English School Mate

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Department of Information Technology

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September 2020

Declaration

Declaration of Candidates

"We declare that this is my own work and this dissertation does not incorporate without acknowledgement of any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. Also, I hereby grant to Sri Lanka Institute of Information Technology, the non-exclusive right to reproduce and distribute my dissertation, in whole or in part in print, electronic, or other media. I retain the right to use this content in whole or part in future works (such as articles or books)."

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Abstract

This research paper aims to develop an English language learning application for the students of Sri Lanka to overcome with their difficulties of learning English language in their secondary school education. Students can easily engage with English materials. According to that research in rural areas students are not able to learn English because of many basic environmental issues. In here students will be able to improve their English spoken, writing abilities and improve their brain improvements and also there is an activity controller and prediction system to student's guide. Machine learning technologies, speech recognition, bitmap and unity 3d are highly used here. This paper proposes a unified methodology to develop English knowledge and improve the student brain in a productive manner.

Keywords - Machine Learning, speech recognition, bitmap, unity 3d, brain improvement

Acknowledgement

With the expansion of modern technology, the lifestyle of people is mostly managed and relied on their computers and mobile phones to an increasing extent. On that premise, File classification is a technique in modern storage systems and can be introduced as a hierarchical arrangement of classification levels and it allows files to be stored in the most efficient approach. The principle idea is to use file properties such as date and time the file was created, size of the file, owner and access patterns and classify files at the very step of folder creation. Machine learning technologies are highly used to achieve the utmost goal of classifying files in an effective manner. This research proposes a unified methodology to classify and secure data with the aid of security levels. However, It is an important requirement to analyze data before classifying in order to get a clear understanding about the data that is about to be classified. Once files are analyzed, they are categorized as Image Files or Text Files. Moreover, appropriate measures will be taken to prohibit accessing files in lower security level to another higher security level without proper authorization. It is a major goal to update from the current security level of the file after each modification to improve accuracy. This proposed model is a single integrated based hybrid data classification system which is developed using High level Microservice architecture to prevent intentional or unintentional misbehaviors and results are captured as a part of this research.

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List of Abbreviations

API	**Application Program Interface**
DB	**Database**
UI	**User Interface**
ML	**Machine Learning**

Introduction

Background

We develop an English language learning application for the students of Sri Lanka to overcome their difficulties of learning English language in their secondary school education. Students can easily engage with English materials. Students face many challenges in attaining English proficiency. Some of the biggest challenges are limited language instruction and limited exposure to the second language. It is therefore important to find innovative ways to support learners by extending language learning and instruction outside the classroom and providing opportunities for more exposure. technologies have the potential to support second-language learning, by providing autonomous learning opportunities and access to learning materials learning application in particular are capable of opening many possibilities for language learners.in rural areas students are not able to learn English because of many basic environmental issues. In here students will be able to improve their English spoken, writing abilities and improve their brain improvements and also there is an activity controller and prediction system to student's guide. Machine learning technologies, speech recognition, bitmap and unity 3d are highly used here. This is a unified methodology to develop English knowledge and improve the student brain in a productive manner. Language is one of the medium of expressing our ideas, feelings and emotions. And if we think about language in present world then English is one of the most used languages in the world and English is used as a second language in sri lanka English is introduced here at the primary level and its inclusion continues till the tertiary level of education. Most of the students in rural areas are weak in English language due to lack of skilled and trained teachers who are familiar to the modern methods and approaches of teaching and lack of materials for teaching in the classroom. Primary level English curriculum implementation is essential to achieve the set English language competency in the rural areas. Students in the rural areas are performing poorly in English compared to their urban counterparts. The present digital technology has influenced the modern era with its new innovations and discoveries where the human beings are enjoying the fruits of these technologies that changed the way of their lives and make convenient for them to lead a comfortable and happy life. The contemporary scientists are still endeavoring in inventing new

things to bring radical changes in almost all fields. It leads the human beings to do their activities in a simplified and easy way while they perform some tasks. Due to these changes in almost all the fields, human beings are now thinking of constructing houses even in the space. These changes also reflect in the field of technology and humans enjoy using these technologies by communicating with their friends and relatives who are in the other regions of the world. As technology advances, there have many changes in almost all the areas. Many countries have advanced their studies in science and technology and machines are doing the work of humans. The dawn of technology resulted in globalization of trade and commerce and now the corporate and large-scale industries are capable of competing with the other business organizations around the globe. Technology also helped many people in getting better employment opportunities, especially, many software professionals are settling down in their jobs all over the globe. Technology is also of great use in the field of education where most of the students as well as the teachers depend on online resources and the available innovations in education. With the advent of the internet, the teachers are able to use some useful websites to retrieve information about their topics and even some learners also browse the net in order to get their doubts clarified. The twenty-first century brought many radical changes in communication as well as information technology also. As a result, most of the people are now-a-days carrying portable devices with them like laptops, notebooks, tablets, palmtops, smart watches, mobile phones, iPads, thumb drives, pagers, etc. wherever they go. With the development of learning technologies in the late 20th century, education system has changed rapidly. This is due to the capability of technology to provide a proactive, easy access and comprehensive teaching and learning environment. Nowadays, Ministry of education in all over the world has provide a lot of facilities and training in order to enhance the use of advanced technologies in the countries' teaching and learning process. A high budget has been placed in order to provide the equipment needed by teachers to improve the education system. Despite all the efforts, most of the countries are facing similar problem whereby the teachers are not maximizing the usage of the technology provided.

1) To surround schools with dynamic and innovative learning environments for students to become more motivated and creative

2) To enable students to gain wider range of knowledge and be able to access to internet for developing a global outlook

3) To nurture students with capabilities of processing information more effectively and efficiently

4) To develop students with attitudes and capability of life-long learning

Researchers have broken down the methodology into 4 main components in order to cover up this research problem.

1. Brain Development Game

2. Written English Module

3. Spoken English Module

4. Activity Prediction Controller Panel

Sri Lanka is a small country with both rural and urban areas. If we talk about urban areas in sri lanka , they are well developed and these area people have all the requirements for their living. And if we talk about education sector in urban areas, they have all the learning sources and good well developed schools. But in the rural areas we can identified many problems. If we talk about rural areas education sector, we can identify problems like less learning resources, and they have not so well developed schools. So there is a huge difference between rural and urban areas education sector. So, in this study we try to reduce that difference using information technology. That means using the information technology we can do distance learning mechanisms. That means by using application on a smart phone we can remotely connect and can do information sharing. In this study we took English language as our subject and we make a mobile application to learn English. But our target group is grade 6 students. So, we need to teach English using interesting way. As a solution for that matter we use a mobile game to teach English. Actually, we use mobile game to teach vocabulary to the students

Absence of capability in English knowledge is one among the main reasons for joblessness. The main proof for this is that the lack of English knowledge has become one major boundary for graduates to seek job opportunities especially within the private sector. Henceforth, the private

sector wants to use non-graduates with great language skills, contrasted with graduates. English language skills is an empowering influence for professional success and social relationships. Comparatively a very large portion of the undergraduates understand the importance of English language skills when they run behind jobs. It is frequently past the purpose of no return at that time. Enhancing English language skills is a huge commitment and a long lasting learning practice. The students must perceive the importance of English, build up a program to gain all the skills, and adequately utilize all the accessible assets. In contrast, although the Importance of English language is discussed in many forums around Sri Lanka, the number of steps taken by state and non-state organizations to uplift the English proficiency level is minimal. Especially the students who are in rural areas are not met with the requirements to improve their English language skills. The main focus of this research is to present an integrated solution to improve all the main aspects of English Language while preserving the interest of students to learn. This also introduces an Instructor Dashboard to help mentors visualize results easily and to predict student proficiency levels. This document is based on the Written English module which is one of the components of the above mentioned integrated solution.

English language education must be attention at the first level, junior secondary level and senior secondary level of all schools. All told schools, students must incline the chance, no matter socio-economic and regional differences, to accumulate a level of English proficiency that aids them in instruction and career advancement [7]. Access to English education across the country is partly determined by the supply of teachers who are well trained in teaching English to students. The allocation of teachers to different schools determines access to English learning skills for college kids across the country. Disadvantaged schools or schools in extremely rural areas of the country require good English teachers. As well as many of the problems they have to fulfill their education. Some of those are lack of teaching methods, physical distance of students to school, difficulty finding teachers interested in relocating, poor connection and poverty [1]. This research proposes a solution to help mainly rural area students to learn English language entertainingly. So the main focus is to present an integrated solution to improve all the main aspects of English Language while preserving the interest of students to learn. This also introduces an Instructor Dashboard to help mentors visualize results easily and to predict student proficiency levels. This document is

based on the Spoken English module which is one of the components of the above mentioned integrated solution.

Since online learning can generate large amounts of records in students' learning process, it provides an effective way to get a deep understanding of students' learning behaviors and predict their academic performance. Due to the benefits of online learning, more and more schools combine with online education to achieve better teaching results. In this study, data is collected from anonymous students. The dataset records the students details like student term test marks their preference for the English activities, students background details like family, parents occupation, school their online learning And entertaining activities. Due to the absence of face-to face meetings, web-based systems is most important.. Other factors were the student's financial status, which was captured according to the area they live in and whether they commuted to school or not.A set of additional institutional factors such as program of study and fee type and other factors such as address and gender were used at the early stage of the analysis, but then removed due to redundancy or weak correlation to the prediction model. The students enrolled at the school come from various states with different education profiles and have also had different levels of success measured consistent with average grades at schools or state examinations. This, along with their current engagement, probably affects their success within the early phase of their studies. Predicting the success of students within the early phase of their studies helps faculties in directing more activities to less performing students so on improve their success. Analyzing academic success is important for education, on condition that the strategic planning of study programs implies expanding or reducing the scope or depth of the curriculum further as modifying the English language depending on student achievements. A lot of research observes academic success generally, like success in individual courses or groups of courses or within the individual phases of studying, bushed terms of current variables like commitment to studying, fulfillment of obligations, quality of delivered educational processes, perceived difficulty of the curriculum and different socio-demographic variables (place of residence, gender, income, habits). Rarely have we undertake scientific observation of success in high school, especially in individual subjects, or success within the state exam and completion of the school curriculum. It's our opinion that these factors can have an enormous influence on students' success within the early phase of upper education because they contain acquired knowledge, work habits and attitudes towards studying.

Therefore, success in high school is included within the suggested model so as to investigate its influence on the output variable

Literature Survey

When collecting information about our proposed system, First we gather information about previously done research projects using published research papers. But at this point we did not find a research project that was similar to our proposed system. So, we have found information about previously done research component by component. So, the very first component of our system is the Game module. Game developing is one of the major developing areas in information technology. Game making is a creative art. So, developers make their games using their creativity. Game developers use different game making softwares to make their games. Android studio, Unity 3D, Unreal game engine are few major softwares that game developers are mainly used.

- **Xiye Feng and Meihui Xu, " 2D mobile game platform Based on the android system"[1]**
  Nowadays in the world there is a rapid development in smartphones. Because of that the Android platform became more popular among smartphones. And also the mobile games based on the android became more popular in the world. In this paper Andengine engine was used to develop the game. In this game platform they use mainly four functions.

    1. **Andengine engine module** : It is responsible for the scene creation, initialization of characters and touch screen monitor about the game.
    2. **The game interface module**: responsible for control interface implementation.
    3. **Data storage module**: the game use shared preferences storage of data.
    4. **Audio and Video playback module**: video part responsible for the opening of the animation playback of the game. And the voice control responsible for game background music playback.

