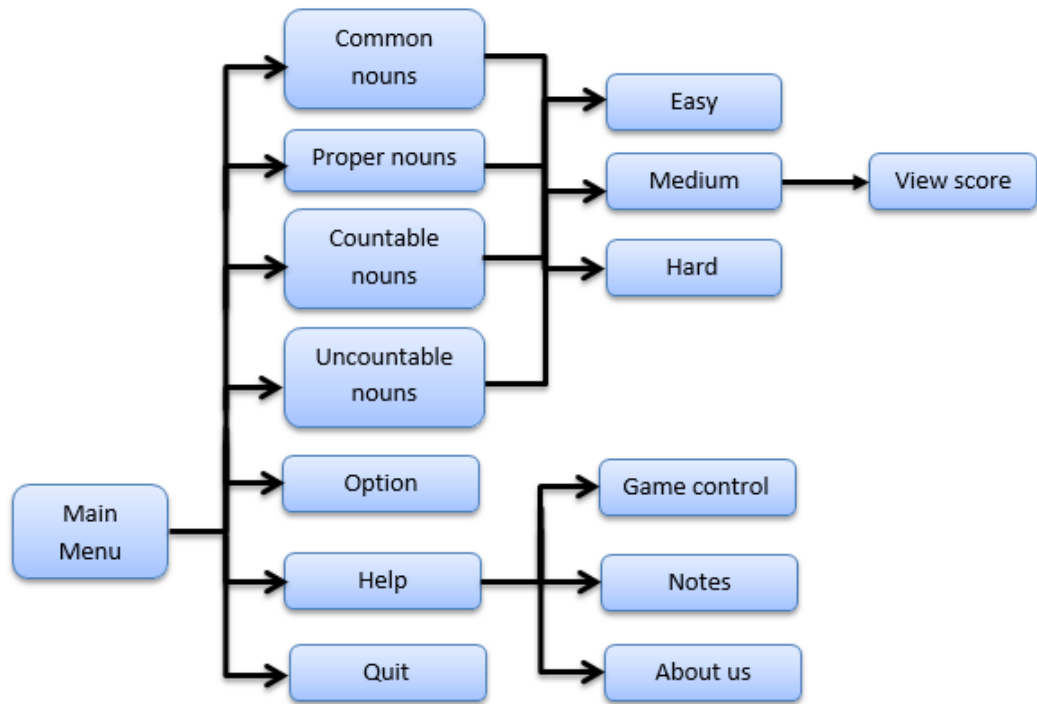
Car	Colours
	Blue
	Green
	Grey

 A small, bright pink toy car with black wheels and a black interior, shown from a top-down perspective on a grey, textured surface.	<p>Pink</p>
 A small, bright red toy car with black wheels and a black interior, shown from a top-down perspective on a dark, mossy ground.	<p>Red</p>
 A small, white toy car with black wheels and a black interior, shown from a top-down perspective on a reddish-brown dirt surface.	<p>White</p>
 A small, bright yellow toy car with black wheels and a black interior, shown from a top-down perspective on a sandy beach near the water.	<p>Yellow</p>



iii. Game Flow

a) Figure 3.3 shows the Grammar Race game content.

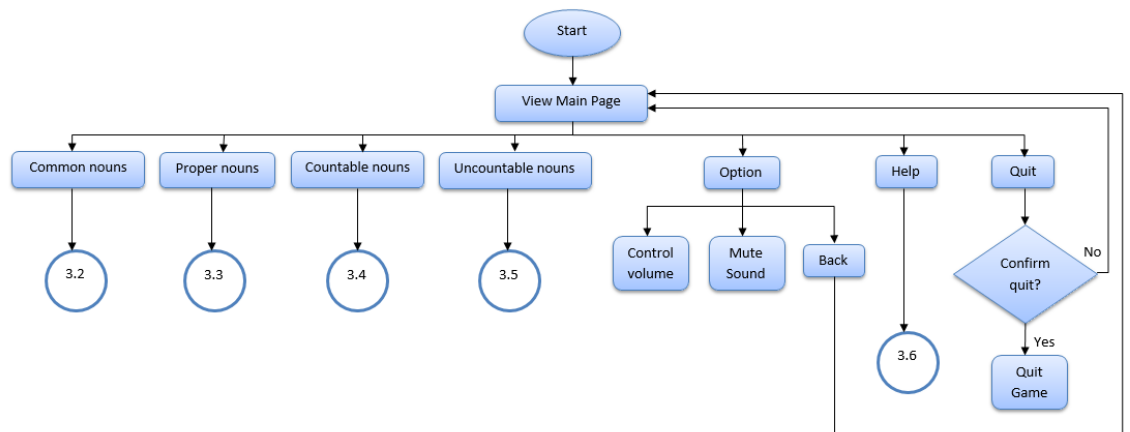


**Figure 3.3** Grammar Race game content

Start with the main menu page; it contains the selection of game topics, option, help, quit and player setting. To play the game, player has to select one of the four game topic selection and then they has to select the game level. After done playing the game, they will view the score in at the end of game. In the option, user can change the music volume. In help section, user can view the game control, notes and about us. The game control shows the game guideline control while notes view the simple explanation note based on the topics. About Us tell the whole overview of the Grammar Race game. Quit is for user to quit the game.

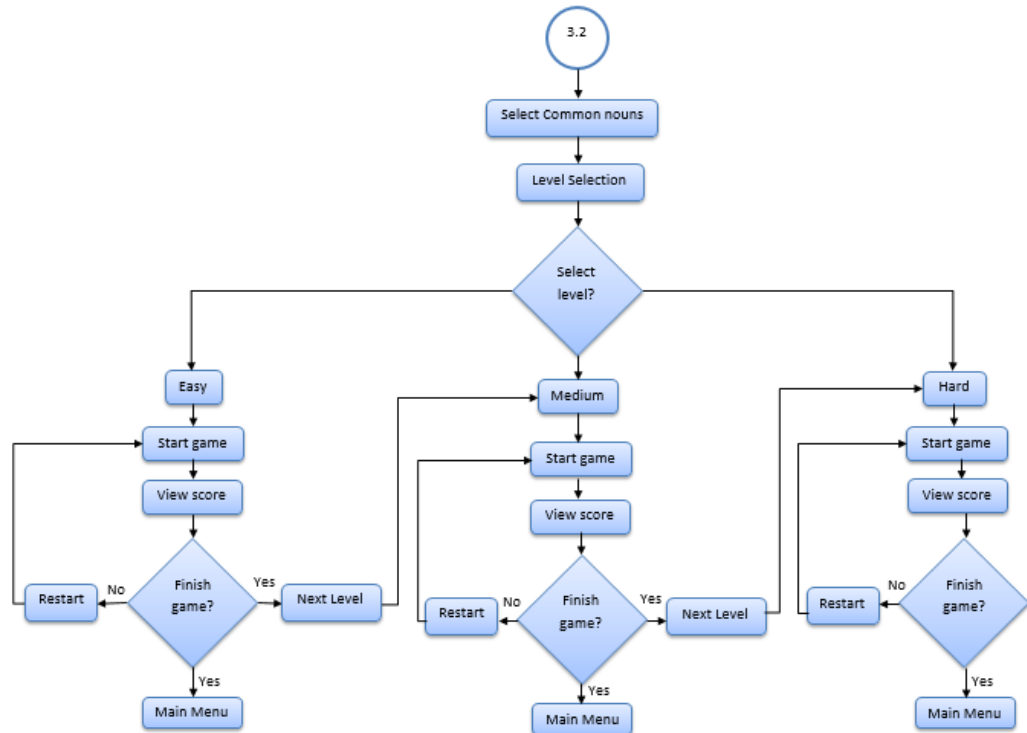
b) Game flow chart

Figure 3.4 below shows the flowchart for the main page. User can play game by selecting Common Nouns, Proper Nouns, Countable Nouns or Uncountable Nouns. Other functions are Option and Help. Quit is to quit the game.



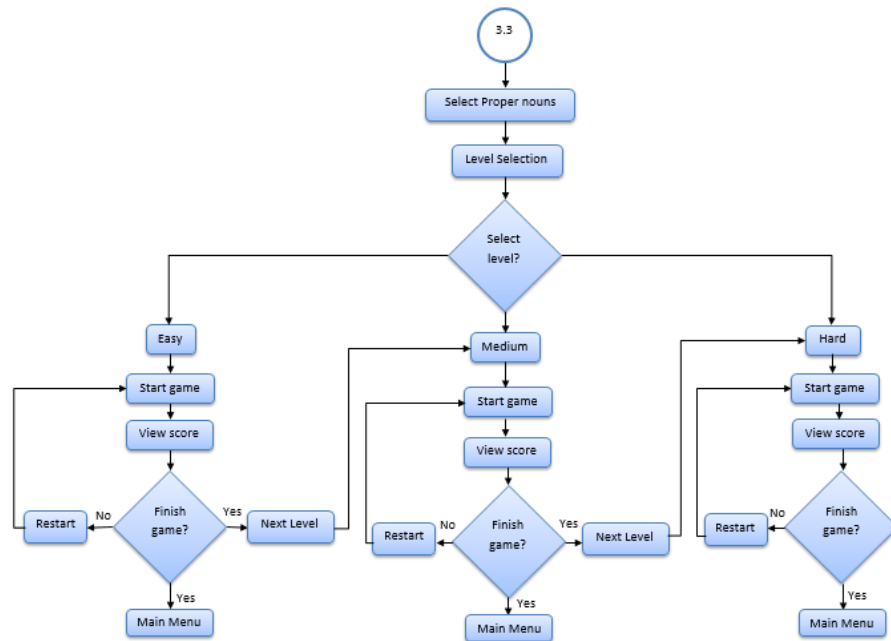
**Figure 3.4** Flowchart at Main Page

Figure 3.5 below shows the flowchart for Common Nouns game. In the selection level, user can select either easy, medium or hard. If user select easy level, at the end of the game, user can choose, to restart the level, continue to next level, which is the medium level or quit to main menu. In the medium and hard level, the flow also same except at the end of hard level, it contain two option only that are restart the level and quit to main menu.



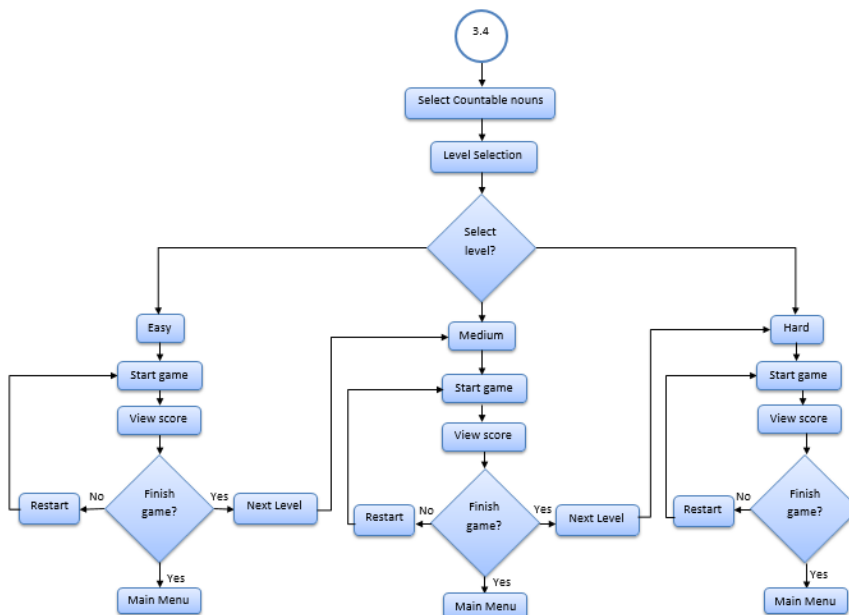
**Figure 3.5** Flowchart for Common Nouns game

Figure 3.6 below shows the flowchart for the Proper Nouns game. The flow is same with Common Nouns game.



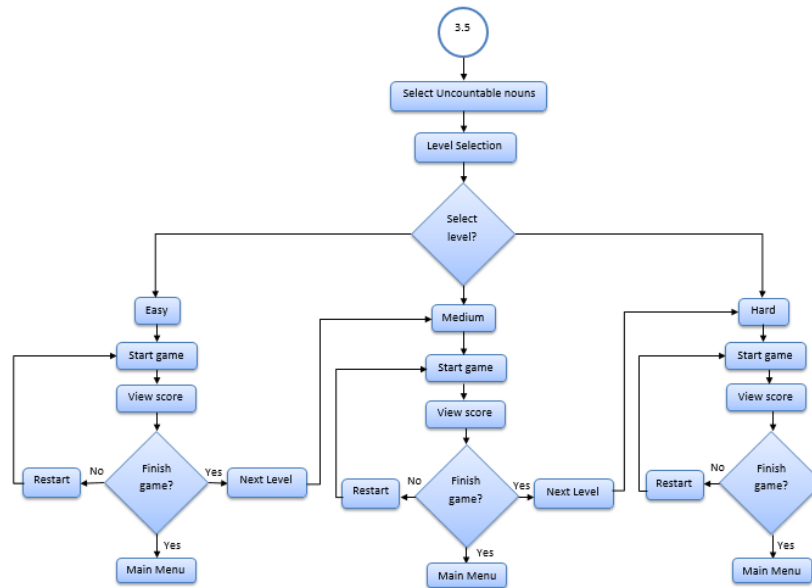
**Figure 3.6** Flowchart for Proper Nouns game

Figure 3.7 below shows the flowchart for the Countable Nouns game.



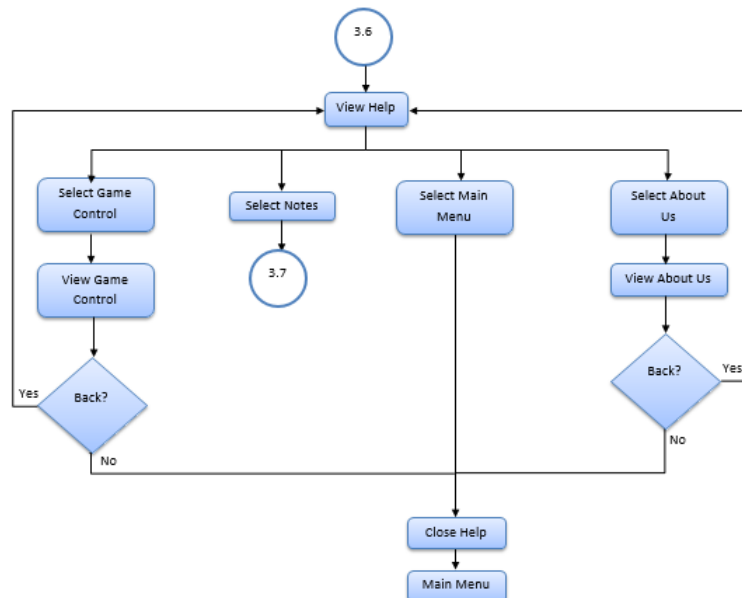
**Figure 3.7** Flowchart for Countable Nouns game

Figure 3.8 below shows the flowchart for the Uncountable Nouns game.



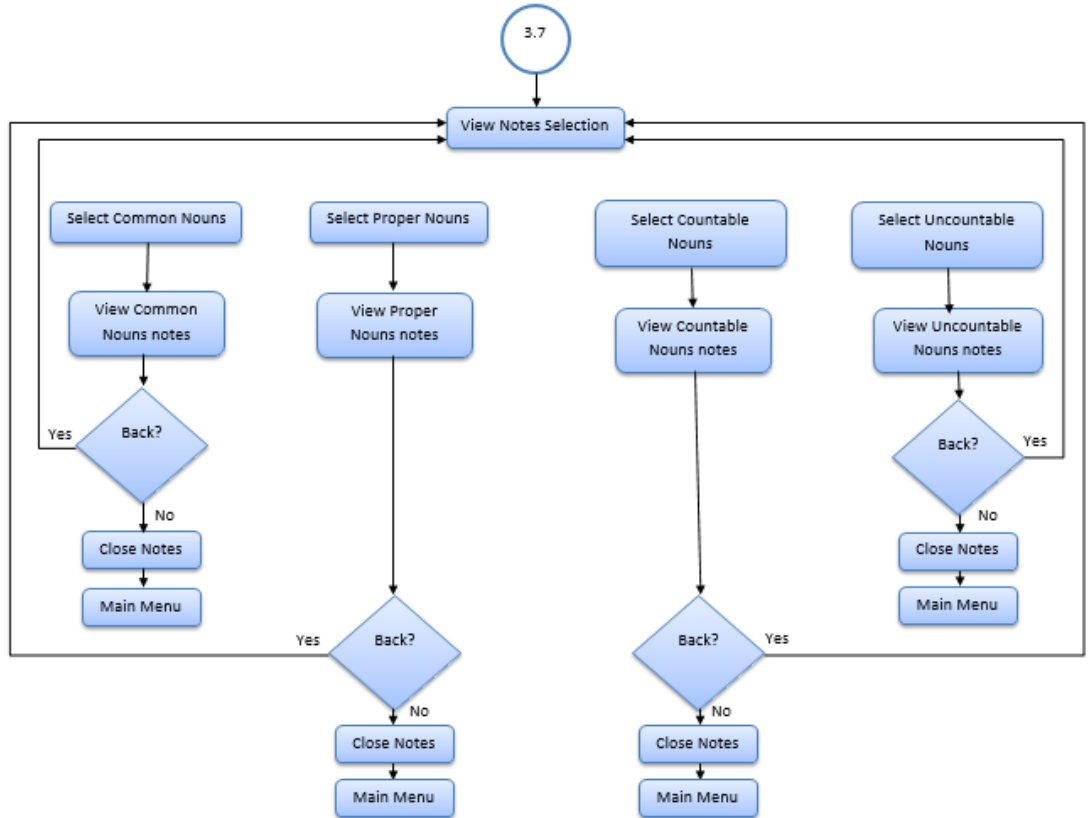
**Figure 3.8** Flowchart for Uncountable Nouns game

Figure 3.9 below shows the flowchart for Help. In this section, the options provide are game control, notes and about us. Main menu is to close the Help and back to the main menu page.



**Figure 3.9** Flowchart for Help

Figure 3.10 below shows the flowchart for Notes selection. The Notes section provided four notes that are for Common Nouns, Proper Nouns, Countable Nouns, and Uncountable Nouns.




**Figure 3.10** Flowchart for Notes

iv. Storyboards

The storyboard is a series of illustration displayed in sequence for previsualizing the game scene. The storyboard consist of ten (10) pages and the details will be explain in the templates below.

Page 1/10 : Main Menu



**Figure 3.11** Main Menu

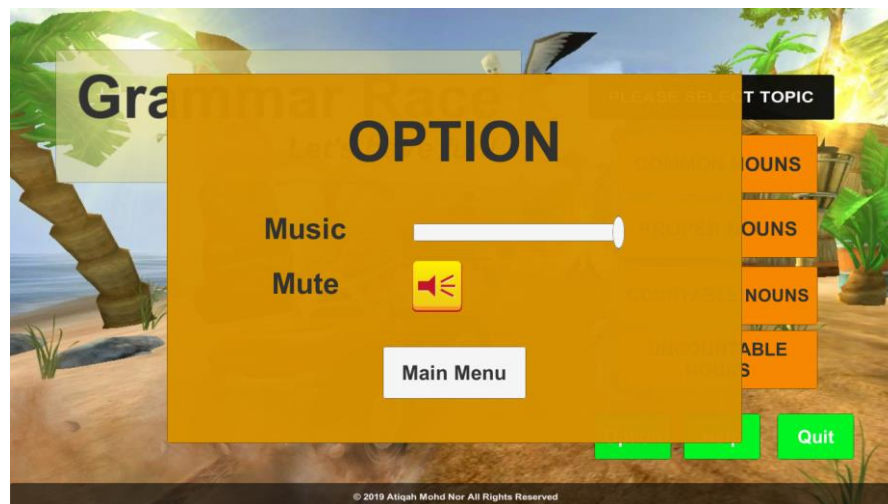
Description :

Text : Title; Grammar Race Let's have fun!

Button : common nouns, proper nouns, countable nouns, uncountable nouns, options, help, quit

Interactivity:

This is the main menu page of Grammar Race. It provided 4 game topics for player. 'Common Nouns' button to play common nouns game. 'Proper Nouns' button to play proper nouns game. 'Countable Nouns' to play countable nouns game. 'Uncountable Nouns' to play uncountable nouns game. 'Options' button to view the game option. 'Help' button to show the guide to play the game. 'Quit' button to quit the game.



**Figure 3.12** Option Setting


Description :

Dialogue box : option box

Text : OPTION, Music

Slider bar : bar for music

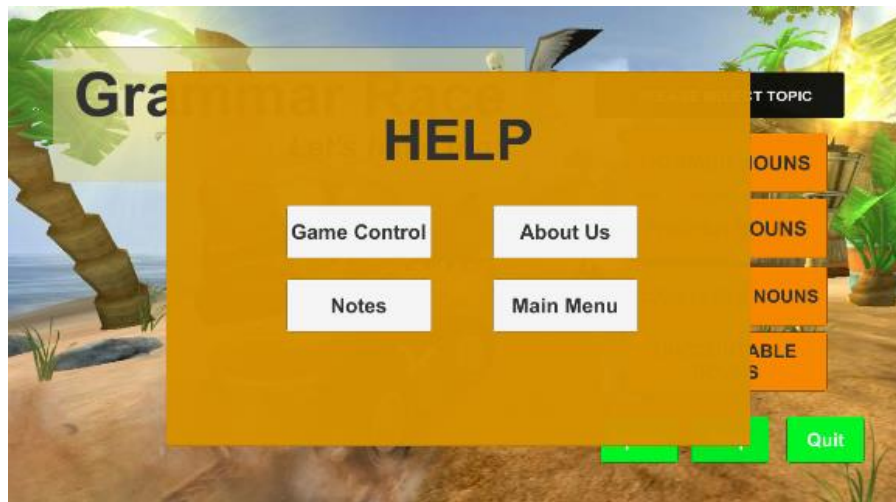
Button : main menu

Toggle button : Mute 

Interactivity :

The option provide the music setting. The player may adjust the game sound volume by sliding the slider to the left to decrease the volume or slide to the right to increase the volume. The mute toggle button when clicked, it will turn off the music volume. 'Main Menu' button to go back to main menu page.





**Figure 3.13** Help Option

Description :

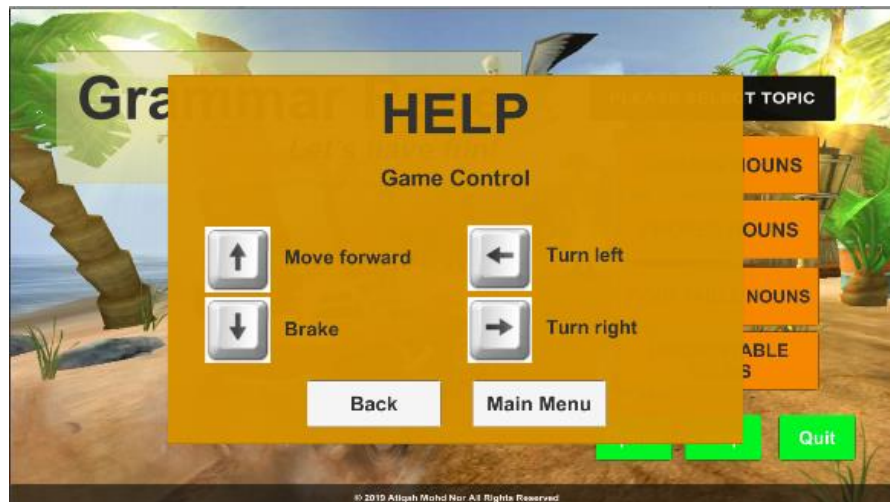
Dialogue box : help box

Text : HELP

Button : game control, notes, about us, main menu

Interactivity :

Help option provide game control, notes and about us. 'Game Control' button to view explanation to play the game. 'Notes' button to view the explanation of topics. 'About Us' button to view the whole summary about Grammar Race game. 'Main Menu' button to go back to main menu.



**Figure 3.14** Game Control

Description :

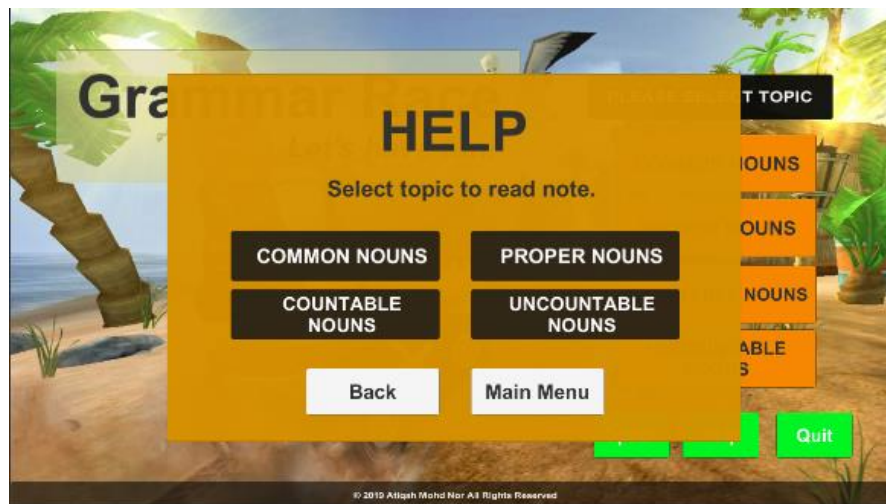
Dialogue box : yellow box

Text : HELP, Game Control, Move forward, turn left, Brake, turn right

Button : back, main menu

Interactivity :

Game control show the guideline to control the car using computer keyboard. 'Back' button to go back to Help page. 'Main Menu' button to go back to main menu page.



**Figure 3.15** Topic's note selection

Description :

Dialogue box : yellow box

Text : title HELP, instruction

Button : common nouns, proper nouns, countable nouns, uncountable nouns, back, main menu

Interactivity :

After user click on 'Notes' button it will bring to this page. User has to select the topic to view the notes. 'Common Nouns' button to view common nouns notes. 'Proper Nouns' button to view proper nouns notes. 'Countable Nouns' button to view countable nouns notes. 'Uncountable Nouns' button to view uncountable nouns notes. 'Back' button to go back to Help page. 'Main Menu' button to go back to main menu page.



Figure 3.16 Note

Description :

Dialogue box : yellow box

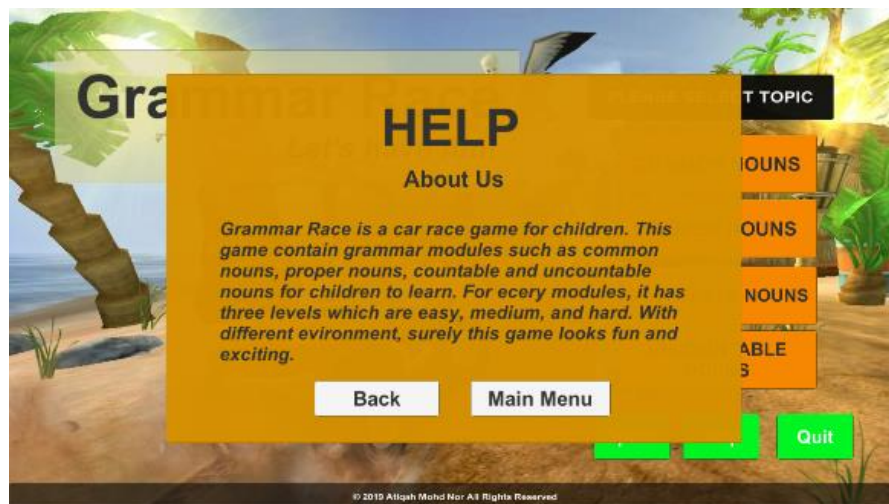
Text : title, instruction

Image : note panel

Button : back, main menu

Interactivity :

Common nouns notes view the definition and simple explanation uses of common nouns in Grammar. The example also given to make the player understand more about the topic. 'Back' button to go back to topic's note selection. 'Main Menu' button to go back to main menu page.



**Figure 3.17** About Us

Description :

Dialogue box : yellow box

Text : title, about us summary

Button : back, main menu

Interactivity :

‘About Us’ tell the overview of the Grammar Race game. ‘Back’ button to go back to Help page. ‘Main Menu’ button to go back to main menu page.



**Figure 3.18** Quit

Description :

Dialogue box : yellow box

Text : quit, instruction

Button : quit, cancel

Interactivity :

The pop up box appear to ask the confirmation to quit game. 'Quit' button to quit the game. 'Cancel' to cancel quit game and back to main menu page.



**Figure 3.19** Level Selection

Description :

Image : note panel

Button : easy, medium, hard, back

Text : title, please select level

Interactivity :

Level selection page give player to select level of game. 'Easy' button to play easy level, 'Medium' button to play medium level, and 'Hard' button to play hard level. 'Back' button to go back to main menu. Dialogue box at the left top of screen show the player's name that has inputted.