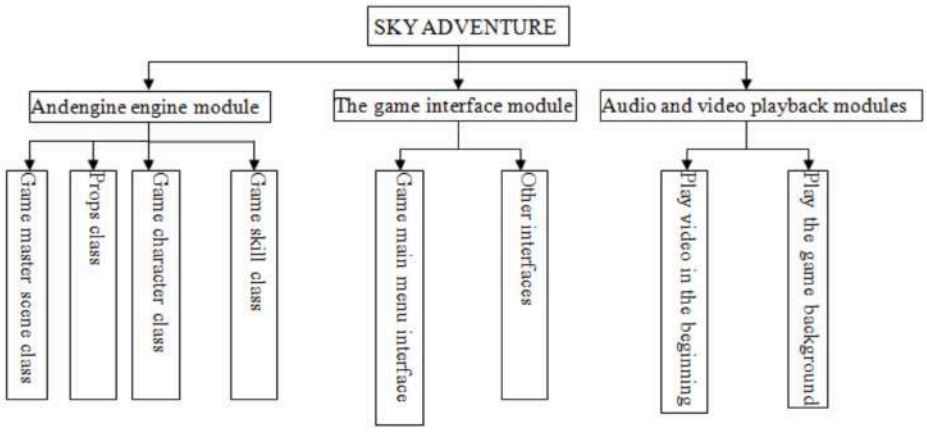


Figure I: basic flow chart of the game.

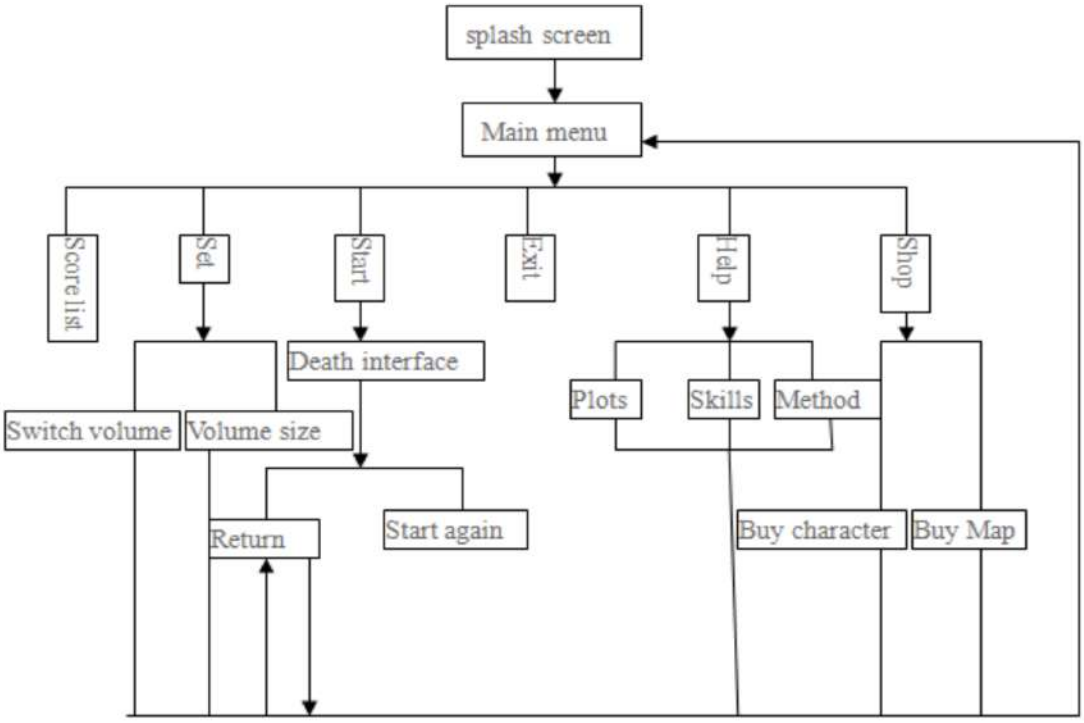


Figure II: basic flow chart of the game.

- **Monther M.Elaish, Norjihan Abdul Ghani, Liyana Shuib, and Ahmed Al-Haiqi, " Development of mobile game application to boost students' motivation in learning English vocabulary. "[2]**

This study have been done to motivate students to learn English in Arab countries. In this study they mainly focused on English vocabulary learning. In here they have use digital gaming, such as mobile games to improve students' English vocabulary. In here they finally developed a game to successfully motivate the Arab students to learn English as their secondary language.

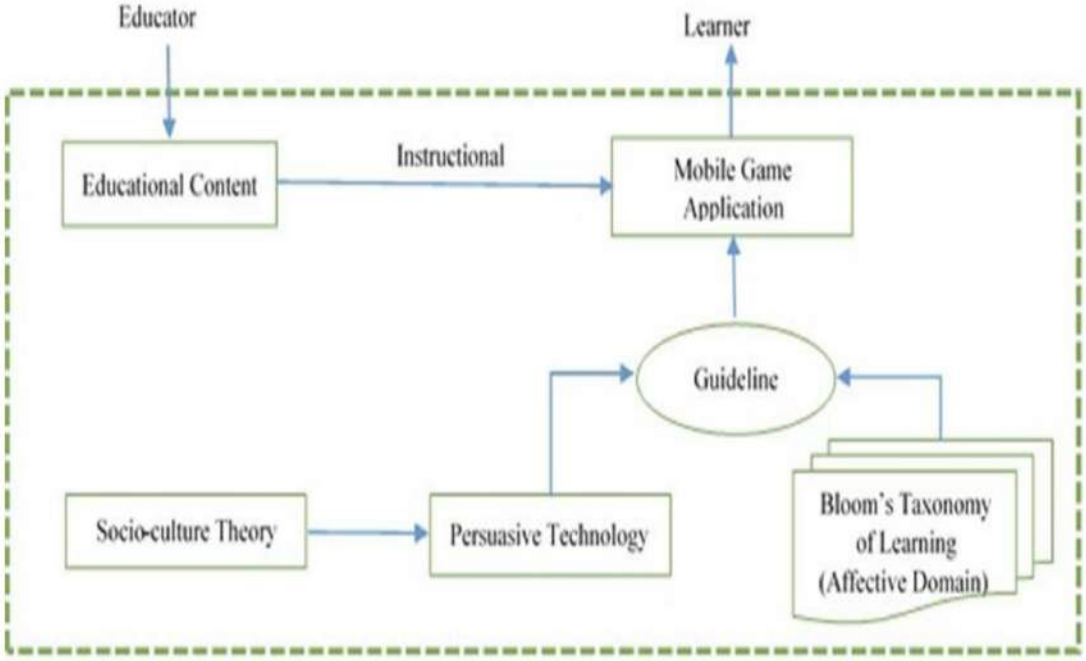


Figure III: -Game framework

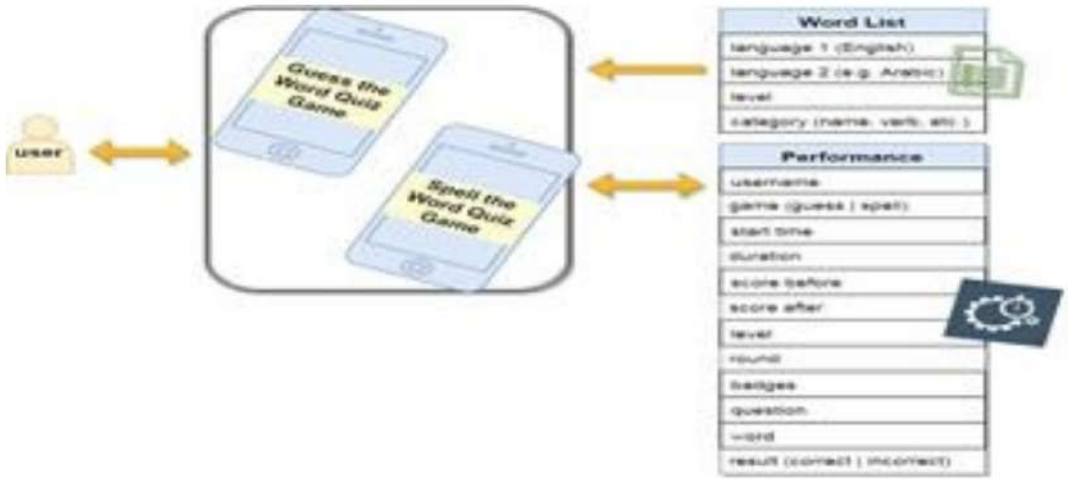


*Figure IV:*System architecture

Anyone wants a language to communicate with others so speaking is one of the major parts in any language. Speaking English allows you to truly broaden your world, from job opportunities to the flexibility to relate to people from every country. Knowing the language makes it way more interesting every trip. Education is incredibly important to enhance yourself but learning English also improves the standard of life.

● ***Yuichi Ono, Takumi Ishii, Akio Ohnishi "Construction of a Voice-based Asynchronous Communication System Utilizing Speech Recognition and Its Potential for EFL Learners' Speaking Ability: A Pilot Study"[3]***

The present paper deals with the construction of an asynchronous voice-based computer mediated communication (CMC) system for less confident English as a Foreign Language learners. The results from this pilot evaluation of the system are discussed in terms of its usability and effectiveness at reducing foreign language anxiety. The proposed system incorporates a browser-driven Automatic Speech Recognition (ASR) into a blog to provide real-time feedback on their pronunciation before posting. With the results from the questionnaire survey conducted in this pilot study, we demonstrate that this system

reduces foreign language anxiety in speaking and increases motivation for less motivated learners. [3]

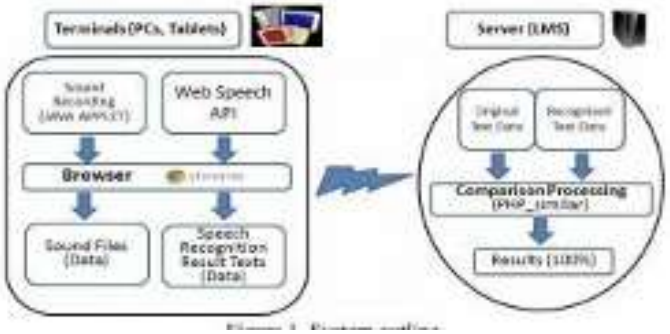


Figure V: System outline

1. Use of Web Speech API - As a speech recognition tool, the system Speech API, which was formulated by the W Consortium. Google Chrome was selected for the pilot study because it offers partial technology. For sound recording, Java apply Multiple, simultaneous processing of sound voice recognition was made possible b JavaScript. [3]

Valéria Farinazzo Martins, Eduardo Lombardi, Luana Felix da Silva, Marcelo dePaiva Guimarães "Using the recognition and speech synthesis to assist the practice of English pronunciation "[4]

Recognition and voice synthesis systems have been used in diverse situations, such as by phones, GPS´s, games and consumer services. This is because speaking is inherent in human beings which makes it a user-friendly computer interface. This paper aims to present a mobile application (Talk2Practice) based on recognition and voice technology to support English pronunciation teaching. In order to evaluate the usability of this application, tests were performed with 19 users.[4]

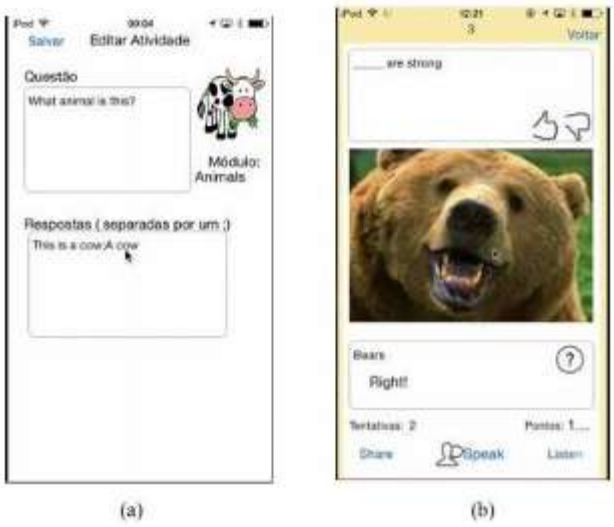


Figure VI: Interfaces of the Talk2Practice system

Rebecca Hincks "Using speech recognition to evaluate skills in spoken English"[5]

This paper analyzes some of the results of the use of PhonePass, a telephone-based test of spoken English that uses automatic speech recognition. It finds that the test provides sensitive measures of speech rate and phonetic accuracy.

The PhonePass Test

The PhonePass test uses automatic speech recognition to assess facility in spoken English. It is designed as a simple way for organizations to test the English skills of potential employees or students. To administer the test, an organization purchases test papers from Ordinate Corp. Each test paper is unique, though the items are recombined to make other tests. To take the test, the examinee calls a phone number in California and is connected with a computer. The examinee enters his test paper number on the telephone keypad and then follows instructions. The test results are soon available on the company website. The test consists of five parts. This paper concerns results derived from Part A, Reading, where the examinee is instructed to read a set of sentences. The recognition engine can assess how the examinee's pronunciation of each word in the sentence compares with acceptable pronunciations, and measure the rate at which the examinee reads. The speech processing used by Ordinate Corporation was trained with the speech of native speakers and adapted

for use by nonnative speakers. It uses forced alignment to locate the relevant parts of the speech signal, an HMM-based speech recognizer, a pronunciation dictionary, and an expected-response network constructed from responses collected in over 4000 administrations of the test (Bernstein 1999) [5].

Reading Fluency

In Part A, Reading, the examinee is asked to read aloud eight of the twelve sentences on the test paper. Data gathered from this part of the test determine the scores for two subscores: Reading Fluency and Pronunciation (Townshend 1998) [5].

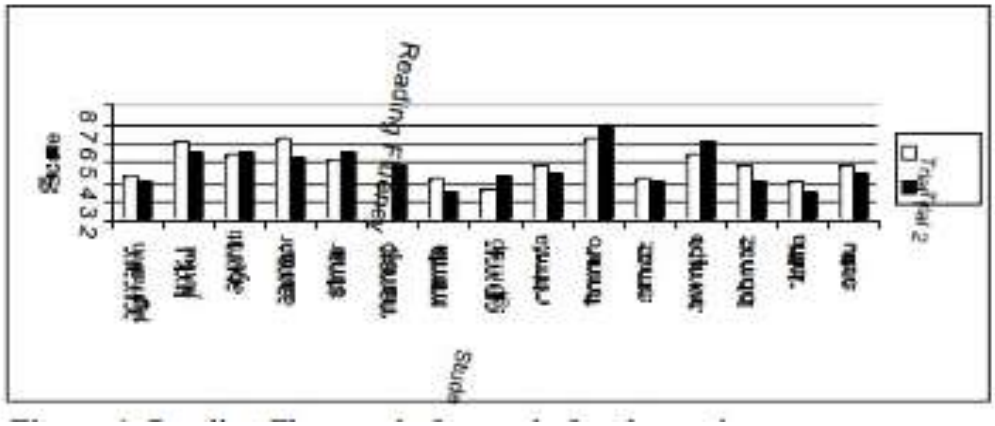


Figure VII: Reading Fluency, before and after, by student.

The lowest score shown in Figure 1 was Mrmfa's second trial. The highest result was Tmmro's second trial. Coincidentally, these two tests contained three sentences in common. Examinee Tmmro, with a score of 6.9, read these sentences twice as quickly as Mrmfa, who had a score of 3.5. Table 1 shows the sentences and the speed at which they were read [5].

Sentence	Tmmro2 (6.9)	Mrmfa2 (3.5)
"It's really expensive, but his friends eat there a lot."	4.06 seconds	7.92 seconds
"He gives them a pretty big discount."	2.05 seconds	3.89 seconds
"And they, in turn, always leave him a generous tip."	3.66 seconds	7.42 seconds
Total	9.77 seconds	19.23 seconds

Table I: Reading speed for selected utterances, best and worst scoring students

Pronunciation

Part A of the PhonePass test also provides data for the Pronunciation subscore. Students' before and after results on the pronunciation subscore are shown in Figure

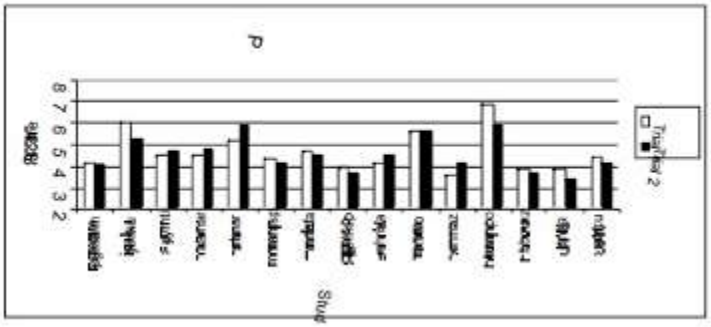


Figure VIII: Pronunciation subscore, before and after, by student.

Bwmpo's Pronunciation score can have been pulled down by the fact that the second set of sentences contained more words that he had particular problems with. The positive effect of the more natural prosody present in the second trial is not reflected in this score, though it can be seen in Figure 1 that his Reading Fluency score increased by more than half a point [5].

Error	First trial (score 6.9)	Second trial (score 5.9)
devoicing final /z/, /d/, /v/	9 out of 11 possible	13 out of 15 possible
/h/>[x]	2 out of 5 possible	7 out of 10 possible
Total (for these phonemes)	11 out of 16 possible	20 out of 25 possible

Table II: Bwmpo errors

Our proposed solution has a component called a writing module. Below on this chapter is discussed about previously done few research projects areas about writing module generation and what are the technologies and algorithms they used.

N. Doghonadze, E. Pipia, A. Aliyev "THE DEVELOPMENT OF ENGLISH AS A FOREIGN LANGUAGE WRITING SKILLS THROUGH THE APPLICATION OF MOVIES SUPPORTED BY EDUCATIONALTECHNOLOGIES"[6]

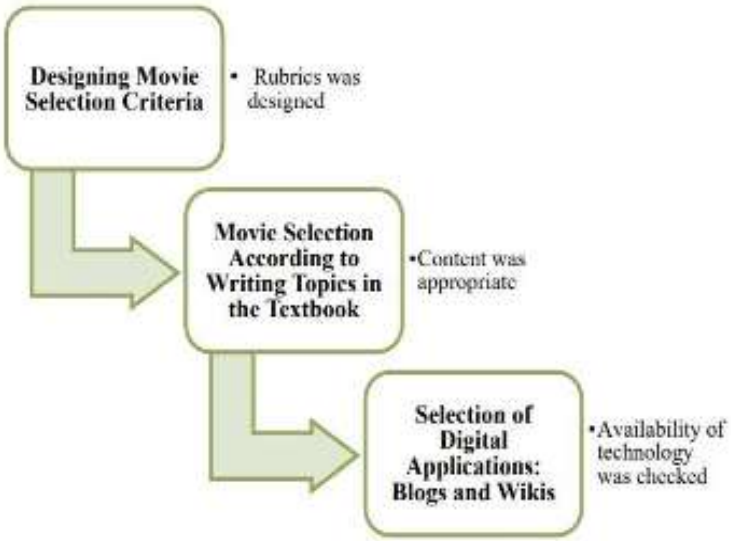


Figure 1. Designed Model for the Experiment- Step1.

Figure IX: Design model for the experiment – Step 1

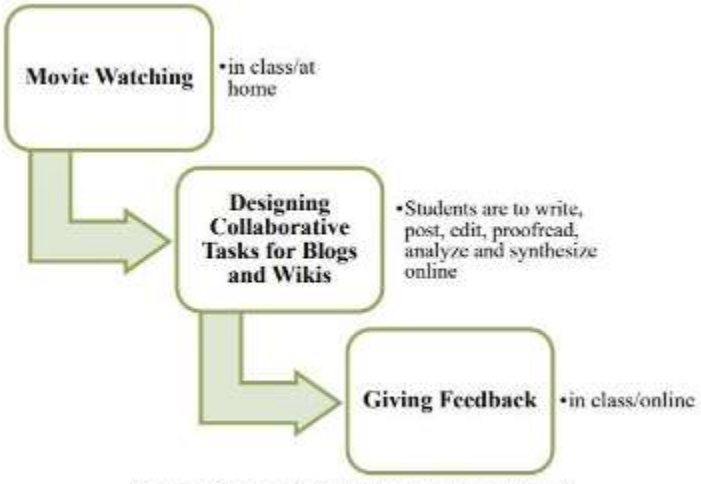


Figure 1 Designed Model for the Experiment- Step 2.

Figure X: Design model for the experiment – Step 2

Table 1 Mean Tests Results (2015-2016 Spring).

	Pre-Test	While-test 1	While-test 2	Post test
Experimental group I	**22.21**	**24.69**	**25**	**27.01**
Control group I	22.18	22.78	24	24.68

Table III: Mean test result

Ali Muftah ,Ben Omran ,Mohd Juzaiddin Ab Aziz" AUTOMATIC ESSAY GRADING SYSTEM FOR SHORT ANSWERS IN ENGLISH LANGUAGE"[7]

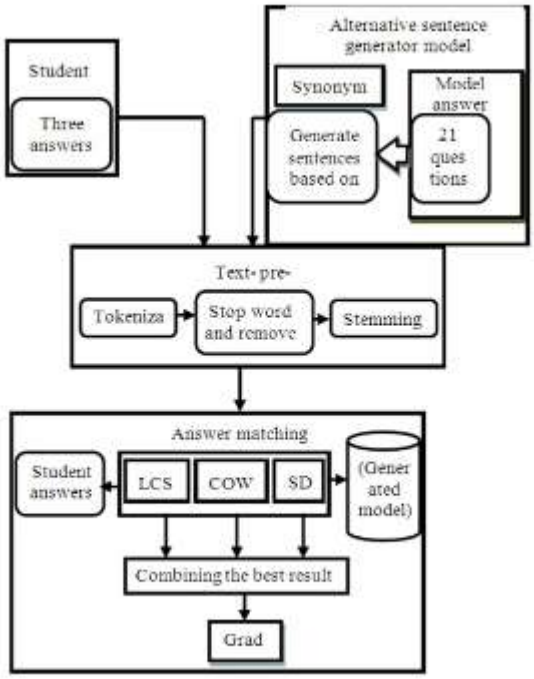


Fig. 1. Architecture of AEG system for short answer in English language

Figure XI: Architecture of AEG system

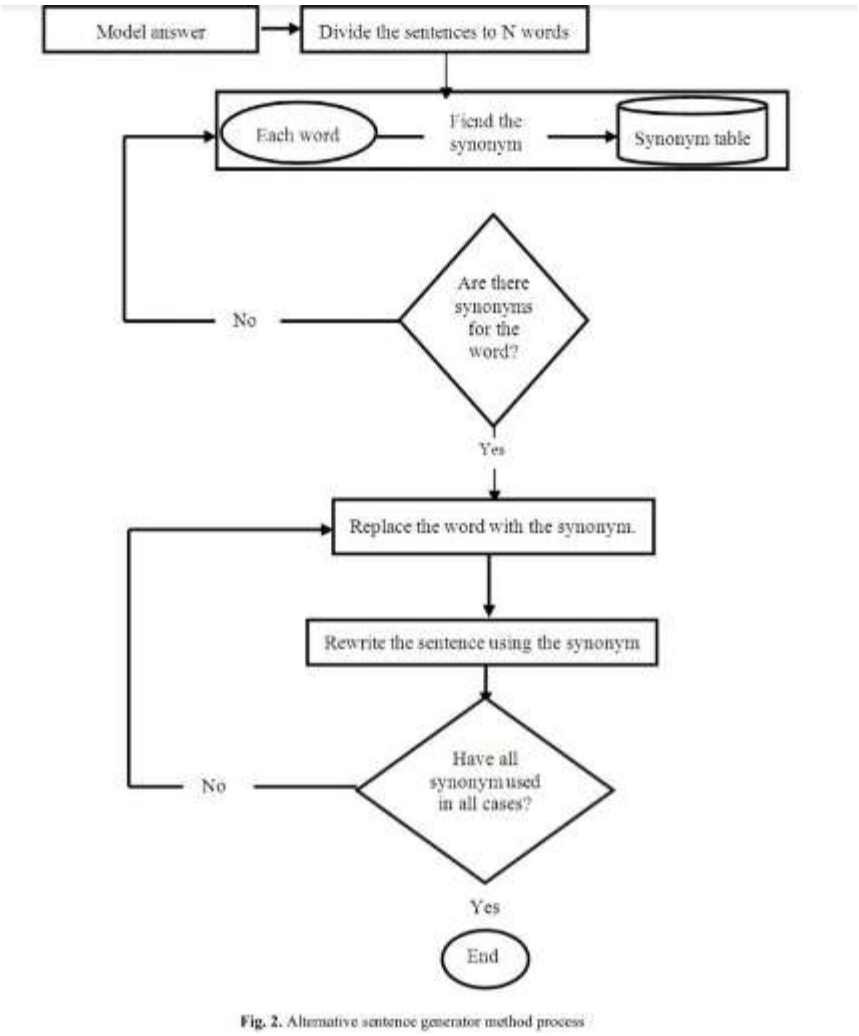


Fig. 2. Alternative sentence generator method process

Figure XII: Alternative sentences generator method

Identification of aspects in Written English

Practically every employment will require some level of Written English abilities, regardless of whether it is sending messages, composing updates or giving briefs and reports. The capacity to convey briefly and clearly using written aspects guarantees that everybody you work with comprehends what you are going to express. Written English skills can be considered as those which are important to express what is on your mind using written aspects such as letters and emails. Although it seems to be equal compared to the verbal language, written language differs a lot compared to verbal language rules. The verbal language utilizes body movements and tone while written language depends on syntax, punctuations and word decision. It is important to notice that to develop Written English skills, it requires practice, time and interest. Since Written

English skills are so significant nowadays, it is also important to make an effort to improve them. The Written English language is composed of 5 major key elements as discussed below.