**Figure 3.20** Playing field ( Common Nouns – Easy Level )

Description :

Panel box : top; Score, title and timer, and left; instruction




Game object : car, question and answers

Image : in question panel

Button : Setting , Guideline 

Toggle : Mute 

Interactivity :






This is the game for Common Nouns topic for easy level. Player has to move the car using keyboard control to move forward and cube to answer the questions. Game instruction shown at the left corner of screen. Click on  to view note,  to mute the sound, and  to open setting.



v. Game Controls

The controls are slightly more complicated than a typical game, due to the nature of combining the keys to perform different moves. Table 3.2 shows the game control using keyboard key and mouse device.

**Table 3.2** Game control

	Move forward Press up key to move the car forward.
	Move left Press left key for car to turn left.
	Move right Press right key for car to turn right.
	Brake / Reverse Press down key to brake to stop the car or reverse the car.
	Accelerate car to move

vi. Levels design

In the level design, it will specify how all the level designed and arranged based on the topic modules. Figure 3.21 shows how the question and answers arranged in the game.



**Figure 3.21** Level design

There are four topic modules to be covered in this game. The topics are common nouns, proper nouns, countable nouns and uncountable nouns. In every topics, there are three levels provided that are easy, medium and hard. Therefore, there are ten questions given in every levels based on the topic. The question panels and answers cubes were arranged along the track. The question modules will be shown in table 3.1 in the appendix D.

### 3.2.2.3 Game Mechanics

Game mechanics are constructs of rules or methods designed for interaction with the game state, thus providing gameplay. It will explain the rules, and reward and punishment in the game below.

i. Rules

Player has to move the car forward with time taken and at the same time has to answer the question by hitting the answer object on the road.

ii. Reward and punishment

Player will get the mark when they choose the correct answer and there are a hidden mark that put randomly in the answers. The hidden mark is two (2) marks. If they hit the wrong answer, the mark will not be given. (1 correct answer = 1 mark)

### 3.2.2.4 Game Technology


Game technology refers to the development of supporting technologies for games, independent of a specific game design. In this part, there are three technology used that are graphical user interface, sound and audio, and network.

i. Graphical User interface (GUI)

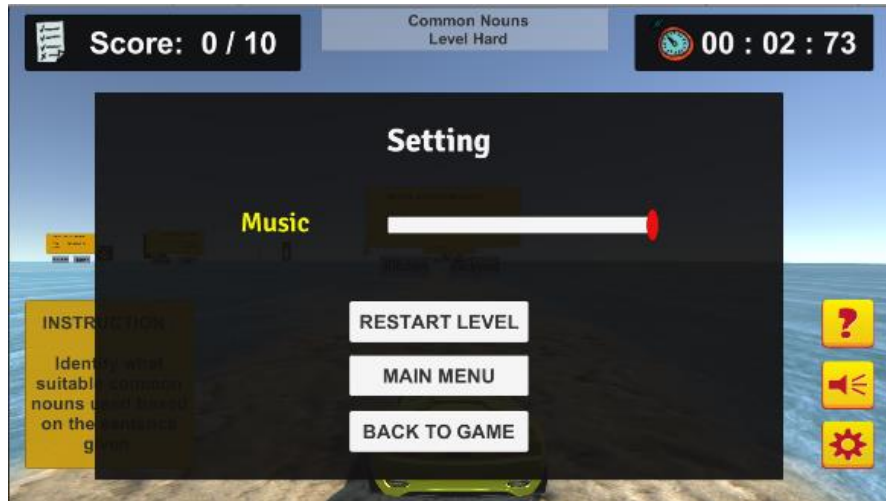
The GUI will feature the following information in figure 3.22.



**Figure 3.22** Game Field

a) Feature 1 : Option icon 


Option icon will display a pop up of game setting such as music volume control, restart game button, main menu button and quit game button. This icon placed at the right corner of screen and in all game fields.



**Figure 3.23** Option Setting

In figure 3.23, player may adjust the music volume by slide the slider to the left to reduce the volume or to the right to increase volume. For the buttons, 'Restart Level' button to restart the game. 'Main Menu' to quit the playing field game and go back to main menu page. 'Back To Game' button to continue the game.

b) Feature 2 : Volume toggle 

When user click on the volume icon, the game sound will mute and the icon will change to .

c) Feature 3 : Guideline icon 

Guideline icon will show some notes based on the game topic to help the player to complete the race.



**Figure 3.24** Game Paused

In figure 3.24 above shows that to continue the game, just click on the ‘Back’ button.

ii. Sound and audio

a) Music

The music will be a simple loop downloaded free from the Soundimage.org website. The music sounds placed in:

- Main Menu
- Level Selection
- Game field

b) Sound

Sound effects will be included throughout the game:

- ‘Vroom’ sound, the sound of car
- Sound when car hit the correct answer
- Sound when car hit the wrong answer
- Victory sound when player finish the game.

iii. Network

This game do not require network connectivity.

### **3.2.3 Development**

After the design has been completed, the game development is carried out for this project. The development phase is in which the developers create and assemble the content assets created in the grammar race design phase. The software that will be used is Unity and Microsoft Visual Studio will be used for the scripting part. The project is reviewed and developed according to the requirement analysis. The details will be explained in the chapter four (4).

### **3.2.4 Implementation**

In implementation phase, the complete product of game is fully developed. This phase involves user training activities that show how the game works in the real environment. The game application will be installed in the specific computer for the purpose of testing. The test case design will follow the materials developed during the development stage. The developer will do the testing using functional testing sample in Appendix E. The details will be explained in chapter four (4).

### **3.2.5 Evaluation**

During the evaluation phase, user acceptance tests will be carried out to evaluate and provide feedback for the Grammar Race game based on customer requirements and learning objectives. User will explore how the game can give the impact to them. In addition, the game's defects and weaknesses in the next iteration will be improved. After testing and approval, the completed game system will be installed. The details will be explained in the chapter four (4).

### 3.3 Software & Hardware Requirement

There are two requirements that are hardware and software requirements in the development of this application. In the development of the software system, both parts play an important role.

#### 3.3.1 Software Requirement

Table 3.3 below shows the software elements used during the completion phases of the project.

**Table 3.3** Software items used

<b>Purpose</b>	<b>Software</b>
<b>Operating System</b>	Windows 7 Ultimate
<b>Game Engine</b>	Unity 2018
<b>Scripting Code</b>	Visual Studio 2017
<b>Editing Image</b>	Adobe Photoshop CS6 Snipping Tool
<b>Documentation</b>	Microsoft Word 2013 Microsoft Office 2013 Mandelay
<b>Diagram Modelling</b>	Microsoft Visio 2013 LucidChart Online Software
<b>Planning for the milestones of the project</b>	Tom's Planner : Online Gantt Chart

### 3.3.2 Hardware Requirement

Table 3.4 below shows the hardware elements used during the completion phases of the project.

**Table 3.4** Hardware items used

<b>Hardware</b>	<b>Function / Purpose</b>
<b>Laptop</b>	<p>A portable computer used for the development and documentation of the project</p> <p>Specifications:</p> <ul style="list-style-type: none"> <li>i) Processor: Intel® Core™ i3-3217U CPU @ 1.80GHz 1.80 GHz</li> <li>ii) Installed memory (RAM): 4.00 GB (3.80 GB usable)</li> <li>iii) System type: 64-bit Operating System</li> </ul>
<b>External Hard Disk</b>	<p>A data storage device used for storing the system and documents and also acts as a system and documentation backup storage.</p> <p>The external hard disk used is from Apacer brand and have 1 TB size space is enough to back up the Grammar Race game that need 1.2 GB spaces.</p>
<b>Wireless Mouse</b>	<p>A wireless mouse that connects to a computer without the use of wires. Instead, the mouse uses some manner of wireless technology, like Bluetooth, RF, or infrared</p>



radio waves. Usually, a USB receiver is plugged into the computer and receives signals from the cordless mouse.

The mouse used is from GIGABYTE brand that need A3 battery to function. By using mouse, the work operation will be easier and faster than using the laptop mouse pad.

## **CHAPTER 4**

### **RESULTS AND DISCUSSION**

#### **4.1 Introduction**

In this chapter, we will discuss about the system design, implementation, and system testing and result discussion of Serious Game in Learning English (Grammar Race). The implementation phase is the crucial phase, which the system will be developed based on the needs and the design has been mentioned in chapter 3. The development use ADDIE as the method, this may shorten the development time as it capable to deliver within short time. This methodology gives advantages which is it allows software to be code faster and make it easier to change any requirement. The codes are the main part of the implementation phase as it carries out and run the function. All the changes and improvement should be done according to the phases of the methodology used.

Moreover, this chapter will discuss all the design for the interfaces, development environment, tools and technology and the system flow in details. It is important to plan and understand the project well as it may affect during the development and the output of the system as well. Furthermore, explanation for each interface and database implementation are included in this chapter. Testing result also will be justified by the end of this chapter.

#### **4.2 Implementation**

In the implementation, it is consist of development environment, tools and technologies, system functionality and sample coding. All the details explained in the next section.

### **4.2.1 Development Environment**

This system is a web-based game. This game developed by using Unity software tool. It is because Unity supports both 2D and 3D development with features and functionality for specific needs across genres. The development of game interface and racetrack environment can be created with Unity technologies and components. One of the key components is the terrain engine system. Unity's terrain system allows creating vast landscapes that suitable for racetracks for games or applications. The selection of tools that available easier the process of creating of terrain quickly. At runtime, terrain rendering is highly optimized for efficiency. In addition, with their built-in user interface (UI) systems, it allows to create user interfaces fast and intuitively.

For the scripting part, C# language used in Microsoft Visual Studio. C# is a Microsoft programming language that is a hybrid of C and C++. Scripting is the main important thing that is the coding part. It tells the GameObjects how to behave for instance the scripts and components that attached to the GameObjects and how they interact with other. For example in Grammar Race, the script for the movement of car, score, time and scene management were attached to the GameObjects.

### **4.2.2 Tools and Technologies**

Grammar Race is a serious game for primary students to learn English especially in Grammar. User can play this race game while learning something so that they can earn some benefits from this game. The main tools of developing this game is Unity 2018 software shows in figure 4.1. Unity is a first choice of game developers because it is a real time platform that powered by tools and services and offer incredible possibilities for game developers. It supports the customized extensions through the Asset Store, which features thousands of resources, tools, and extensions to speed up the Grammar Race game project. For instance, the standard asset used in this game is the car object and some ground textures to texture the racetracks. Figure 4.2 shows the Asset Store that can be access through Unity software.

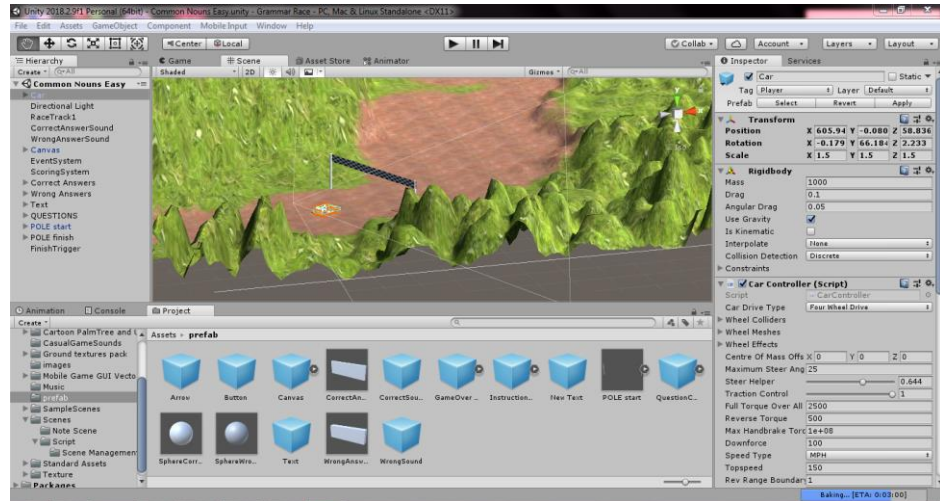


Figure 4.1 Unity tool

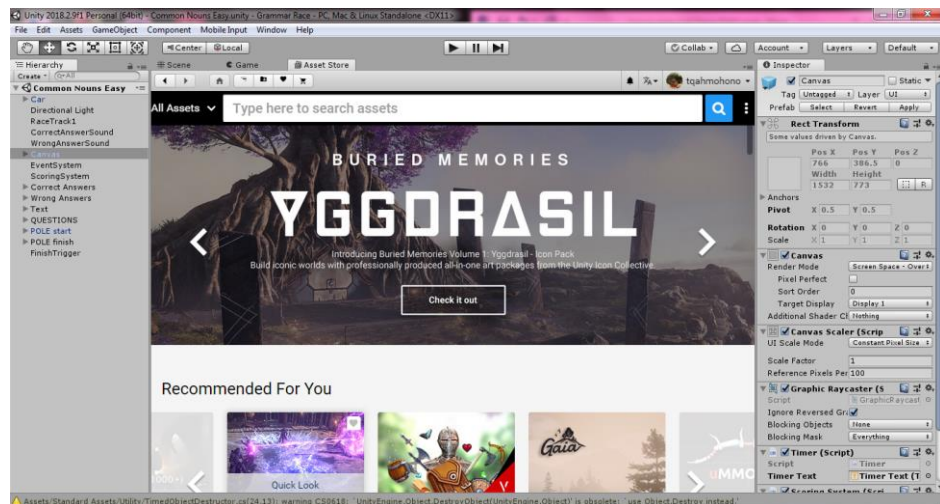


Figure 4.2 Asset Store

Furthermore, for the scripting part, Microsoft Visual Studio 2017 is the suitable tool software for C# language. This software is better than MonoDevelop because of its stability and has plenty of free and paid plugins that extend its functionality. There are some scripting needed in this game for example scene management scripting that is function to move from one scene to another scene. Figure 4.3 shows the Microsoft Visual Studio 2017 interface.