Figure XIII: 5 major key of Writing English module

Evaluation of the question making process parallel to identified Written English aspects

The main focus of this research is to improve the English knowledge of rural students who are in grade 06. Therefore it is important to prepare questions to suit the rural society preserving the identified aspects of Written English. According to the above discussion there are 6 main areas in Written English language as clarity, conciseness, tone, active voice, grammar and punctuation. This section explains how the types of questions are selected to cater the mentioned areas.

There are various question types in the academic world including essay type questions, structured type questions, true or false questions, fill in the blank questions, multiple choice questions and matching questions. According to the English lessons allocated for the grade 06, the main focus is on structured type questions, multiple choice questions, fill in the blank questions and true or false questions. On the other hand among the identified areas in Written English, grade 06 pupils book mainly focuses on grammar, punctuation and conciseness. Therefore by considering both

consisting question types and consisting Written English areas, 10 exercises are created within the component.

Most of the institution and schools using final examination grade of the student as the student.Academic performance criteria. The final grades of any student depend on assessment and test. The performance of the student depends upon how many grades a student score in the final examination. Norlida Buniyamin, Pauziah Mohd Arsad et al. (2013) stated that what are the significance of academic analytics for an educational institution and how they work for the improvement of education. They also proposed an intelligent recommendation intervention system to improve the student's performance and achievement in education

Computers have become ubiquitous, especially in the last three decades, and are significantly widespread. This has led to the collection of vast volumes of heterogeneous data, which can be utilized for discovering unknown patterns and trends (Han et al., 2011), as well as hidden relationships (Sumathi & Sivanandam, 2006), using data mining techniques and tools (Fayyad & Stolorz, 1997). The analysis methods of data mining can be roughly categorized as: 1) classical statistics methods (e.g. regression analysis, discriminant analysis, and cluster analysis) (Hand, 1998), 2) artificial intelligence (Zawacki-Richter, Marín, Bond, & Gouverneur, 2019) (e.g. genetic algorithms, neural computing, and fuzzy logic), and 3) machine learning (e.g. neural networks, symbolic learning, and swarm optimization) (Kononenko & Kukar, 2007). The latter consists of a combination of advanced statistical methods and AI heuristics. These techniques can benefit various fields through different objectives, such as extracting patterns, predicting behavior, or describing trends. A standard data mining process starts by integrating raw data – from different data sources – which is cleaned to remove noise, duplicated or inconsistent data. After that, the cleaned data is transformed into a concise format that can be understood by data mining tools, through filtering and aggregation techniques. Then, the analysis step identifies the existing interesting patterns, which can be displayed for a better visualization (Han et al., 2011) .

To accomplish our goals, we developed a predictive analytic model utilizing machine learning (ML) algorithms. ,e most appropriate ML predictive model was selected for

analyzing student interactions in VLE learning activities and determining students' levels of engagement in VLE courses given that a lack of student engagement results in a high dropout rate . Predictive models are currently used in many educational institutions A predictive model can help instructors guide students in succeeding in a course, and be used to determine which activities and materials are more important to the course assessment. Such models also enable instructors to engage students in different activities through the VLE, thereby encouraging the students to participate in the VLE course. Instructors must invest time discerning why student engagement in particular course activities and material is attenuated. Our models can easily be integrated into VLE systems and can enable teachers to identify low-engagement students through different assessments, the use of different course materials, and the number of times VLE activities (e.g., data plus, forumng, glossary, resources, URL, homepage, Ou collaborate, and subpages) are accessed. Teachers can also spend more time on assessments and materials that are difficult for a particular group of students, enabling them to discover why an assessment is easy or difficult and providing supplementary intervention to students who need it. A predictive system enables an instructor to automatically identify low-engagement students during a course based on activities from that online course. Given such detection, the instructor can then motivate (e.g., send an e-mail reminder) or identify difficulties during the course . When a student receives an advisory e-mail from an instructor (i.e., an e-mail asking about any difficulty), on a weekly basis, the student is more likely to work hard and increase their engagement. Such communication is important because it assesses student workloads and addresses issues at an early stage of the course . Apt advice will also improve student retention and decrease the course dropout rate

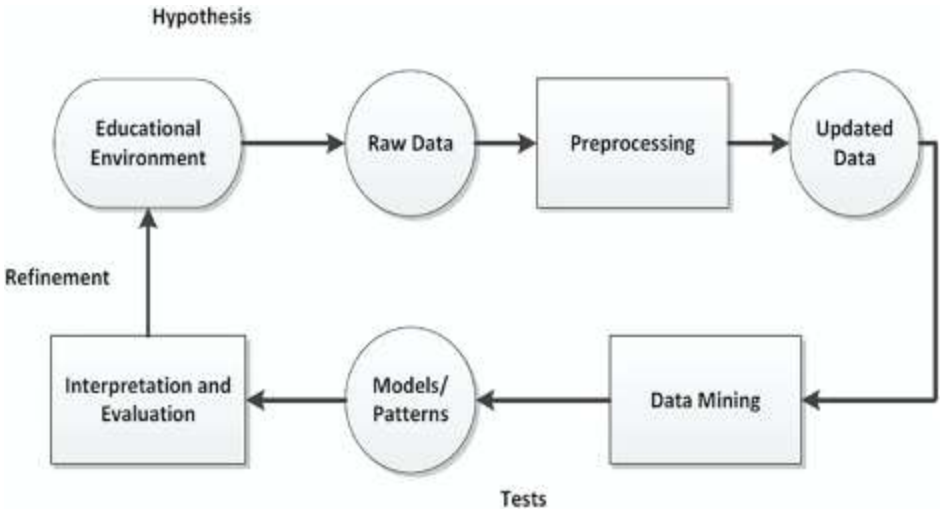


Figure XIV: Data flow

Research Gap

The lack of English expertise is one of the key causes for joblessness. The key evidence of this is that the lack of English literacy has become a major barrier for graduates to pursue work opportunities , especially within the private sector. From now on, the business sector tends to use non-graduates with a high degree of language skills, as opposed to graduates. The ability to speak English is an inspiring effect on career performance and social interactions. Comparatively, a very significant portion of graduates understand the value of English language skills while employed behind a position. The object of no return at that time is always past.

With the rapid enchantment of technology, the use of cell phones has risen considerably. Modern culture, however, continues to use smartphones to make their lives simpler than to adhere to conventional practices. The most significant fact is that this is followed not only by teenagers, but also by youth and children. The perfect explanation is that most parents use online learning channels like Youtube to educate students using videos. As a result, students in Grade 06 are usually not interested in learning using books but using online approaches directly related to mobile technology. Compared to the global academy, most developing countries use this process, which has produced promising effects when used within the limits. In Sri Lanka, however, the assets available to students, especially those who are starting secondary education, are very small.

Sri Lanka is one of the most qualified nations in the world. Therefore, without debate, Sri Lanka's school system is at a higher standard. Yet Sri Lanka is also known to be one of the developed countries in the world. The key explanation for this is the technical gap that holds students away from meeting their targets, especially in rural areas. Most students learn to use e-learning when they begin their higher education. It is also clear that if the fundamental basis for the proper use of online assets is taught to students during their secondary education, it is possible for us to achieve the highest level as a country.

On the other hand, although there are several solutions developed to fulfill different requirements of English in the world, there are some key elements missing in them. One main key element is that the complete composition of English language is missing when a single solution is selected. For example, 'Memrise' focuses only on Written English language. Therefore there is a huge gap in the local environment to deploy a compound solution catering all aspects of English. Further most of prevailing products web based solutions or either organizational based products. In a situation where the solution is a complex web based application which cannot be operated with a mobile phone, the students without laptops or computers are automatically ejected from the list of possible users. Also if the product is an organizational based solution, the users who are not within the organization should pay to obtain the service. Also all the complex web applications and organizational products are less portable. This also makes a huge gap within the academic system keeping many students with less facilities away from using them.

Furthermore most of the prevailing mobile solutions which are acceptably standard are complex and highly advanced to be used by grade 06 students. Some solutions require training programs for even mentors to get used to them. Also most of them are highly resource consuming which is also another main problem for a mobile phone user in the storage perspective. It is clear that although there are several attempts carried out in this purpose, a solution which can address the above mentioned problems is still in need. Therefore the main focus of this research is to develop a solution which will cover all the required aspects and to make Smart Student the best among the list. The table below shows the comparison of the proposed solution with tyr prevailing situations based on several important and key factors.

Application	Vocabulary improvement game	English writing	Spoken English	Prediction system
Dulingo[8]	√	×	×	×
Memrise[9]	√	√	×	×
BBC Learning English[10]	×	√	×	×
Hello English [11]	√	×	×	×
Our proposed application	√	√	√	√

Table IV: Research Gap

Research Problem

English proficiency is the most elementary consideration to get into the private sector, and it is important to go forward within the public sector. Foreigners who migrate to English-based countries such as the United Kingdom, the United States, Canada and Australia can routinely fail to accumulate occupations if their English-language skills do not match their professional qualifications. This periodically obliges them to become self-employed or to look for average jobs. English also helps to create interpersonal relationships between various nationalities, as it is the 'most commonly spoken language' in the world, filling it as a typical language for individuals who speak in various dialects. In addition , students pursuing higher education or vocational programs must have English-language skills. In addition, any who decide to look for foreign colleges are expected to complete their English-language examination, most usually IELTS (International

English Testing System) or TOEFL (Test of English as a Faraway Language). It is also clear that English is an important and necessary element for the development of civilization. The concern, however, is that while a sector of students living closer to developing areas has a sufficient chance of studying English, the majority of students living in rural areas do not have many opportunities.

The ability to speak English is an inspiring effect on career performance and social interactions. Comparatively, a very significant portion of graduates understand the value of English language skills while employed behind a position. The object of no return at that time is always past. Enhancing English language skills is a big undertaking and a long-term learning activity. Students must understand the value of English, set up a curriculum to learn all the skills and make the most of all the usable tools. The biggest concern, though, is that most organisations tend to improve English skills after concentrating on technical skills.

With the rapid enchantment of technology, the use of cell phones has risen considerably. Modern culture, however, continues to use smart phones to make their lives simpler than to adhere to conventional practices. The most significant fact is that this is followed not only by teenagers, but also by youth and children. The perfect explanation is that most parents use online learning channels like Youtube to educate students using videos. As a result, students in Grade 06 are usually not interested in learning using books but using online approaches directly related to mobile technology. Compared to the global academy, most developing countries use this process, which has produced promising effects when used within the limits. In Sri Lanka, however, the assets available to students, especially those who are starting secondary education, are very small.

As mentioned above in the Introductory section, English has three key facets, such as hearing, speaking and writing. Any of the available eLearning platforms in the world concentrate only on one particular feature of English that creates students who are only comprehensive in one of the areas listed above. Moreover, as a result, the learning tools used for reading and speaking are better than those used for writing. For eg, there are platforms such as Reddit and Medium for reading and platforms such as Duolingo and Hello English for speaking. The creation of a hybrid eLearning program, including reading , writing and speaking English, is therefore one of the key needs of the national academy.

The student assessment and response confirmation process is as critical as the question-making process in a well-structured learning management system. While solutions have been developed to meet the educational requirements for the convenience of students, a solution to meet the requirements for the convenience of teaching has not yet been developed. The local academy therefore wants, as a whole, a mobile, comfortable hybrid system that covers all learning facets of English along with a teacher dashboard.

Research Objectives

The main objective of this research is to develop a hybrid solution to improve and evaluate the Spoken English, Written English, English Listening and English Reading abilities of the grade 06 students. To bring out this main objective in a more creative and an effective manner, the complete solution is divided into four major components. The first component focuses on improving and evaluating the Written English knowledge of students while the second component focuses on improving and evaluating the Spoken English knowledge of the students. The third component is for the convenience of the mentor where the mentor can view the results in an organized dashboard and also it is possible for the mentor to predict the marks for each exercise depending on external factors. The fourth component is a hybrid game which includes a brain development and an interactive vocabulary development game. As a whole the product was developed by taking the above mentioned four research areas as the main objectives. In addition to the main objective several specific objectives were designed to increase the productivity and efficiency of the product while maintaining the commercial quality.

Main Objective

- The key aim of this study is to develop a hybrid approach to strengthen and test grade 06 students' spoken Language, written Language, English listening and English reading skills. The full approach is split into four major components in order to carry out this key purpose in a more innovative and productive way.The first component focuses on strengthening

and measuring students' written English skills, while the second component focuses on developing and measuring students' spoken English knowledge. The third aspect is for the mentor's comfort, where the mentor can see the outcomes in an ordered dashboard and it is also possible for the mentor to forecast the marks based on external variables for each exercise. The fourth aspect is a mixed game that involves the creation of the brain and an immersive game for the production of vocabulary. The substance was produced as a whole by taking the four research areas listed above as the key goals. A variety of unique goals were planned, in addition to the main objective, to improve the competitiveness and efficiency of the manufacturer while retaining commercial consistency.

- English language plays an important role in our lives because it makes communication between different countries the only common language across the globe. English books are the common available medium of literature and information that is accessible to everyone. English in Sri Lanka is fluently spoken by approximately 23.8% of the population, and widely used for official and commercial purposes. It is the native language of approximately 74,000 people, mainly in urban areas. Nowadays English is one of the main 24 subjects of school syllabus in Sri Lanka. There are three categories of grammar, spoken and listening lessons in the school English pupils' book. So most of the time teaching methods are different from urban province schools than the rural province schools. According to that reason those students' knowledge was different. With the rapid enchantment of technology, the use of mobile phones has increased a lot. Therefore modern society tends to use mobile phones to make their lives easier rather than sticking to traditional methods. The most important fact is that this is followed not only by adults but also by teenagers and children. The best example is that most of the parents use online learning platforms such as Youtube to teach students using videos. Therefore generally students who are in grade 06 are not interested to study using books but by using online methods specifically related to mobile technologies. When compared to the global academia most of the developed countries use this method which has brought them positive results when used within the limits. But in Sri Lanka the assets available for the students, specifically those who are starting their secondary education is very much limited. The main objective of this research is to develop a hybrid solution to improve and evaluate the

Spoken English, Written English, English Listening and English Reading abilities of the grade 06 students. To bring out this main objective in a more creative and an effective manner, the complete solution is divided into four major components. The first component focuses on improving and evaluating the Written English knowledge of students while the second component focuses on improving and evaluating the Spoken English knowledge of the students. The third component is for the convenience of the mentor where the mentor can view the results in an organized dashboard and also it is possible for the mentor to predict the marks for each exercise depending on external factors. The fourth component is a hybrid game which includes a brain development and an interactive 25 vocabulary development game. As a whole the product was developed by taking the above mentioned four research areas as the main objectives. In addition to the main objective several specific objectives were designed to increase the productivity and efficiency of the product while maintaining the commercial quality

- The main objective of this research is to develop a hybrid solution to improve and evaluate the Spoken English, Written English, English Listening and English Reading abilities of the grade 06 students. Spoken lesson mainly focuses on student's pronunciation to improve, the module targets to cover every spoken lesson of their English pupil book, improving and evaluating the Spoken English knowledge of the students As a whole, the product was developed by taking the above mentioned four research areas as the main objectives. In addition to the main objective, several specific objectives were designed to increase the productivity and efficiency of the product while maintaining commercial quality.
- English language plays an important role in our lives because it makes communication between different countries the only common language across the globe. English books are the common available medium of literature and information that is accessible to everyone. English in Sri Lanka is fluently spoken by approximately 23.8% of the population, and widely used for official and commercial purposes. It is the native language of approximately 74,000 people, mainly in urban areas. Nowadays English is one of the main subjects of school syllabus in Sri Lanka. There are three categories of grammar, spoken and listening lessons in the school English pupils' book. So most of the time teaching methods are different from urban province schools than the rural province schools. According to that reason those students' knowledge was different. With the rapid

enchantment of technology, the use of mobile phones has increased a lot. Therefore modern society tends to use mobile phones to make their lives easier rather than sticking to traditional methods. The most important fact is that this is followed not only by adults but also by teenagers and children. The best example is that most of the parents use online learning platforms such as Youtube to teach students using videos. Therefore generally students who are in grade 06 are not interested to study using books but by using online methods specifically related to mobile technologies. When compared to the global academia most of the developed countries use this method which has brought them positive results when used within the limits. But in Sri Lanka the assets available for the students, specifically those who are starting their secondary education is very much limited.

Specific Objectives

- The main focus of this The main focus of this document is on Written English module which covers one specific
- and a special aspect of English language. The other components are built assuming that the Written English module works correctly. Therefore to ensure that the made assumption is correct and to increase the quality of this component several specific objectives were designed based on the Written English module.
- Collection of lessons relevant to the grade 06 English syllabus.
- Categorization of lessons based on the identified aspects of Written English language.
- Selection of relevant types of questions and Construction of exercises based on the identified criterias.
- Maintaining the functional independence of the component to make sure that the final product can be switched accordingly.
- Implementation of a user-friendly environment to allow the users to operate the system with minimum knowledge to gain maximum Performance.
- Ensure that the designed solution will not make any difference to the cost estimation of the final product.
- Development of the Written English component to function based on minimum resources consumption but maximum efficiency.
- Ensure that the solution is easily accessible and portable while maintaining the security.

- Adoption of a commercially valuable development structure and a sustainable outcome.study to develop a game to improve students' English vocabulary skills and brain improvement skills.
- Collecting the English words.
- Categorize the English words into different levels.
- Make different levels using English words.
- The main focus of this document is on the Spoken English module which covers one specific and special aspect of English language. The other components are built assuming that the Spoken English module works correctly. Therefore to ensure that the made assumption is correct and to increase the quality of this component several specific objectives were designed based on the Spoken English module.
- Collection of lessons relevant to the grade 06 English syllabus.
- Categorization of lessons based on the identified aspects of Spoken English language.
- Selection of relevant types of questions and Construction of exercises based on the identified criteria.
- Selection of relevant types of questions and Construction of exercises based on the identified criteria.
- Implementation of a user-friendly environment to allow the users to operate the system with minimum knowledge to gain maximum Performance.
- The ability to predict individual success in exams and courses has been researched. Accurately predicting students' exam or course grades has the potential to help students in various ways; by using accurate predictions we can detect early on students who have difficulties with the course materials and help them to improve. Moreover, using this kind of prediction technique can help in several other education-related areas .
- Collection of student details relevant to the grade 06 .
- Refer all the lessons of grade 6
- Categorization of lessons.
- Maintaining the functional independence of the component to make sure that the final product can be switched accordingly.
- Implementation of a user-friendly environment to allow the users to operate the system with minimum knowledge to gain maximum Performance.

- Ensure that the designed solution will not make any difference to the cost estimation of the final product.
- Development of the prediction and teacher dashboard component to function based on minimum resources consumption but maximum efficiency.
- Ensure that the solution is easily accessible and portable while maintaining the security.
- Adoption of a commercially valuable development structure and a sustainable outcome. One common approach for solving this type of prediction problem is to extract as many attributes as possible, sometimes as many as hundreds. By evaluating the value of each attribute, researchers can attempt to predict exam grades or other variables using linear regression or multiple regression methods. Usually, when using regression, one tries to predict the dependent variables' values using independent attributes of different types. The number of independent variables is very large and includes age and gender marks of the term test, educational level of parents , emotional and social factors , and even the complexity measure of teachers' notes . Other methods used in tackling the grade prediction problem are the factor analysis or other classification schemes with statistical analysis student's exam grades. We also demonstrate - by using multiple regression and machine learning that other social parameters are also influential in determining a student's grade. Moreover, they can help predict which students are likely to fail the test.

Methodology

The solution proposed under the research topic is broken down into 4 major components in order to fulfill all the objectives required to cover the prevailing research problems.

1. Written English Module
2. Spoken English Module
3. Prediction and Visualization mentor Dashboard
4. Brain Development and Vocabulary Improvement Game

Nowadays knowing English language increases your chances of getting a good job in a multinational company within your home country or for finding work abroad. It is also the language of international communication, the media, and the internet, so learning English is important for socializing and entertainment as well as work. So for that reason, English learning can be considered so important.

Language is one of the mediums of expressing our ideas, feelings, and emotions. And if we think about language in the present world then English is one of the most used languages in the world and also English is used as a second language in Sri Lanka. English is introduced here at the primary level and it's inclusion continues till the tertiary level of education. Most of the students in rural areas are weak in English language due to a lack of skilled and trained teachers who are familiar with the modern methods and approaches of teaching and lack of materials for teaching in the classroom. Further primary level English curriculum implementation is essential to achieve the English language competency in rural areas since students in rural areas are performing poorly in English compared to the urban counterparts.

Based on the above collected facts it is clear that the solution should cover every aspect of English to fulfill the requirements needed to the society. Therefore the main focus of this research is to develop a hybrid solution to improve and evaluate the Spoken English, Written English, English Listening and English Reading abilities of the grade 06 students. To bring out this in a more creative and an effective manner, the complete solution is divided into four major components as shown above. The first component focuses on improving and evaluating the Written English knowledge of students while the second component focuses on improving and evaluating the Spoken English knowledge of the students. The third component is for the convenience of the mentor where the mentor can view the results in an organized dashboard and also it is possible for the mentor to predict the marks for each exercise depending on external factors. The fourth component is a hybrid game which includes a brain development and an interactive vocabulary development game.

The above introduction on the complete mechanism of the solution explains how the 04 major components collaboratively function together. The main focus of this document is on the Written English component which is the initial sector of the Smart Student Application. All the other

components are developed parallel to this component while covering all the discussed objectives. The diagram below shows the overall workflow of the Smart Student system.