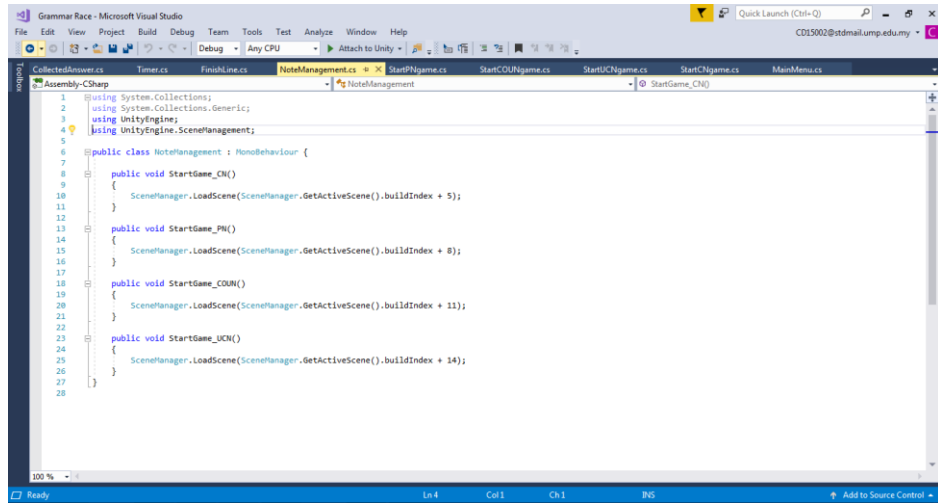


Figure 4.3 Microsoft Visual Studio 2017

### 4.2.3 System Functionality

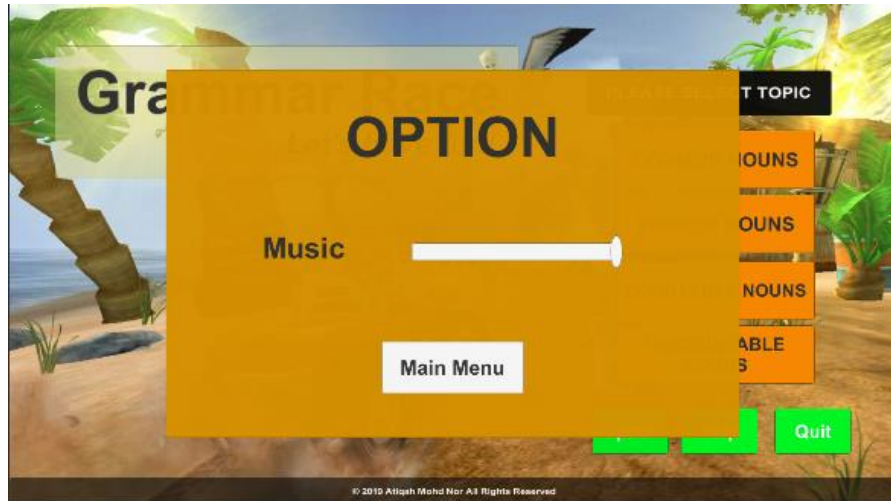
#### iv. Main Menu

Figure 4.4 shows the main menu page interface. In this page, user can select the topic of the game they want to play. Four games provided which are Common Nouns, Proper Nouns, Countable Nouns and Uncountable Nouns. Option lead to game setting and Help brought to game control, notes, and about us. Lastly, Quit is to exit the game.



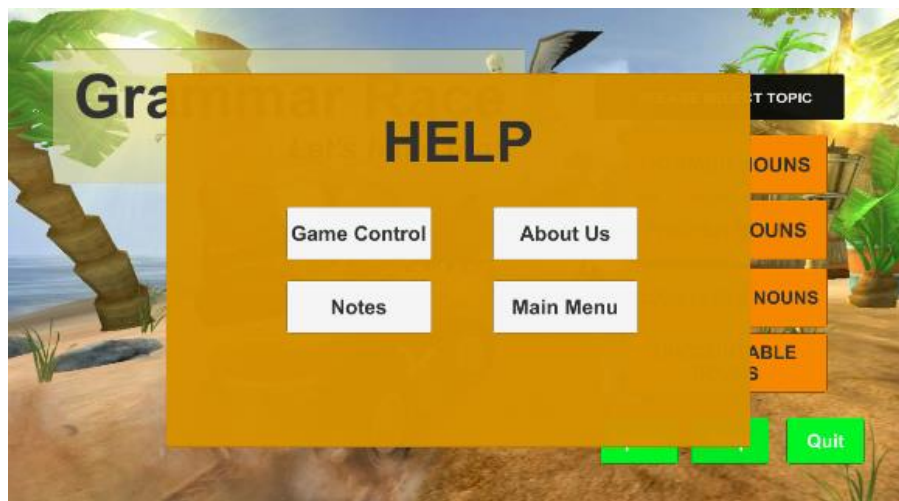
Figure 4.4 Main Menu

Figure 4.5 below shows the dialogue box of option when user clicked on the Option button. The option provide the music volume setting. User may adjust the game music volume by sliding to the left to decrease the volume or to the right to increase the volume.



**Figure 4.5** Option popup box

Figure 4.6 below shows the Help dialogue box page that provide the Game Control, About Us and Notes button.



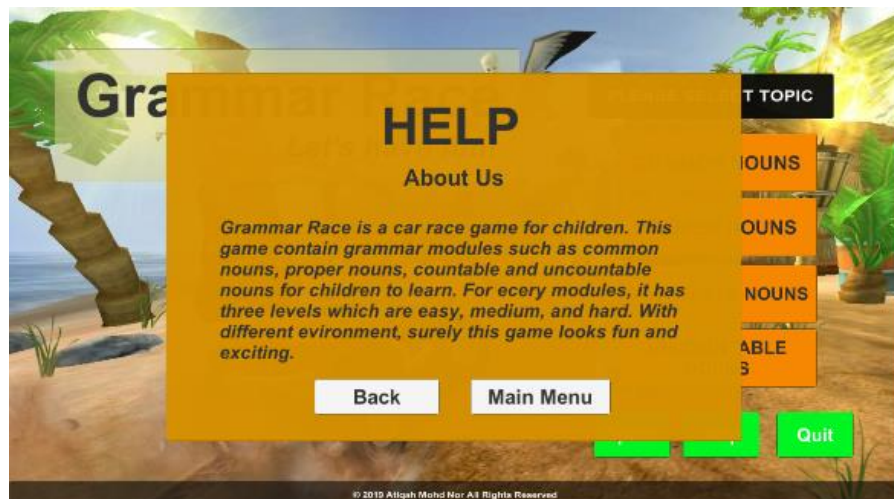
**Figure 4.6** Help popup box

Figure 4.7 shows the Game Control section of Help dialogue box page. Game control shows the guideline to control the car using computer keyboard and computer mouse.



**Figure 4.7** Game Control popup box

Figure 4.8 shows the About Us section in Help dialogue box page. It displays the information about the Grammar Race.



**Figure 4.8** About Us

Figure 4.9 below shows the topic notes provided in the Notes section in Help dialogue box. User has to click on the button provided to view the notes.

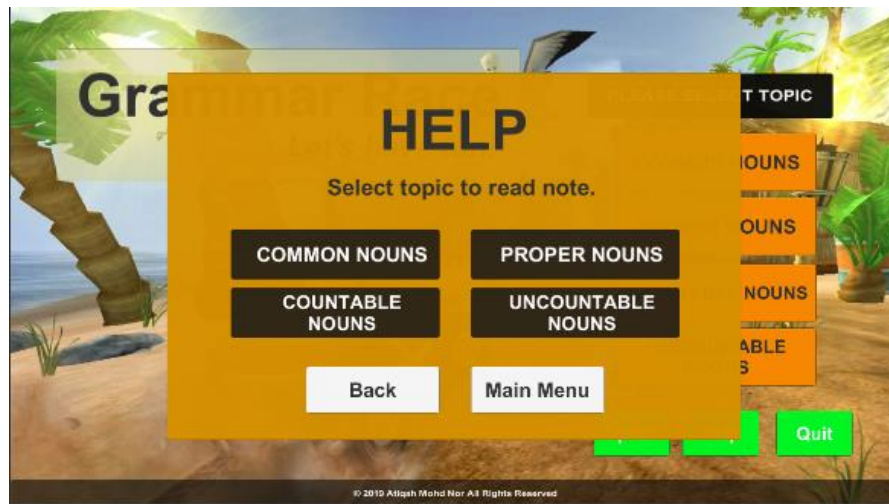


Figure 4.9 Notes Selection

Figure 4.10 below shows the common nouns note from help section. The note is the explanation about the topic in more details. Back button is to go back to notes selection and main menu button is to close the popup box and back to main menu.

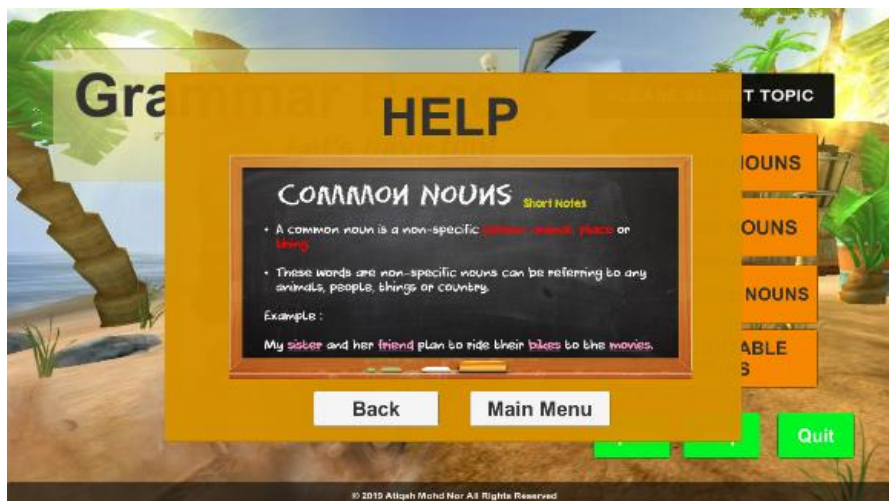


Figure 4.10 Common Nouns note popup box



Figure 4.11 below shows the popup message of quit confirmation. Quit button is to quit the application and cancel button is to cancel and close the popup message box.



**Figure 4.11** Quit popup message box

v. Level Selection

Figure 4.12 below shows the levels selection page. After user select the game topic, it will lead to this page before proceed to game field. In this page, some short notes given to help user to answer the questions. The levels given are easy, medium and hard. User can choose the level by clicking on one of those buttons.



**Figure 4.12** Levels selection page

vi. Game field

Figure 4.13 below shows the game field page. This is the page where user play the games. The total of game field are twelve (12). In this scene, the score, timer and game title shown at the top of screen. Besides that, at the left of the screen, there is an instruction panel to give the instruction of the game and at the right of the screen; there are question mark button for short note, mute button to mute the sound and setting button to open the game setting.



Figure 4.13 Game field

Figure 4.14 below shows the guideline popup box when user click on the question mark button.

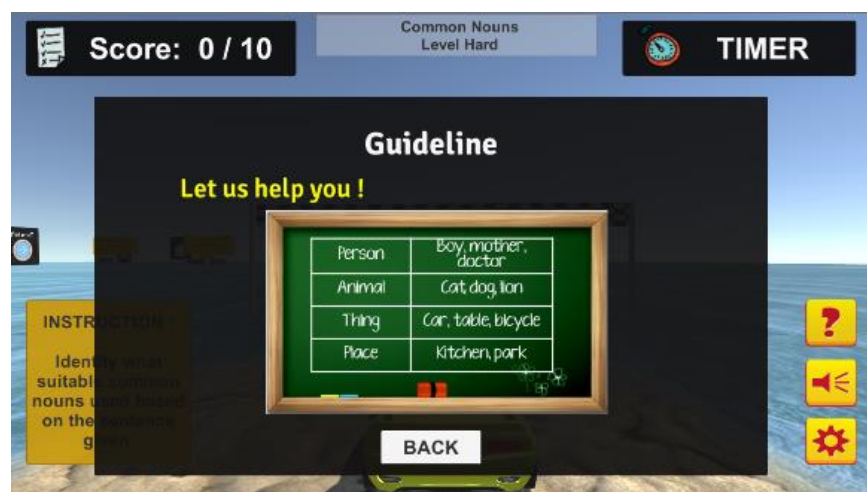
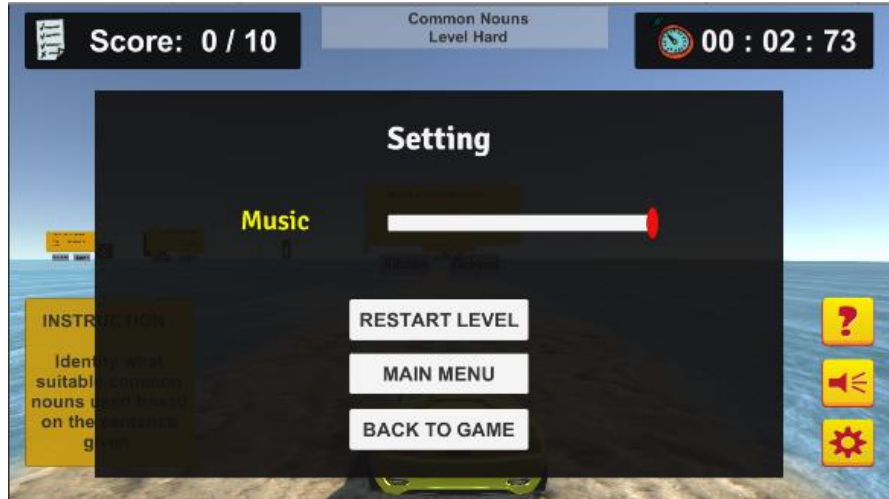


Figure 4.14 Guideline

Figure 4.15 below shows the setting popup box. The slider bar is for music volume setting by sliding to the left and right to decrease and increase the volume. The restart button is to restart the game, main menu button to go back to main menu page and back to game button is to close the popup box and resume the game.



**Figure 4.15** Setting popup box

## 4.2.4 Sample Coding

This section will explain the sample of coding for main menu, car user control, car controller, car audio, scoring system, collected answer, wrong collected answer, timer, music slider bar and pause function.