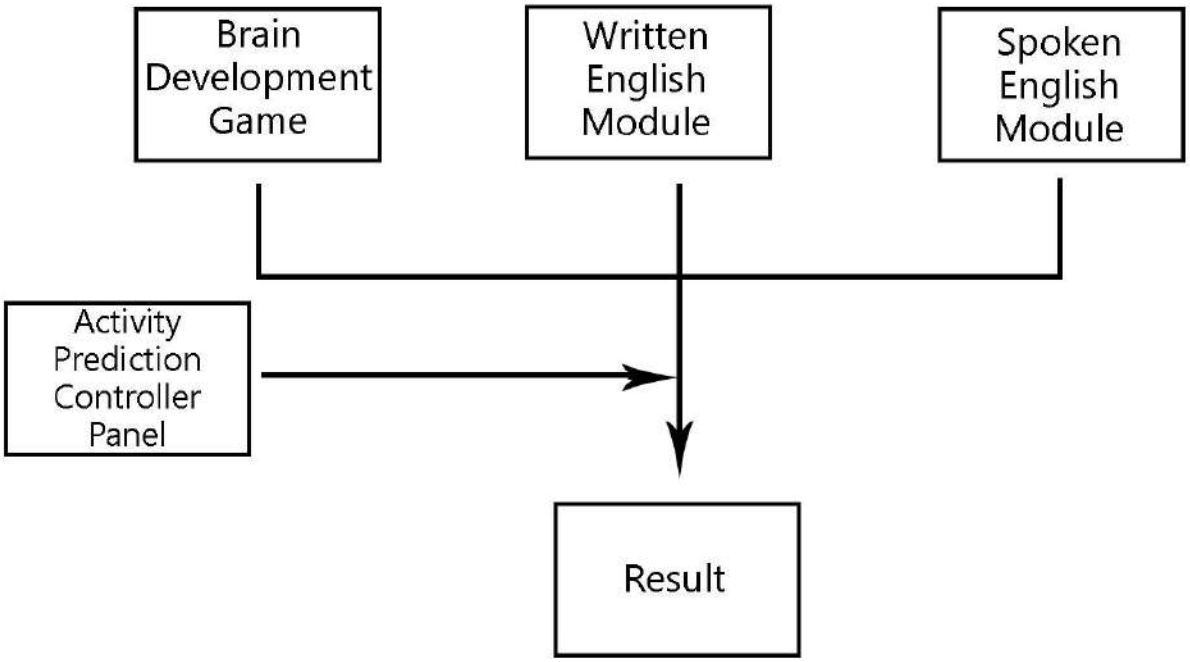


Figure XV: Workflow diagram

In the game module as a outline we mainly developed a game to achieve main objectives. Thats are vocabulary skill improvement and brain development through a mobile game. So , if we study little bit about how games are using in education, there are so many information that we can refer.

Educational games that are specifically designed or have incidental or secondary educational significance for academic purposes. In a learning environment, all types of games can be used, but educational games are games that are intended to help individuals learn about certain topics, broaden concepts, improve growth, understand a historical event or culture, or help them learn a skill while they play. Educators and the government realize the benefits that gaming has on learning. Games teach us goals, rules, problem solving as a story.

If we study about benefits that has on gaming. The gaming is a social activity so, students become socialized because of games. And another big advantage is gaming improves critical thinking on

students. So gaming can be used on learning purposes on students. Because students like interesting ways to do their learning because, current education system is much bored system to learn.

In our solution, we mainly developed two separate games to achieve two objectives that I mentioned earlier. So, I used two different game developing softwares. Android studio and Unity 3D are the main softwares that I used. I developed a English Vocabulary improvement game using Android studio. In my android game I developed it as 3-tier architecture. And in my android app I hard coded the answers of my game levls. I did it because in a game first we decided game levels answers that will never change. And if the answers on the application then we can match the answer quickly. It is a good way to up lift the performance of the game.

The brain development game is mainly focused on increasing the thinking and analyzing power of students. It is important to note that the Implementation was done using both Android Studio and Unity3D to test the performance of the game since the logical complexity is high at each level. When compared to Android Studio, Unity3D is easier to use if both the software are not familiar. Furthermore, regardless of whether you should know Android Studio and not Unity 3D, you would just profit by that in a specific way.

Since most games contain things like realistic resources, sound resources, an explicit treatment of client input, liveliness and so forth and so on, and a game motor like Unity 3D is extraordinarily evolved to be acceptable at taking care of those things, whereas increasingly "nonexclusive" improvement devices like Android Studio, Eclipse, Visual Studio, etc. All things considered, nonexclusive. Solidarity 3D additionally lets you run the game inside the game supervisor, empowering you to change the properties of your game resources legitimately and see the outcomes right away. You would need to grow a large portion of such prospects yourself should you make your game in an apparatus like Android Studio[2].

The coding portion of building up a game is best made in a device for coding, and Unity 3D in and without anyone else isn't a coding instrument. For that part, you need an extra tool likeMonoDevelop (which you get packaged with Unity 3D) or Visual Studio, whereas the Unity 3D editorial manager is made for building the game scenes and taking care of the game resources.

It is exceptionally lightweight and asset the executives is done entirely well in this IDE. It boots up quickly when contrasted with other improvement IDEs. It's anything but a memory hungry IDE. Even beginners can work with this IDE very easily. Emulator begins extremely delayed in Android Studio, possibly that is where it needs improvement. It takes a great deal of memory space to introduce the IDE. Heavy application and will hinder PC execution[3].

The motor is exceptionally favored for its all-inclusive help to 27 stages. The application created and conveyed can be effortlessly shared between PC, web, and versatile stages. Moreover, the spry philosophy empowers quick prototyping and steady discharges, which thus accelerate game development. The content manager is given by IDE to compose the code, however once in a while, a particular code supervisor is likewise utilized by the designers to mitigate disarray. Moreover, the incorporated improvement supervisor support JavaScript and C# for scripting and offers eminent highlights that are perfect for the game development. The excellent sound and special visualizations are upheld by the motor that facilitates the game turn of events. The visuals are versatile on each screen and gadget with no twisting or bargain with the picture quality. It's an unquestionable requirement. The fledgling designers need the straightforward documentation that is given in detail by the Unity motor. The definite documentation incorporates the clarification of each little topic. The troubleshooting and tweaking are incredibly simpler with Unity game advancement since all the game factors are shown during interactivity, which thusly permits the designers to investigate the procedure at runtime. Not to state, yet the motor lingers behind from a graphical perspective. It doesn't offer a variety of apparatuses to make staggering illustrations instead of other game advancement engines. In Unity 5 motor, the inherent help for the PhysX material science motor has some presentation issues and comes up short on some significant functionalities which should be added to make the incredible game app. The designers need to have licenses for the best illustrations, organization, and execution upgrades. These licenses are costly to buy. Besides, the utilization of rendering, cradle support, stencil support, and truly more highlights scale up the advancement costs because of costly licenses. The code is steady in Unity rather than different motors and pressed with extraordinary engineering that improves the game application execution. Be that as it may, inaccessibility of the source code makes discovering, tending to, and fixing the exhibition issues difficult. The game created utilizing Unity motor devours more memory, which thus makes OOM blunders and investigating issues in the applications[4].

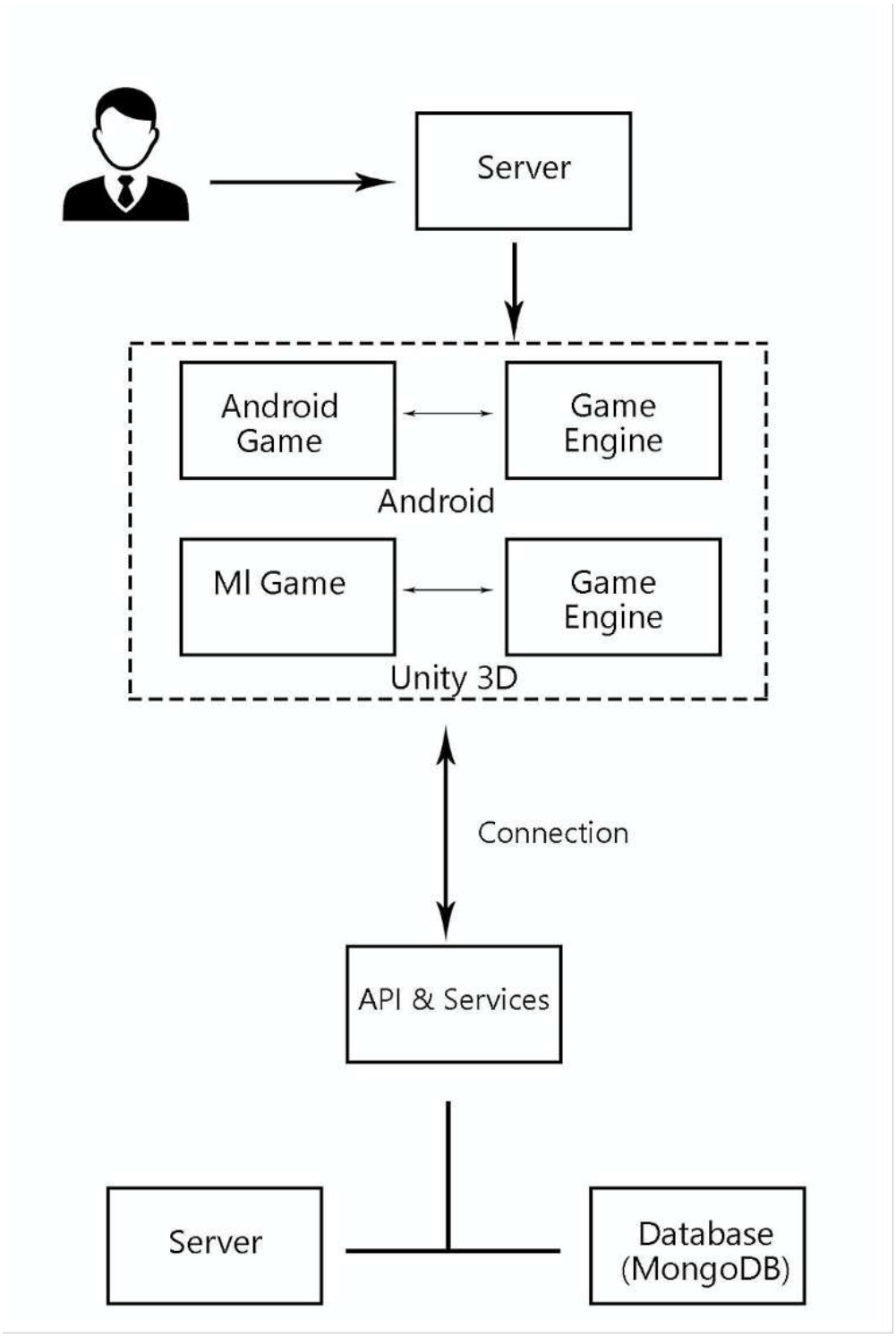


Figure XVI: System diagram

The Written English module is implemented based on several advanced logics. Initially, the product component has various types of exercises built within it covering most of the learning techniques including questions to underline, questions to mark true or false, and questions to fill in the blanks. Further, it is important to note that in some instances the questions are organized into lessons where a lesson contains questions of all the types.

The Written English module follows a unique method to load the questions into the front end which is known as fetched HTTP calls. The Hypertext Transfer Protocol (HTTP) is designed to enable communications between clients and servers. HTTP works as a request-response protocol between a client and a server. Here the questions are stored on a remote database and fetched through HTTP calls [10]. The Fetch API is a modern replacement for XHR; it was introduced in browsers recently to make asynchronous HTTP requests easier to do in JavaScript, both for developers and other APIs that build on top of Fetch[11].

The Written module also allows the users to see their progress, rank, scores, and other statistics for written quizzes which will provide the user as well as the mentor a productive environment to work with. The user-friendly interfaces further make the system more usable to children making the product more interesting. The answer validation process of the Written English module is implemented using Firebase ML vision and a custom drawing canvas. Firebase ML Kit is a mobile SDK that makes it easier for mobile developers to include machine learning capabilities in their applications. ML Kit is a wrapper over the complexities of including and using machine learning capabilities in your mobile app [7][8]. The complete mechanism of the Written English module can be divided into 6 main phases.

- The user draws on custom canvas
- If the user does not draw for 1s recognize it as break
- Get the bitmap from canvas
- Provide bitmap as input to the detector
- Display text
- Compare the recognized text with the correct answer of the question

The diagram below illustrates the system overview of the Written Module.