### a) Main Menu script

Figure 4. 16 below shows the scripting for the scene management for main menu. This script help to move from main menu scene to the other scenes.

```
1  using System.Collections;
2  using System.Collections.Generic;
3  using UnityEngine;
4  using UnityEngine.SceneManagement;
5
6  public class MainMenu : MonoBehaviour {
7
8      public void CN_note()
9      {
10         SceneManager.LoadScene(SceneManager.GetActiveScene().buildIndex + 1);
11     }
12
13     public void PN_note()
14     {
15         SceneManager.LoadScene(SceneManager.GetActiveScene().buildIndex + 2);
16     }
17
18     public void COUN_note()
19     {
20         SceneManager.LoadScene(SceneManager.GetActiveScene().buildIndex + 3);
21     }
22
23     public void UCN_note()
24     {
25         SceneManager.LoadScene(SceneManager.GetActiveScene().buildIndex + 4);
26     }
27
28     public void QuitGame()
29     {
30         //Debug.Log ("QUIT");
31         Application.Quit();
32     }
33 }
34
```

**Figure 4.16** MainMenu.cs

b) Car User Control script

Figure 4.17 below shows the car user control script. This scripting is to declare for movement of car with computer keyboard.

```
1  using System;
2  using UnityEngine;
3  using UnityStandardAssets.CrossPlatformInput;
4
5  namespace UnityStandardAssets.Vehicles.Car
6  {
7      [RequireComponent(typeof (CarController))]
8      public class CarUserController : MonoBehaviour
9      {
10         private CarController m_Car; // the car controller we want to use
11
12
13         private void Awake()
14         {
15             // get the car controller
16             m_Car = GetComponent<CarController>();
17         }
18
19
20         private void FixedUpdate()
21         {
22             // pass the input to the car!
23             float h = CrossPlatformInputManager.GetAxis("Horizontal");
24             float v = CrossPlatformInputManager.GetAxis("Vertical");
25             #if !MOBILE_INPUT
26                 float handbrake = CrossPlatformInputManager.GetAxis("Jump");
27                 m_Car.Move(h, v, v, handbrake);
28             #else
29                 m_Car.Move(h, v, v, 0f);
30             #endif
31         }
32     }
33 }
34
```

Figure 4.17 CarUserController.cs

c) Car controller script

Figure 4.18 below shows the scripting for car controller. This script is related with CarUserController.cs script.

```
// Use this for initialization
private void Start()
{
    m_WheelMeshLocalRotations = new Quaternion[4];
    for (int i = 0; i < 4; i++)
    {
        m_WheelMeshLocalRotations[i] = m_WheelMeshes[i].transform.localRotation;
    }
    m_WheelColliders[0].attachedRigidbody.centerOfMass = m_CentreOfMassOffset;

    m_MaxHandbrakeTorque = float.MaxValue;

    m_Rigidbody = GetComponent<Rigidbody>();
    m_CurrentTorque = m_FullTorqueOverAllWheels - (m_TractionControl*m_FullTorqueOverAllWheels);
}

private void GearChanging()
{
    float f = Mathf.Abs(CurrentSpeed/MaxSpeed);
    float upgearlimit = (1/(float) NoOfGears)*(m_GearNum + 1);
    float downgearlimit = (1/(float) NoOfGears)*m_GearNum;

    if (m_GearNum > 0 && f < downgearlimit)
    {
        m_GearNum--;
    }

    if (f > upgearlimit && (m_GearNum < (NoOfGears - 1)))
    {
        m_GearNum++;
    }
}
```

**Figure 4.18** CarController.cs

d) Car audio script

Figure 4.19 below shows the scripting for car audio. This script using the audio source component to add audio into car and also related with CarController.cs script.

```
private void StartSound()
{
    // get the carcontroller ( this will not be null as we have require component)
    m_CarController = GetComponent<CarController>();

    // setup the simple audio source
    m_HighAccel = SetUpEngineAudioSource(highAccelClip);

    // if we have four channel audio setup the four audio sources
    if (engineSoundStyle == EngineAudioOptions.FourChannel)
    {
        m_LowAccel = SetUpEngineAudioSource(lowAccelClip);
        m_LowDecel = SetUpEngineAudioSource(lowDecelClip);
        m_HighDecel = SetUpEngineAudioSource(highDecelClip);
    }

    // flag that we have started the sounds playing
    m_StartedSound = true;
}

private void StopSound()
{
    //Destroy all audio sources on this object:
    foreach (var source in GetComponents<AudioSource>())
    {
        Destroy(source);
    }

    m_StartedSound = false;
}
```

Figure 4.19 CarAudio.cs

e) Scoring System script

Figure 4.20 below shows the code for the scoring system. The code function is to show and update the score at the above of the page.

```
1  using System.Collections;
2  using System.Collections.Generic;
3  using UnityEngine;
4  using UnityEngine.UI;
5
6  public class ScoringSystem : MonoBehaviour {
7
8      public GameObject ScoreText;
9      public static int theScore;
10
11     void Update()
12     {
13     {
14         ScoreText.GetComponent<Text>().text = "Score: " + theScore + " / 10";
15     }
16     }
17 }
```

**Figure 4.20** ScoringSystem.cs

f) Collected answer script

The figure 4.21 below shows the code part for the correct answer. If user got the correct answer, the one (1) mark will be given and the correct answer sound will be played.

```
1  using System.Collections;
2  using System.Collections.Generic;
3  using UnityEngine;
4
5  public class CollectedAnswer : MonoBehaviour {
6
7      public AudioSource CorrectAnswerSound;
8
9      void OnTriggerEnter(Collider other)
10     {
11     {
12         CorrectAnswerSound.Play();
13         ScoringSystem.theScore += 1;
14         Destroy(gameObject);
15     }
16     }
```

**Figure 4.21** CollectedAnswer.cs



g) Wrong collected answer script

Figure 4.22 below shows the code part for the wrong answer. If user select the wrong answer, the zero (0) mark will be given and the wrong answer sound will be played.

```
1  using System.Collections;
2  using System.Collections.Generic;
3  using UnityEngine;
4
5  public class WrongCollectedAnswer : MonoBehaviour {
6
7      AudioSource WrongAnswerSound;
8
9      void OnTriggerEnter(Collider other)
10     {
11         WrongAnswerSound.Play();
12         //ScoringSystem.theScore += 0;
13         Destroy(gameObject);
14     }
15 }
16
```

**Figure 4.22** WrongCollectedAnswer.cs

## h) Timer script

Figure 4.23 below shows the code part for the game timer. It will count the start time until user finish the game. The time taken will be save.

```
1  using System.Collections;
2  using System.Collections.Generic;
3  using UnityEngine;
4  using UnityEngine.UI;
5
6  public class Timer : MonoBehaviour {
7
8      public Text timerText;
9      private float startTime;
10     private bool finished = false;
11
12     // Use this for initialization
13     void Start () {
14         startTime = Time.time;
15     }
16
17     // Update is called once per frame
18     void Update () {
19         if (finished)
20             return;
21
22         float t = Time.time - startTime;
23
24         string minutes = ((int)t / 60).ToString();
25         string seconds = (t % 60).ToString("f2");
26
27         timerText.text = minutes + ":" + seconds;
28     }
29
30     public void Finnish()
31     {
32         finished = true;
33         timerText.color = Color.yellow;
34     }
35 }
```

Figure 4.23 Timer.cs

i) Music slider bar script

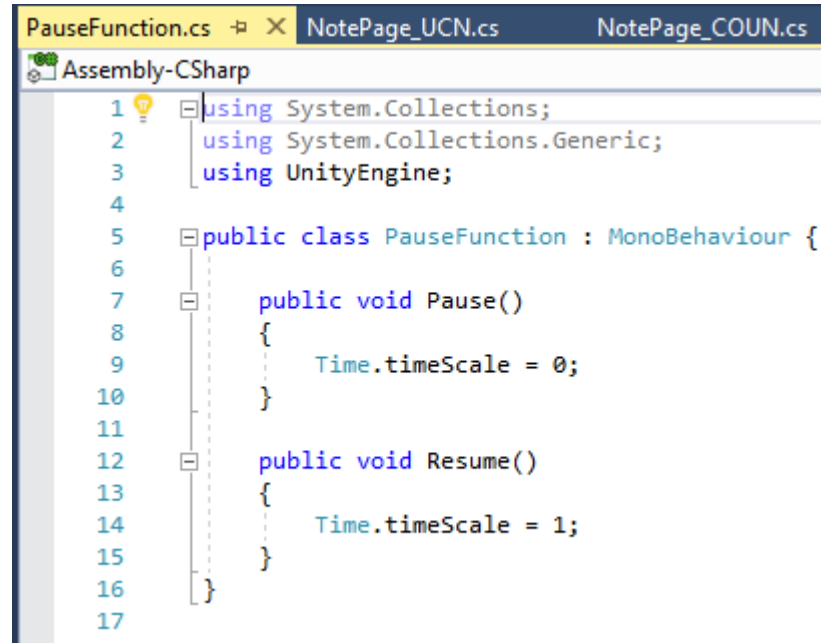
Figure 4.24 below shows the scripting part for the music slider bar. The script is calling the component of Audio Source set the volume to the slider bar.

```
public class MusicSlider : MonoBehaviour {  
    //Reference to Audio Source component  
    private AudioSource MusicSource;  
  
    //Music volume variable that will be modified  
    //by dragging slider knob  
    private float musicVol = 1f;  
  
    // Use this for initialization  
    void Start () {  
        //Assign Audio Source component to control it  
        MusicSource = GetComponent<AudioSource>();  
    }  
  
    // Update is called once per frame  
    void Update () {  
        //Setting volume option of Audio Source to be equal to mmusicVol  
        MusicSource.volume = musicVol;  
    }  
  
    //Method that is called by slider game object  
    //this method takes vol value passed by slider  
    //and sets it as musicvalue  
    public void setVolume(float vol)  
    {  
        musicVol = vol;  
    }  
}
```

**Figure 4.24** MusicSlider.cs

j) Pause script

Figure 4.25 below shows the scripting for pause function. This function will add to the question mark and setting button in the game field.



```
1 using System.Collections;
2 using System.Collections.Generic;
3 using UnityEngine;
4
5 public class PauseFunction : MonoBehaviour {
6
7     public void Pause()
8     {
9         Time.timeScale = 0;
10    }
11
12    public void Resume()
13    {
14        Time.timeScale = 1;
15    }
16 }
17
```

**Figure 4.25** PauseFunction.cs

### 4.3 Testing and Result Discussion

Software testing is a process of executing a program or application with the intent of finding the software bugs and defects that can lead the project to fail. In the software testing, it also includes verification and validation process to fulfil the requirement of project. The project need to run and the output must be same with the expected result. There are several testing techniques used to test the system, however, Grammar Game race recommended black box testing technique. Black box testing is specification-based test design technique where the input values derived without knowledge of the program logic and produce the actual result. By using this technique, the system is observed externally and focus on what the system does.

Furthermore, several types of testing have been carried out which are unit testing, integration testing, functional testing, system testing, user acceptance testing (UAT). Unit testing is a first level process where unit or components of software were tested. This is to check either the component functioning well or not. Second level is integration-testing means the component of software combined and tested as a group. This level of test is to detect defect in interaction between integrated units. Third test level is system testing where it tested the completed system. One of the system testing is functional testing. Functional testing verified the software application performances and functions correctly according to design specifications. UAT is the last level testing process where the system was test for acceptability. This is to ensure the system meets the customer requirements. Thus, functional testing and user acceptance testing are selected as a testing approach because those technique is the most suitable to test the system. For example, functional testing, for game marks, we test the mark given is correct or not based on the questions sample and compute with the expected result. One (1) teacher represent the primary school English teacher, one (1) user represent as parents and one (1) students will be representative as primary student will be selected to carry out the testing to perform user acceptance test.

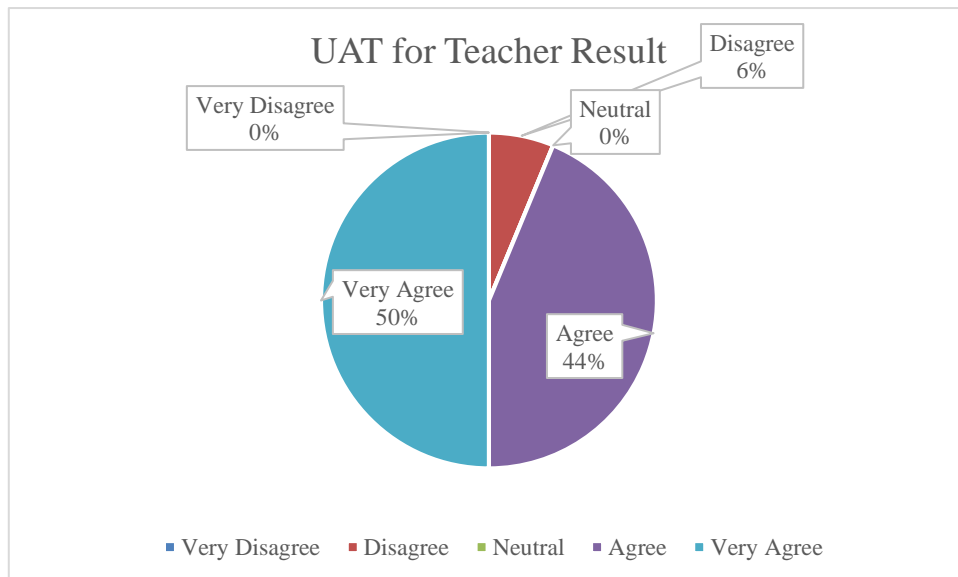
#### **4.3.1 Functional Test**

Functional testing is a process for developer to test each function of the game application. This testing mainly involves black box testing and it is not concerned about the source code of the game application. Every functionality of the game application tested using the functional test sample in Appendix E by providing appropriate input, verified the output and compared the actual results with the expected results. The result of the test showed all the functions 100% functioned well.

### 4.3.2 User Acceptance Test (UAT)

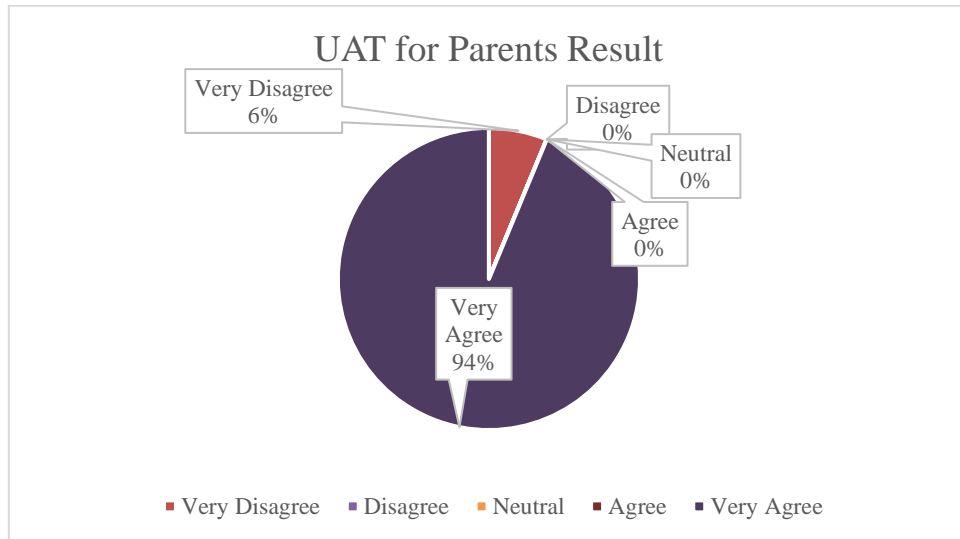
UAT is a process when client or users involved in testing the actual software to ensure the system has fulfilled the requirement needed during the discussion and have achieved the objective. For the UAT specification in Appendix F, it has been distributed to students and teachers to complete the user acceptance test for Grammar Race.

Figure 4.26 below shows the pie chart result of user acceptance test for teacher. The result shows most the feedback answers from the teacher are positive and higher than 90%. For answer very agree, it is calculated to 50 %, followed by agree with 44%. Another 6% is they disagree that to control the car is hard.



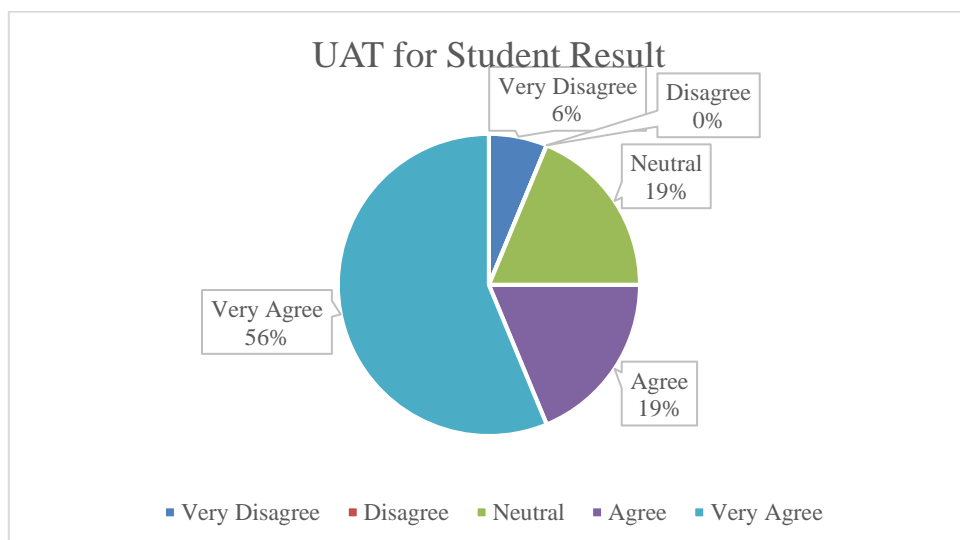
**Figure 4.26** UAT for teacher pie chart result

Figure 4.27 below show the pie chart of UAT result came from the parents. The result show all the feedback answers are very agree with 94% and 6% disagree to control the car is hard.



**Figure 4.27** UAT for parents pie chart result

Figure 4.28 below shows the pie chart result from UAT for primary school student. The result shows that, students are very agree with 56%, agree with 19%, and neutral with 19%. For 6% disagree is they disagree that to control the car while answering the question is hard.



**Figure 4.28** UAT for student pie chart result

#### **4.4 User Manual**

User manual is a technical communication document intended to assist user to use a particular system. In this user manual guide, it contain the information about game, system requirement with minimum and recommended requirements, installation guide, the game screen, the game worlds and the main menu contents.

For the Grammar Race user manual specification, see Appendix G.



## **CHAPTER 5**

### **CONCLUSION**

#### **5.1 Introduction**

The purpose of this chapter is to summarize the findings of Serious Game in Learning English (Grammar Race) in order to achieve the objectives and solve the problems that have been stated in problem statement in Chapter one (1). This game application is to help primary school students to learn English especially in Grammar topics in fun and interactive ways. Furthermore, through this game, it can increase the student's enthusiasm to learn English. By implementing this game, the problems like boring and uninterested learning environment can be avoided. In addition, following the IR 4.0, Grammar Race can give a high potential because the topics content mostly taken from KSSR English Textbook that similar with what primary students learn. Thus, teachers and educators as well as students can get a lot of benefits from this game application.

For the development phase, Grammar Race using ADDIE methodology that suitable for educational method. By using this methodology, the flow of the development process can be run smoothly. The selected methodology also plays important part in this project for developer complete their task. The objective, problem statement and project scope that have been stated in Chapter one (1) can be achieve.

## 5.2 Project Constraint

Constraints for this project are:

### I. Cost Constraint

There are many features provided in the Unity Asset Store either free or not but the 3D objects that needed in the game development mostly cost money.

### II. Requirement Constraint

The requirement from teachers are not fully enough because it requires much time and cost to meet them.

### III. Development Constraint

The Unity engine takes a lot of spaces in HDD that sometimes to open the application it take some times to run it. Moreover, if plug in with mouse device, it is slow and takes some time to move the cursor in Unity.

### IV. Resource Constraint

Overall, the contents of this game are taken from the KSSR English textbook until the end of the question sample, we are lacking off content and ideas.

### V. Time Constraint

The main problem is to allocate enough time for research during the development of the game application. Time management is important in developing any system to make it run smoothly. As a student, there are many responsibilities that should be done by followed the schedule.

### **5.3 Future Work**

Several enhancements can be suggested for future improvement of Grammar Race game for primary school students.

- I. Add more subtopics of Grammar in Grammar Race game since now this game only have four subtopics.
- II. Add player setting and database so the students can create their profile to save their score for their preferences.
- III. Implementing the Grammar Race in mobile platforms in both Android and iOS to easier them to reach the game.

# REFERENCES

## REFERENCES

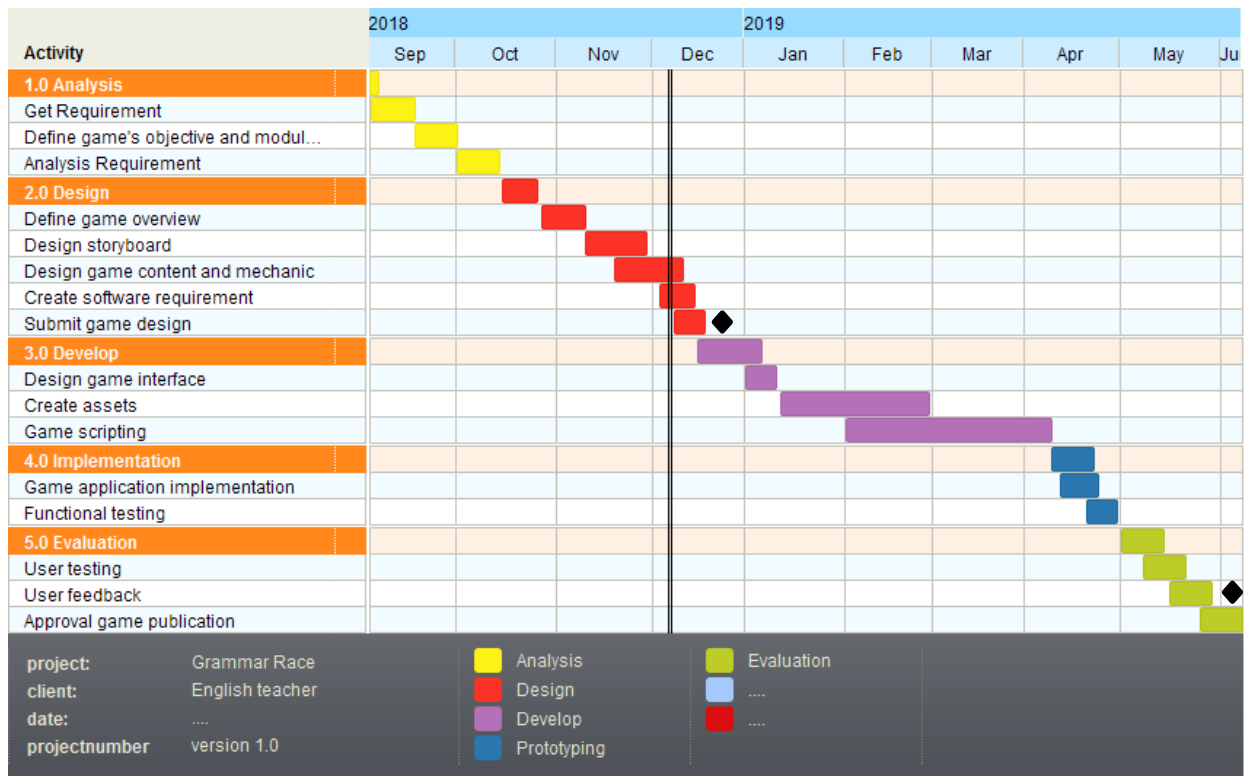
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# **APPENDIX A**

## APPENDIX A

### Gantt Chart



- 1) Milestone 1 – Submit full report (PSM1)
- 2) Milestone 2 – Submit full report (PSM2) and game application.



# **APPENDIX B**

## APPENDIX B

- I. Sample questionnaire for teachers that has been distributed through Google Form. Here is the link : <https://forms.gle/yyr8TPEzxsgKS7Ra9>

# SURVEY ON EDUCATIONAL GAME IN LEARNING ENGLISH FOR PRIMARY SCHOOL FOR TEACHER

Hi, my name is Atiqah binti Mohd Nor from Kuantan, Pahang. My major is Computer Science (Graphics & Multimedia Technology) from Universiti Malaysia Pahang. Basically, in this semester I am going to develop a serious game in learning English as my final year project. The purposes of this questionnaire survey is to collect idea and gather information that required for the game contents. All the answers submitted by you will be highly valued since it will be assisting me in completing this project

You are encouraged to add your comments and suggestions at the final part of the survey. Thank you.

\* Required

Name \*

Contact Number \*

School's Name (Workplace) \*

State \*

What are the topics in English syllabus for primary students? \*

Please add in other if there is more answer

- Nouns
- Singular or Plural
- Pronouns
- Verbs
- Grammar
- Vocabulary
- Other:

What are the most difficult topic to teach students? \*



Which skills that are hard for students to learn? \*

- Reading
- Writing
- Speaking

Which grade do you prefer to approach them learning English with educational game? \*

- Grade 1
- Grade 2
- Grade 3
- Grade 4
- Grade 5
- Grade 6

Based on the students grade, which topic you prefer to put in the game application? \*

Do you think learning English with game applications will give a benefit to students? \*

- Yes
- No
- Maybe

Based on your answer above, state the reasons. \*

Do you think learning English with game applications will give a benefit to teachers? \*

- Yes
- No
- Maybe

Based on your answer above, state the reasons. \*

How many hours will you give students to play game? \*

- 1/2 hour
- 1 hour
- 2 hours
- 3 hours

Which platform do you prefer?

- Personal Computer (PC)
- Video game consoles (Xbox, PSP)
- Mobile Phone

### Comments/Suggestions



- II. Sample questionnaire for teachers that has been distributed through Google Form. Here is the link: <https://forms.gle/DMrH54AEySu6aRcm7>

# SURVEY ON EDUCATIONAL GAME IN LEARNING ENGLISH FOR PRIMARY SCHOOL FOR PARENTS

Hi, my name is Atiqah binti Mohd Nor from Kuantan, Pahang. My major is Computer Science (Graphics & Multimedia Technology) from Universiti Malaysia Pahang. Basically, in this semester I am going to develop a serious game in learning English as my final year project. The purposes of this questionnaire survey is to collect idea and gather information that required for the game contents. All the answers submitted by you will be highly valued since it will be assisting me in completing this project

You are encouraged to add your comments and suggestions at the final part of the survey. Thank you.

\* Required

Name \*

How many children do you have in primary school? \*

 ▼

Do you allow your children playing game? \*

- Yes
- No

How about the educational game especially in learning English? Do you allow? \*

- Yes
- No

How many hours will you let your children spending time playing game? \*

- 1 hour
- 2 hours
- 3 hours
- 4 hours
- 5 hours
- Other:

What topics seem too difficult for your children to learn? \*

- Grammar
- Singular or Plural
- Pronouns
- Nouns
- Verbs
- Vocabulary
- Other:

What skills do you think your children lack of? \*

- Reading
- Writing
- Speaking

Which platform do you prefer? \*

- Personal Computer (PC)
- Video Game Consoles (Xbox, PSP)
- Mobile Phone

### Comments/Suggestion



# APPENDIX C



## APPENDIX C

- I. Table below shows the result from the questionnaire that has been distribute to teachers. The five survey results had been chosen:

Timestamp	10/21/2018 19:54:00	10/21/2018 20:34:43	10/21/2018 20:51:43	10/23/2018 17:11:18	10/23/2018 17:13:28
Name	Mohd Azrulfazli Bin Shamsudin	SITI NORIAH ABDUL KADIR	NORZILA BT JOHARI	Mariani Sulaiman	Ruziah
Contact	0199918410	0139081596	1120761595	0199587960	0196293613
School's Name	SK Kuala Kaung	SK KUALA KAUNG	SK KUALA KAUNG	SK Sanggang Seberang	SK SANGGANG SEBERANG
State	Malaysia	PAHANG	MALAYSIA	Pahang	PAHANG
What are the topics in English syllabus for primary students?	Nouns, Singular or Plural, Pronouns, Verbs, Grammar, Vocabulary, Topical based on the textbook	Nouns, Singular or Plural, Pronouns, Verbs, Grammar, Vocabulary	Grammar	Verbs	Nouns, Singular or Plural, Pronouns, Verbs, Grammar, Vocabulary
What are the most difficult topic to teach students?	Grammar	Subject verb agreement	TENSES	Grammar	Grammar
Which skills that are hard for students to learn?	Writing	Speaking	Speaking	Speaking	Speaking
Which grade do you prefer to approach them learning English with educational game?	Grade 1, Grade 2, Grade 3	Grade 1, Grade 2, Grade 3	Grade 6	Grade 1	Grade 1, Grade 2, Grade 3, Grade 4, Grade 5, Grade 6
Based on the students grade, which topic you prefer to put in the game application?	Grammar	Noun and verb	GO GREEN	Verbs	Grammar

Do you think learning English with game applications will give a benefit to students?	Yes	Yes	Maybe	Yes	Yes
Based on your answer above, state the reasons.	It will increase their interest to learn English	Pupils show their enthusiasm while learning using digital materials compare to traditional one.	EXAM CLASS	Pupils like games	More interactive
Do you think learning English with game applications will give a benefit to teachers?	Yes	Yes	Maybe	Yes	Yes
Based on your answer above, state the reasons.	It will help the teacher as the teaching tools	We can attract pupils' attention to focus on the topic that need to be learnt. Learning in the classroom can be more active if pupils already gain the vocab. from the games app so they can focus on constructing sentences for speaking and writing skills.	FOCUSING ON EXAM	More activities can be done.	The learning process more interesting
How many hours will you give students to play game?	1/2 hour	1/2 hour	1/2 hour	1/2 hour	1 hour
Which platform do you prefer?	Personal Computer (PC)	Personal Computer (PC), Mobile Phone	Personal Computer (PC)	Personal Computer (PC)	Personal Computer (PC)

Comments/Suggestions				Games can motivate pupils to learn.	The Games must have difficulty level
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II. Table below shows the result from the questionnaire that has been distribute to parents. The five survey results had been chosen:










Timestamp	10/18/2018 15:44:16	10/21/2018 19:29:47	10/21/2018 19:40:05	11/18/2018 17:08:26	11/18/2018 17:10:14
Name	ROHAZLIZA	HAFIZAH BINTI RAMLI	Wan nabisah binti wan kadir	Hashimah	Fayadh
How many children do you have in primary school?	1	2	1	4	1
Do you allow your children playing game?	Yes	Yes	Yes	No	Yes
How about the educational game especially in learning English? Do you allow?	Yes	Yes	Yes	Yes	Yes
How many hours will you let your children spending time playing game?	1 hour	2 hours	3 hours	1 hour	3 hours
What topics seem too difficult for your children to learn?	Grammar, Singular or Plural, Pronouns, Verbs, Vocabulary	Grammar	Grammar	Grammar, Singular or Plural, Pronouns, Nouns, Verbs	Grammar, Singular or Plural, Verbs
What skills do you think your children lack of?	Reading, Speaking	Writing	Writing	Writing, Speaking	Reading, Writing, Speaking
Which platform do you prefer?	Mobile Phone	Mobile Phone	Mobile Phone	Personal Computer (PC), Mobile Phone	Personal Computer (PC)
Comments/Suggestion		Please create a game that can build a self confidence & skills	How about mathematics game?		create a game that can attract children to learn english


# APPENDIX D

## APPENDIX D

Table below shows the question module samples in the game for every topics and levels.