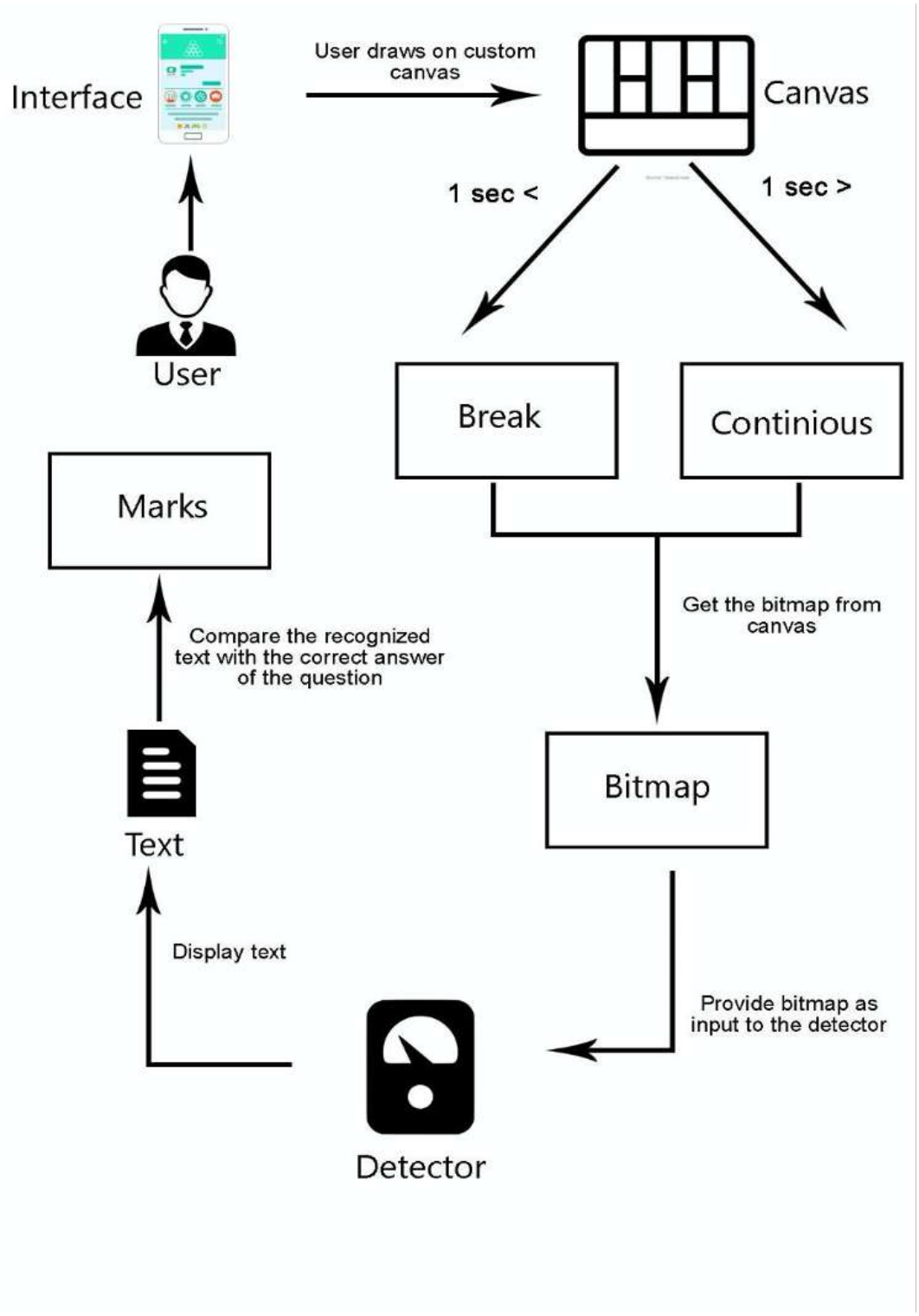


Figure XVII: Written English Architecture

The Spoken English module follows a unique method to load the questions into the front end which is known as fetched HTTP calls. The Hypertext Transfer Protocol (HTTP) is

designed to enable communications between clients and servers. HTTP works as a request-response protocol between a client and server. Here the questions are stored on a remote database and fetched through HTTP calls. The Fetch API is basically a modern replacement for XHR; it was introduced in browsers recently to make asynchronous HTTP requests easier to do in JavaScript, both for developers and other APIs that build on top of Fetch.

The next most important feature implemented is the progress status and the score related to the component. Users will be able to see their progress, rank, scores and other statistics for spoken quizzes. The score calculation process is totally based on the identification of the answers based on the given voice output to the product. This is totally implemented using Google speech recognizer. Google has a great Speech Recognition API. This API converts spoken text into written text, briefly Speech to Text. You can simply speak in a microphone and Google API will translate this into written text. The API has excellent results for English language. The complete mechanism of the Spoken English module can be divided into 6 main phases. This can also be referred to as the speech recognition and answer validation process in technical terms.

- User click speak button
- Google speech recognizer module is configured to identified English and launched
- User speak and Google speech recognizer capture the audio
- Google speech recognizer process audio and output the identified text
- Identified text is displayed to the user
- Identified text is compared to the original text and marks are calculated

Speech-to-Text has three main methods to perform speech recognition. These are listed below:

- **Synchronous Recognition** (REST and gRPC) sends audio data to the Speech-to-Text API, performs recognition on that data, and returns results after all audio

has been processed. Synchronous recognition requests are limited to audio data of 1 minute or less in duration.

- **Asynchronous Recognition** (REST and gRPC) sends audio data to the Speech-to-Text API and initiates a *Long Running Operation*. Using this operation, you can periodically poll for recognition results. Use asynchronous requests for audio data of any duration up to 480 minutes.
- **Streaming Recognition** (gRPC only) performs recognition on audio data provided within a gRPC bi-directional stream. Streaming requests are designed for real-time recognition purposes, such as capturing live audio from a microphone. Streaming recognition provides interim results while audio is being captured, allowing results to appear, for example, while a user is still speaking.

The diagram below illustrates the speech recognition and answer validation process for the Spoken English module.

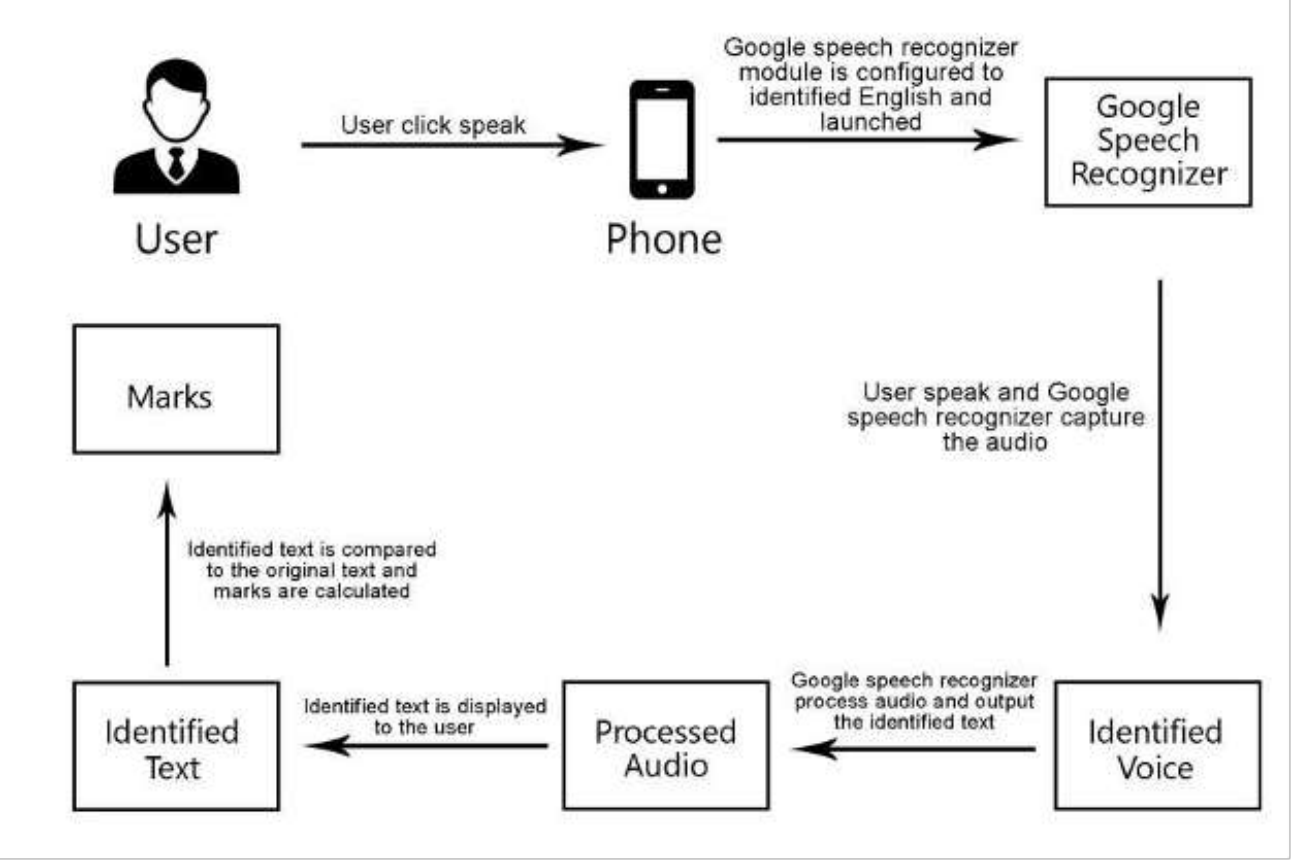


Figure XVIII: spoken module architecture

In this study, we utilized various ML techniques to study student engagement in different VLE activities. selected techniques were suitable for both domain and categorical educational attributes. Brief details of the ML, training, testing, and input data are provided below. Machine Learning Technique. Various types of ML techniques have been used as predictive models. ,

ML techniques tested as predictive models in the current study are described below. Decision Tree (DT). A DT has a tree-like structure with internal nodes represented by rectangles and leaves represented by ovals. An internal node has two or more child nodes. , internal nodes represent dataset features, and the branches represent the values of these features. Each leaf contains a class related to the dataset . DT is trained with a training set containing tuples. Finally, the DT is used to classify a dataset with unknown class labels . DTs are primarily used to process information for decision-making , tree is constructed from the dataset by

determining which attributes best split the input features at the child nodes. In this case, we used the concept of information gain which is dependent on information theory. When a node has minimum entropy (highest information gain), that node is used as a split node . A DT is important when a study seeks to determine which features are important in a student prediction model . , rules for DTs are easy to understand and interpret, and we know exactly which classifier leads to a decision. A J48 decision tree belongs to the DT family; it both produces rules and creates the tree from a dataset. ,e J48 algorithm is an improved version algorithm. It is a sample-predictive ML model that predicts the target values of an unseen database based on the different values of input features in the current dataset. ,e rules of this approach are easily interpreted. Moreover, this method is an implementation of the ID3 (interactive dichotomize) algorithm and is a supervised ML algorithm used primarily for classification problems. ,e internal nodes of a J48 decision tree represent the input features (attributes), and the branches of the tree represent the possible values of the input features in the new dataset. Finally, the terminal nodes (leaves) display the final values of target variables ,e attribute-selection process is based on the information gain method (gain ratio) . ,e J48 decision tree works for both numeric and categorical variables; moreover, it determines the variables that are best at splitting the dataset attribute with the highest gain ratio reflects the best split point.

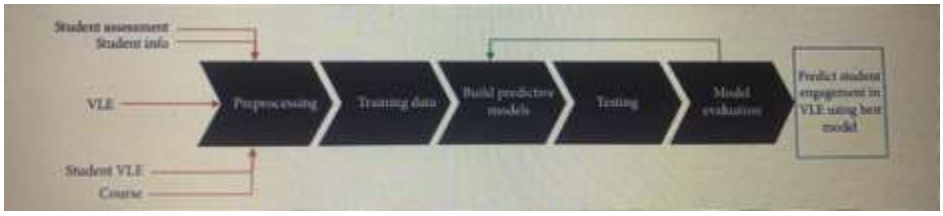


Figure XIX: Data preprocessing

A plethora of pattern recognition methods have been applied to problems in bioinformatics including rule based, statistical methods and machine learning -based methodologies. The goal of machine learning is to train a computer system to distinguish classify cases based on known examples. Machine learning methods include sev-eral widely differing approaches such as support vector machines, neural networks, Bayesian classifiers, random forests and decision trees.In the following discussion we concentrate on machine learning methods as

they are nowadays widely used to tackle complex phenomena, which would be otherwise difficult to handle. Successful machine learning method development requires a good quality training set. The data-set should represent the space of possible cases. Thisspace is huge for genetic variations as they can have somany different effects and underlying mechanisms. Another aspect is the choice of the machine learning approach. There is not a superior architecture among them. Third, the quality of the predictor depends on how the training has been done, which features are used and insufficient to adequately describe the pattern in the feature space. Another problem is overfitting, which means that the learner, due to sparse data,complex model or excessive learning procedure, describes noise or random features in the training dataset, instead of the real phenomenon. It is crucial to avoid overfitting as it leads to decreased performance in real cases. Many predictors provide a measure for the probability of prediction, in this domain a measure of how likely the variation is pathogenic. This information can be used for ranking the investigated cases. A more advanced version is to obtain e.g. by bootstrapping an estimate of the standard error of the prediction indicative of the prediction.