TOPIC	LEVEL	QUESTION	ANSWER
Common nouns	Easy	Select people, thing, animal, or place based on the image given:  1) Ball  2) Dog  3) Baker  4) Shoes  5) Playground  6) Doctor  7) Library  8) Cat  9) School  10) Bicycle	1) Thing  2) Animal  3) People  4) Thing  5) Place  6) People  7) Place  8) Animal  9) Place  10) Thing
	Medium	Identify what suitable common nouns used for the image given:	1) Girl  2) Mosque  3) Lion





		<p>1)  ( girl / boy)</p> <p>2)  ( mall / mosque)</p> <p>3)  ( lion / animal )</p> <p>4)  ( Hospital / building)</p> <p>5)  ( book / paper)</p> <p>6)  ( guitar / piano)</p> <p>7)  ( bakery / market)</p> <p>8)  ( cat / dog)</p> <p>9)  ( computer / television)</p>	<p>4) Hospital</p> <p>5) Book</p> <p>6) Guitar</p> <p>7) Bakery</p> <p>8) Cat</p> <p>9) Television</p> <p>10) Doctor</p>
--	--	---	--

		<p>10)  ( doctor / farmer)</p>	
	Hard	<p>Identify what suitable common nouns used based on the sentence given.</p> <p>1) Mother is cooking in the (kitchen, backyard).</p> <p>2) The (lion, zebra) has stripes on its body.</p> <p>3) The new (maid, lady) helps me to mop the floor.</p> <p>4) Let's go shopping at the nearby (building, mall).</p> <p>5) Mother gets many (presents, friends) on Mother's Day.</p> <p>6) The (rabbit, leopard) is a wild animal.</p> <p>7) Qistina wants a red (rope, ribbon) to tie the presents.</p>	<p>1) Kitchen</p> <p>2) Zebra</p> <p>3) Maid</p> <p>4) Mall</p> <p>5) Presents</p> <p>6) Leopard</p> <p>7) Ribbon</p> <p>8) Tailor</p> <p>9) Guestroom</p> <p>10) Sharpener</p>

		<p>8) The (shopkeeper, tailor) has sewn my shirt.</p> <p>9) The visitors are waiting in the (storeroom, guestroom).</p> <p>10) Get the (knife, sharpener) to sharpen your pencil.</p>	
Proper nouns	Easy	<p>Identify which one is the proper nouns.</p> <p>1) Donald / drummer / boy</p> <p>2) Car / Proton Saga / taxi</p> <p>3) Tower / building / KLCC</p> <p>4) Salleh / student / boy</p> <p>5) Tun Fatimah Hospital / hospital / patient</p> <p>6) Park / National Park / playground</p> <p>7) Television / phone / iPhone</p> <p>8) Clifford School / library / canteen</p>	<p>1) Donald</p> <p>2) Proton Saga</p> <p>3) KLCC</p> <p>4) Salleh</p> <p>5) Tun Fatimah Hospital</p> <p>6) National Park</p> <p>7) iPhone</p> <p>8) Clifford School</p> <p>9) Malaysia</p> <p>10) Encik Yusof</p>



		<p>9) Town / Malaysia / country</p> <p>10) Teacher / headmaster / Encik Yusof</p>	
	Medium	<p>Choose suitable proper nouns used for the image given.</p> <p>1)  (man / Santa Claus)</p> <p>2)  (KLCC / tower)</p> <p>3)  (zoo / Zoo Negara)</p> <p>4)  ( Mickey Mouse / mouse)</p> <p>5)  (Malaysia / flag)</p> <p>6)  (park / Disneyland)</p>	<p>1) Santa Claus</p> <p>2) KLCC</p> <p>3) Zoo Negara</p> <p>4) Mickey Mouse</p> <p>5) Malaysia</p> <p>6) Disneyland</p> <p>7) September</p> <p>8) iPhone</p> <p>9) Gambang waterpark</p> <p>10) Shah Alam mosque</p>

		<p>7)  ( September / calendar)</p> <p>8)  (iPhone / telephone)</p> <p>9)  ( park / Gambang Waterpark)</p> <p>10)  ( Shah Alam mosque / mosque)</p>	
	<p>Hard</p>	<p>Identify the error in the sentence and correct it by choosing the answer.</p> <p>1) I live in malaysia.</p> <p>2) She is teaching english language.</p> <p>3) Syahirah is a hardworking girl.</p> <p>4) My sister runs in the park every sunday.</p> <p>5) Ahmad is taking a plane to london.</p>	<p>1) Malaysia</p> <p>2) English</p> <p>3) Syahirah</p> <p>4) Sunday</p> <p>5) London</p> <p>6) Labour Day</p> <p>7) March</p> <p>8) Disneyland</p> <p>9) Tesco</p> <p>10) Clifford</p>

		<p>6) The zoo will be closed on labour day.</p> <p>7) Nina's birthday is in march.</p> <p>8) Lets go to disneyland today.</p> <p>9) We buy our groceries at tesco market.</p> <p>10) Her school name is clifford high school.</p>	
Countable nouns	Easy	<p>Identify the object in the image whether it is countable or uncountable.</p> <p>1) Nurse</p> <p>2) Rice</p> <p>3) House</p> <p>4) Milk</p> <p>5) Car</p> <p>6) Snow</p> <p>7) Uncle</p> <p>8) Blood</p> <p>9) Apple</p> <p>10) Sugar</p>	<p>C – Countable</p> <p>UC – Uncountable</p> <p>1) C</p> <p>2) UC</p> <p>3) C</p> <p>4) UC</p> <p>5) C</p> <p>6) UC</p> <p>7) C</p> <p>8) UC</p> <p>9) C</p> <p>10) UC</p>

	Medium	<p>Choose suitable collective nouns used for countable nouns in a sentence given.</p> <ol style="list-style-type: none"> <li>1) (many, much) ducks.</li> <li>2) (a few, a little) children.</li> <li>3) (some, a little) fruits.</li> <li>4) (more, much) chairs.</li> <li>5) (a lot of, a little) papers.</li> <li>6) (several, much) books.</li> <li>7) (most, much) teachers.</li> <li>8) (many, much) apples.</li> <li>9) (a few, a little) newspapers.</li> <li>10) (some, a little) boxes.</li> </ol>	<ol style="list-style-type: none"> <li>1) Many</li> <li>2) A few</li> <li>3) Some</li> <li>4) More</li> <li>5) A lot of</li> <li>6) Several</li> <li>7) Most</li> <li>8) Many</li> <li>9) A few</li> <li>10) Some</li> </ol>
	Hard	<p>Identify the sentence given is used for countable or uncountable.</p> <ol style="list-style-type: none"> <li>1) A patch of blood</li> <li>2) Two bowls of porridge</li> <li>3) A spoon of oil</li> <li>4) Jar of jam</li> </ol>	<p>All the answers are countable nouns</p>

		<p>5) A dustpan of dust</p> <p>6) A handful of sand</p> <p>7) Some relatives</p> <p>8) A few Malaysian</p> <p>9) More envelopes</p> <p>10) A little gum</p>	
Uncountable nouns	Easy	<p>Identify the object in the image whether it is countable or uncountable.</p> <p>1) Hotel</p> <p>2) Curry</p> <p>3) Durian</p> <p>4) Powder</p> <p>5) Money</p> <p>6) Friends</p> <p>7) Food</p> <p>8) Story books</p> <p>9) Salt</p> <p>10) Bread</p>	<p>C – Countable</p> <p>UC – Uncountable</p> <p>1) C</p> <p>2) UC</p> <p>3) C</p> <p>4) UC</p> <p>5) UC</p> <p>6) C</p> <p>7) UC</p> <p>8) C</p> <p>9) UC</p> <p>10) C</p>
	Medium	<p>Choose suitable collective nouns used for uncountable nouns in a sentence given.</p>	<p>1) Much</p> <p>2) A little</p> <p>3) Some</p>

		1) (many, much) water. 2) (a few, a little) sugar. 3) (some, a few) rice. 4) (more, many) coffee. 5) (a lot of, a few) sand. 6) (much, many) oil. 7) (a few, a little) tears. 8) (some, a few) curry powder. 9) (more, many) butter. 10) (a lot of, a few) noodle.	4) More 5) A lot of 6) Much 7) A little. 8) Some 9) More 10) A lot of
	Hard	Identify the sentence given is used for countable or uncountable.  1) A lot of juice 2) A little coke 3) More syrup 4) Some meat 5) Much water 6) Some relatives 7) Some milk 8) Much cream	1) Uncountable 2) Uncountable 3) Uncountable 4) Uncountable 5) Uncountable 6) Countable 7) Uncountable 8) Uncountable 9) Countable 10) Uncountable

		9) Jar of jam	
		10) A little jelly	

# APPENDIX E



## APPENDIX E

### FUNCTIONAL TEST CASE

User type: Developer

Test scenario	Test Case	Input	Expected Result	Actual Result	Pass (✓) / Fail (X)	Comment
Main Menu	User view the main menu page	null	Able to view the main menu page	Same as expected result	Pass	
	User select Common Nouns	Press 'Common Nouns' button	Able to view Common Nouns selection level page	Same as expected result	Pass	
	User select Proper Nouns	Press 'Proper Nouns' button	Able to view Proper Nouns selection level page	Same as expected result	Pass	
	User select Countable Nouns	Press 'Countable Nouns' button	Able to view Countable Nouns selection level page	Same as expected result	Pass	

	User select Uncountable Nouns	Press 'Uncountable Nouns' button	Able to view Uncountable Nouns selection level page	Same as expected result	Pass	
	User select Options	Press 'Options' button	Able to view options dialogue box	Same as expected result	Pass	
	User select Help	Press 'Help' button	Able to view Help dialogue box	Same as expected result	Pass	
	User select Quit	Press 'Quit' button	Able to view Quit popup message confirmation.	Same as expected result	Pass	
Options	User view the Options dialogue box	null	Able to view the Options dialogue box	Same as expected result	Pass	
	User select music adjustment	Slide to the left	Able to decrease the volume	Same as expected result	Pass	Change the colour to differentiate
	User select music adjustment	Slide to the right	Able to increase the volume	Same as expected result	Pass	Change the colour to differentiate the highlighted slider

	User select main menu button	Press 'Main Menu' button	Able to close the option dialogue box and back to main menu.	Same as expected result	Pass	
Help	User view the Help dialogue box	Null	Able to view the Help dialogue box	Same as expected result	Pass	
	User select Game Control button	Press 'Game Control' button	Able to view game control page	Same as expected result	Pass	
	User select Notes	Press 'Notes' button	Able to view notes page	Same as expected result	Pass	
	User select About Us	Press 'About Us' button	Able to view About Us page	Same as expected result	Pass	
	User select Main Menu	Press 'Main Menu' button	Able to close the Help dialogue box and back to Main Menu.	Same as expected result	Pass	
	User view the game control dialogue box	Null	Able to view the game control dialogue box page	Same as expected result	Pass	
Game Control	User select back button	Press 'Back' button	Able to go back to Help dialogue box	Same as expected result	Pass	

	User select Main menu button	Press 'Main menu' button	Able to close Game control dialogue box and back to Main menu page.	Same as expected result	Pass	
Notes	User view the Notes dialogue box page	Null	Able to view the Notes dialogue box page	Same as expected result	Pass	
	User select Common Nouns button	Press 'Common Nouns' button	Able to view Common Nouns note dialogue box	Same as expected result	Pass	
	User select Proper Nouns button	Press 'Proper Nouns' button	Able to view Proper Nouns note dialogue box	Same as expected result	Pass	
	User select Countable Nouns button	Press 'Countable Nouns' button	Able to view Countable Nouns note dialogue box	Same as expected result	Pass	
	User select Uncountable Nouns button	Press 'Uncountable Nouns' button	Able to view Uncountable Nouns note dialogue box	Same as expected result	Pass	
	User select Back button	Press 'Back' button	Able to close the notes dialogue box and back to help dialogue box	Same as expected result	Pass	

	User select main menu button	Press 'Main Menu' button	Able to close notes dialogue box and back to Main Menu page.	Same as expected result	Pass	
Common Nouns note	User view Common Nouns note information	Null	Able to view Common Nouns note information	Same as expected result	Pass	Please select background that suitable with colour font
	User select back button	Press 'Back' button	Able to go back to Notes dialogue box and close the Common Nouns note dialogue box	Same as expected result	Pass	
	User select Main Menu button	Press 'Main Menu' button	Able to close the Common Nouns notes dialogue box and back to Main Menu page.	Same as expected result	Pass	
Proper Nouns note	User view Proper Nouns note information	Null	Able to view Proper Nouns note information	Same as expected result	Pass	Notes looks crowded

	User select back button	Press 'Back' button	Able to go back to Notes dialogue box and close the Proper Nouns note dialogue box	Same as expected result	Pass	
	User select Main Menu button	Press 'Main Menu' button	Able to close the Proper Nouns notes dialogue box and back to Main Menu page.	Same as expected result	Pass	
Countable Nouns note	User view Countable Nouns note information	Null	Able to view Countable Nouns note information	Same as expected result	Pass	Notes looks crowded
	User select back button	Press 'Back' button	Able to go back to Notes dialogue box and close the Countable Nouns note dialogue box	Same as expected result	Pass	
	User select Main Menu button	Press 'Main Menu' button	Able to close the Countable Nouns notes dialogue box and back to Main Menu page.	Same as expected result	Pass	

Uncountable Nouns note	User view Uncountable Nouns note information	Null	Able to view Uncountable Nouns note information	Same as expected result	Pass	Notes looks crowded
	User select back button	Press 'Back' button	Able to go back to Notes dialogue box and close the Uncountable Nouns note dialogue box	Same as expected result	Pass	
	User select Main Menu button	Press 'Main Menu' button	Able to close the Uncountable Nouns notes dialogue box and back to Main Menu page.	Same as expected result	Pass	
About Us	User view the About Us page	Null	Able to view the information about Grammar Race	Same as expected result	Pass	
	User select back button	Press 'Back' button	Able to go back to Help dialogue box and close the About Us dialogue box	Same as expected result	Pass	

	User select Main Menu button	Press 'Main Menu' button	Able to close the About Us dialogue box and back to Main Menu page.	Same as expected result	Pass	
Quit	User view Quit dialogue box	Null	Able to view Quit dialogue box	Same as expected result	Pass	
	User select Quit button	Press 'Quit' button	Able to exit the game	Same as expected result	Pass	Should add Esc button for exit also
	User select cancel button	Press 'Cancel' button	Able to close the Quit dialogue box and back to Main Menu page.	Same as expected result	Pass	
Level selection page	User view level selection page	Null	Able to view the short note summarise	Same as expected result	Pass	
	User select easy button	Press 'easy' button	Able to go to game field for easy level.	Same as expected result	Pass	
	User select medium button	Press 'medium' button	Able to go to game field for medium level.	Same as expected result	Pass	



	User select hard button	Press 'hard' button	Able to go to game field for hard level.	Same as expected result	Pass	
Game field	User view playing field page	Null	Able to view playing field page	Same as expected result	Pass	
	User move the car	Press up key	Able to move car forward	Same as expected result	Pass	Should slow down the car acceleration
	User move the car to the right	Press right key	Able to move car to the right	Same as expected result	Pass	
	User move car to the left	Press left key	Able to move car to the left	Same as expected result	Pass	
	User brake the car	Press down key	Able to slow down the car and the back lamp turn to red	Same as expected result	Pass	
	User select correct answer	Collide with correct answer object	Receive one (1) mark and correct answer sound played.	Same as expected result	Pass	There are random answers with two (2) marks

	User select wrong answer	Collide with wrong answer object	Receive zero (0) mark and wrong answer sound played.	Same as expected result	Pass	
	User select guideline	Press guideline button	Able to view the guideline popup message box.	Same as expected result	Pass	The note is short, might not help players
	User select volume button	Press volume button	Able to mute the sound	Same as expected result	Pass	There are some noises cannot be mutes
	User select setting button	Press setting button	Able to view setting dialogue box.	Same as expected result	Pass	
	User finish the game	Collide with finish line	Able to view score	Same as expected result	Pass	
	User view player's score	Null	Able to view score	Same as expected result	Pass	Should state the score rating
	User select restart level button	Collide with 'Restart Level' button	Able to restart the level again	Same as expected result	Pass	

	User select main menu button	Collide with 'Main Menu' button	Able to go to Main Menu page.	Same as expected result	Pass	
	User select next level button	Collide with 'Next Level' button	Able to go to playing field for the next level.	Same as expected result	Pass	

# APPENDIX F

## APPENDIX F






### User Acceptance Test (UAT)

Name: Mohd Azrulfazli Bin Shamsudin

Position: Teacher

Child's School: Sekolah Kebangsaan Kg Kaung

Please tick (/) in the column given.

Questions	 Very Disagree	 Disagree	 Neutral	 Agree	 Very Agree
1. All the functions work properly.  <i>1. Semua fungsi beroperasi dengan baik.</i>					/
2. The language used is easy to understand.  <i>2. Bahasa yang digunakan senang untuk difahami.</i>				/	
3. This game is interesting and exciting.  <i>3. Game ini sangat menarik dan menyeronokkan.</i>					/
4. The interface design is attractive/appropriate  <i>4. Reka bentuk paparan sangat menarik/sesuai</i>					/

5. The music background is fun.  5. <i>Latar belakang music adalah menyeronokkan.</i>					/
6. The game tracks are interesting.  6. <i>Litar permainan adalah menarik.</i>					/
7. My knowledge in Grammar is increasing  7. <i>Pengetahuan saya dalam tatabahasa semakin meningkat.</i>					/
8. The questions are easy.  8. <i>Semua soalan adalah senang.</i>				/	
9. The questions are clear and easy to understand.  9. <i>Soalan-soalan adalah jelas dan mudah difahami.</i>				/	
10. The instructions are clear and helpful.  10. <i>Arahan adalah jelas dan membantu.</i>				/	
11. This game is easy to play.  11. <i>Game ini senang dimain.</i>				/	
12. After I play this game, my enthusiasm to learn Grammar is increasing.  12. <i>Selepas bermain game ini, semangat saya untuk belajar tatabahasa semakin meningkat.</i>					/
13. I can score almost all the questions.				/	

<p>13. <i>Saya dapat menguasai hampir semua soalan.</i></p>					
<p>14. I find it hard to control the car while answering the questions.</p> <p>14. <i>Saya mendapati sukar untuk mengawal kereta sambil menjawab soalan.</i></p>		/			
<p>15. The notes given are helpful.</p> <p>15. <i>Nota yang diberikan adalah sangat membantu.</i></p>					/
<p>16. I can finish all the level at one time.</p> <p>16. <i>Saya boleh selesaikan semua level dalam satu masa.</i></p>				/	






## User Acceptance Test (UAT)

Name: Imarawati Binti Rashid

Position: Parents

Child's School: Sekolah Kebangsaan Indera Mahkota Utama

Please tick (/) in the column given.

Questions	 Very Disagree	 Disagree	 Neutral	 Agree	 Very Agree
17. All the functions work properly. <i>15. Semua fungsi beroperasi dengan baik.</i>					/
16. The language used is easy to understand. <i>18. Bahasa yang digunakan senang untuk difahami.</i>					/
19. This game is interesting and exciting. <i>17. Game ini sangat menarik dan menyeronokkan.</i>					/
18. The interface design is attractive/appropriate <i>20. Reka bentuk paparan sangat menarik/sesuai</i>					/
21. The music background is fun. <i>19. Latar belakang music adalah menyeronokkan.</i>					/



20. The game tracks are interesting.					/
22. <i>Litar permainan adalah menarik.</i>					
23. My knowledge in Grammar is increasing					/
21. <i>Pengetahuan saya dalam tatabahasa semakin meningkat.</i>					
22. The questions are easy.					/
24. <i>Semua soalan adalah senang.</i>					
25. The questions are clear and easy to understand.					/
23. <i>Soalan-soalan adalah jelas dan mudah difahami.</i>					
24. The instructions are clear and helpful.					/
26. <i>Arahan adalah jelas dan membantu.</i>					
27. This game is easy to play.					/
25. <i>Game ini senang dimain.</i>					
26. After I play this game, my enthusiasm to learn Grammar is increasing.					/
28. <i>Selepas bermain game ini, semangat saya untuk belajar tatabahasa semakin meningkat.</i>					
29. I can score almost all the questions.					/
27. <i>Saya dapat menguasai hampir semua soalan.</i>					
28. I find it hard to control the car while answering the questions.	/				

<p>30. <i>Saya mendapati sukar untuk mengawal kereta sambil menjawab soalan.</i></p>					
<p>31. The notes given are helpful.</p> <p>17. <i>Nota yang diberikan adalah sangat membantu.</i></p>					/
<p>18. I can finish all the level at one time.</p> <p>32. <i>Saya boleh selesaikan semua level dalam satu masa.</i></p>					/






## User Acceptance Test (UAT)

Name: Wan Nur Dania binti Rosuhaimi

Position: Student

Child's School: Sekolah Kebangsaan Kg Kaung

Please tick (/) in the column given.

Questions	 Very Disagree	 Disagree	 Neutral	 Agree	 Very Agree
33. All the functions work properly.  <i>29. Semua fungsi beroperasi dengan baik.</i>					/
30. The language used is easy to understand.  <i>34. Bahasa yang digunakan senang untuk difahami.</i>			/		
35. This game is interesting and exciting.  <i>31. Game ini sangat menarik dan menyeronokkan.</i>					/
32. The interface design is attractive/appropriate  <i>36. Reka bentuk paparan sangat menarik/sesuai</i>					/
37. The music background is fun.  <i>33. Latar belakang music adalah menyeronokkan.</i>					/

34. The game tracks are interesting.					/
38. <i>Litar permainan adalah menarik.</i>					
39. My knowledge in Grammar is increasing				/	
35. <i>Pengetahuan saya dalam tatabahasa semakin meningkat.</i>					
36. The questions are easy.				/	
40. <i>Semua soalan adalah senang.</i>					
41. The questions are clear and easy to understand.			/		
37. <i>Soalan-soalan adalah jelas dan mudah difahami.</i>					
38. The instructions are clear and helpful.				/	
42. <i>Arahan adalah jelas dan membantu.</i>					
43. This game is easy to play.					/
39. <i>Game ini senang dimain.</i>					
40. After I play this game, my enthusiasm to learn Grammar is increasing.					/
44. <i>Selepas bermain game ini, semangat saya untuk belajar tatabahasa semakin meningkat.</i>					
45. I can score almost all the questions.			/		
41. <i>Saya dapat menguasai hampir semua soalan.</i>					
42. I find it hard to control the car while answering the questions.	/				

<p>46. <i>Saya mendapati sukar untuk mengawal kereta sambil menjawab soalan.</i></p>					
<p>47. The notes given are helpful.</p> <p>19. <i>Nota yang diberikan adalah sangat membantu.</i></p>					/
<p>20. I can finish all the level at one time.</p> <p>48. <i>Saya boleh selesaikan semua level dalam satu masa.</i></p>					/

# APPENDIX G

## APPENDIX G

Below is the user manual guide for Grammar Race application.



### User Manual Guide

#### WHAT IS GRAMMAR RACE?

Grammar race is a serious game for educational purpose in learning English especially in Grammar topics. It is a web-based game application.

#### SYSTEM REQUIREMENTS

##### Minimum System Requirements:

OS: Windows 7 SP1+ with DirectX 9.0c

CPU: Pentium III with 600 MHz

RAM: 128 MB

Graphic Card: DirectX-Compatible Graphic card with a minimum of 32 MB Ram

Sound Card: DirectX-Compatible Soundcard

CD-ROM: 2-fach Speed

Hard Disk Space: 270 MB of free discspace

## Recommended System Requirements:

OS: Windows 8 / 10 with DirectX 9.0c

CPU: Pentium 4 with 1.500 MHz RAM: 512 MB

Graphic Card: DirectX-Compatible Graphic card with a minimum of 64 MB Ram

Sound Card: DirectX-Compatible Soundcard

CD-ROM: 40-fach Speed

Hard Disk Space: 270 MB of free disk space

## INSTALLATION

1. Start your computer.
2. Place the CD-ROM into your CD-ROM drive. The Auto run feature of your PC should start installation automatically.
3. If Autorun is disabled or the CD does not automatically install, click Start, Run, type D:\setup (where 'D' is your computer's CD-ROM drive), and click OK.
4. Follow the installation instructions on your screen
5. To start the game, navigate to the Grammar Race program through your Start menu or double-click on the Grammar Race icon on your desktop.

## THE GAME SCREEN





Let's go over the symbols that are permanently fixed on all game screens first.

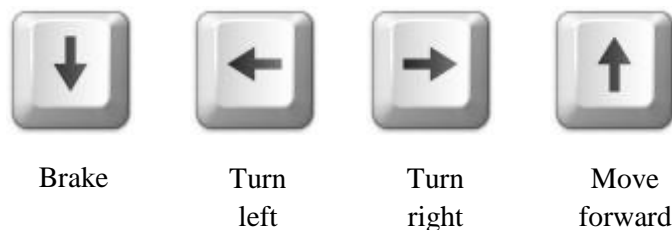
Along at the bottom left of the monitor is the instruction panel. This is where the instruction given to guide the player.

At the right bottom of the screen, there three buttons that represent guideline, mute and setting button. Guideline button will show the short notes that can help player to complete the task game. Next, is the mute button is to mute the sound and setting button content the music volume setting and some buttons.

After that, along the higher edge of the monitor are the panels for score, title and timer. At the score panel it will show the score player get and timer panel will count the time as soon as player start the game. Lastly in the middle is the game title and level.

Let's move on to the game screen.

## THE GAME WORLDS



Now we get to the actual game area. When you begin the game, you start off at the start line at the racetrack. By clicking on the up arrow keyboard, the car will start moving

forward. Thus, the player has to control the car using left and right keyboard and down keyboard to brake the car.

When you finish answering all the questions, you will get to the finish line to record the time taken. The score will be shown after the finish line. Lastly, you can either continue to the next level or restart the game again. Otherwise, you can quit the game by going back to the main menu.

## THE MAIN MENU



Ready to start? The last thing we will talk about is the menu system.

When you start Grammar Race, you will be presented a main menu that allows you to start new games. You can reach this menu again at any time, by pressing the Main Menu button.

### Common Nouns game

Common Nouns game is a game that content questions about common nouns topic.

### Proper Nouns game

Proper Nouns game is a game that content questions about proper nouns topic.

### Countable Nouns game

Countable Nouns game is a game that content questions about countable nouns topic.

**Uncountable Nouns game**

Uncountable Nouns game is a game that content questions about uncountable nouns topic.

**Options**

Options is where to control the music setting.

**Help**

Help contains the game control guideline, notes and About Us.

**Quit**

To quit the game of course.