Figure XX: data processing cycle

A common definition of machine learning is (Mitchell, 1997): “A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P if its performance at tasks in T, as measured by P, improves with experience E.” Basically, machine learning is the ability of a computer to learn from experience (Mitchell, 1997). Experience is usually given in the form of input data. Looking at this data, the computer can find dependencies in the data that are too complex for a human to form. Machine learning can be used to reveal a hidden class structure in an unstructured data, or it can be used to find dependencies in a structured data to make predictions. Latter is the main focus of the thesis. 3.1.2. Predictive analytics Predictive analytics is the act of predicting future events and behaviors present in previously unseen data, using a model built from similar past data (Nyce, 2007; Shmueli, 2011). It has a wide range of applications in different fields, such as finance, education, healthcare, and law (Sas, 2017). The method of application in all these fields is similar. Using previously collected data, a machine learning algorithm finds the relations between different properties of the data. The resulting model is able to predict one of the properties of future data based on properties (Eckerson, 2007)

For the sake of simplicity, the data has only one independent variable. Figure 1 depicts a two dimensional graph that shows the relation between the student age and the dependent variable indicating whether they have passed the exam or not.

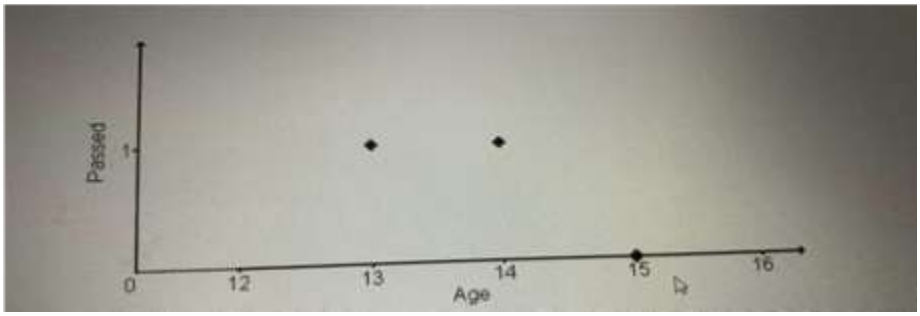


Figure XXI: Graph representation of data.

Depending on the type of regression method, regression creates a straight line or a curve that fits the best to the data. Figure 2 shows the graph after the regression.

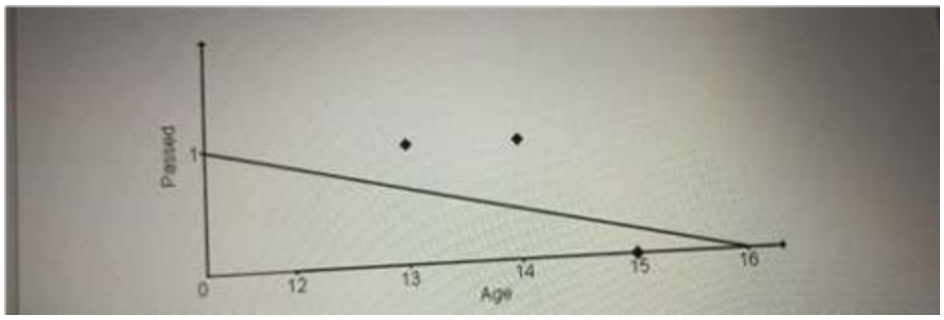


Figure XXII: Graph after the regression.

Commercialization aspect of the product

Commercialization Factor	Previous Solution	English School Mate
Academic relavance	Acceptable	High
Audience	Not Specific	Specific
Lower resource Consumption	No	Yes
Portable	No	Yes
Cast effective	No	Yes
Evaluatable	No	Yes
Vishualizable	No	Yes
Covers every Subject areas	No	Yes
Low operational knowlage	No	Yes

Table V : Commercialization aspect of product

Testing & Implementation

The main implementation of the Smart Student system has 2 major aspects as the Authentication segment and the Backend and Database. The Authentication segment is implemented using Firebase Authentication as a service. This is composed of a Sign-in screen and a Sign-Up functionality. Further, a Navigation Drawer update option and a user profile picture functionality

are added to make the Authentication process complete. The backend and the database are implemented as a REST API using Java Spring-Boot and MongoDB as the database. Moreover, CRUD endpoints for written and spoken questions are also implemented. All the analyses of the question results will be performed here.

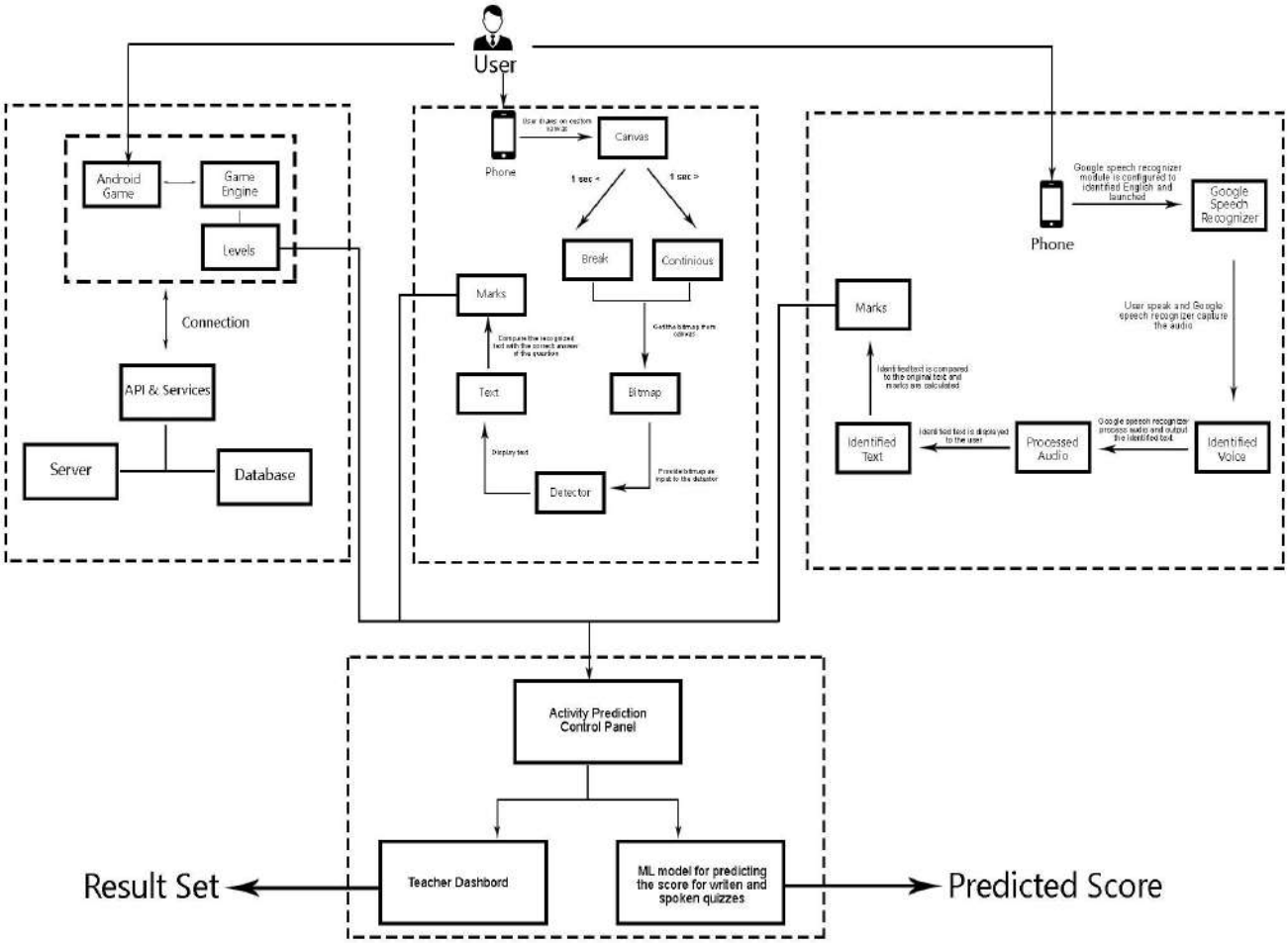


Figure XXIII: High level Architecture

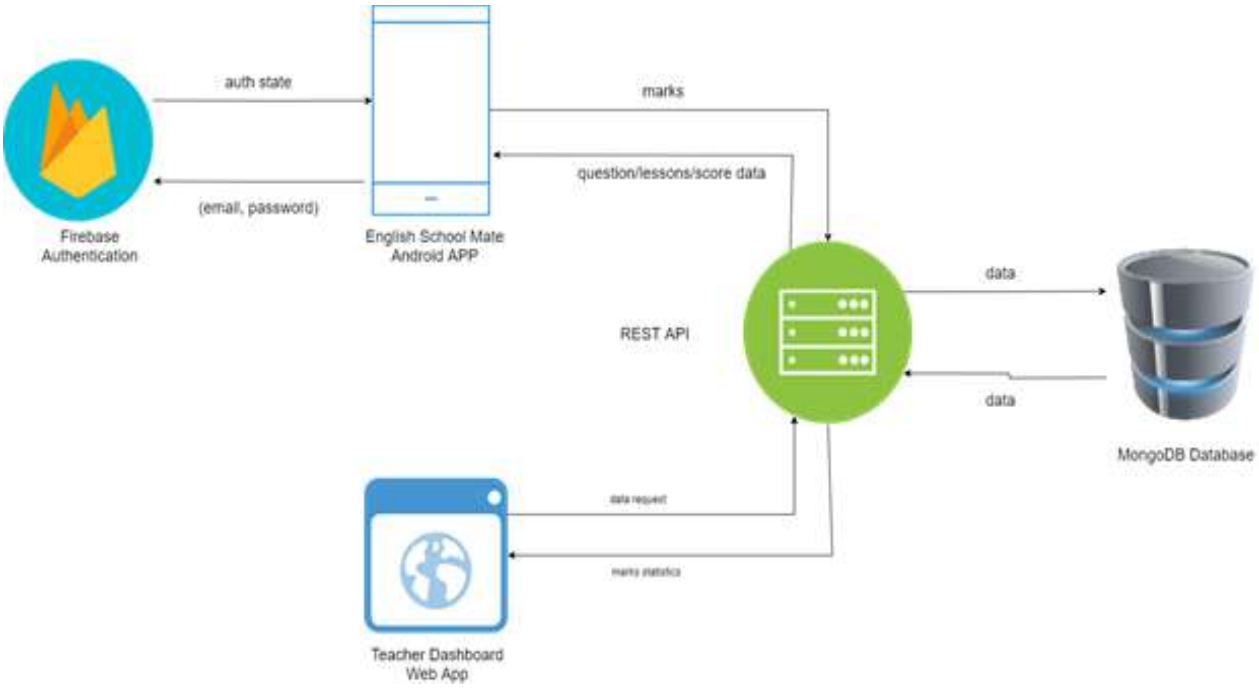


Figure XXIV: tier System Architecture

The android application architecture differs from the system of the Smart Student solution. The Activity sector handles UI and the rendering logic. The View Model handles business logic and change states of live data based on results from operations. The Live data notifies observers (activities/fragments) when the state changes. The Repository connects the backend and android application. It also Fetch and submit data from and to the backend. The diagram below shows the architectural design of the Android Application.

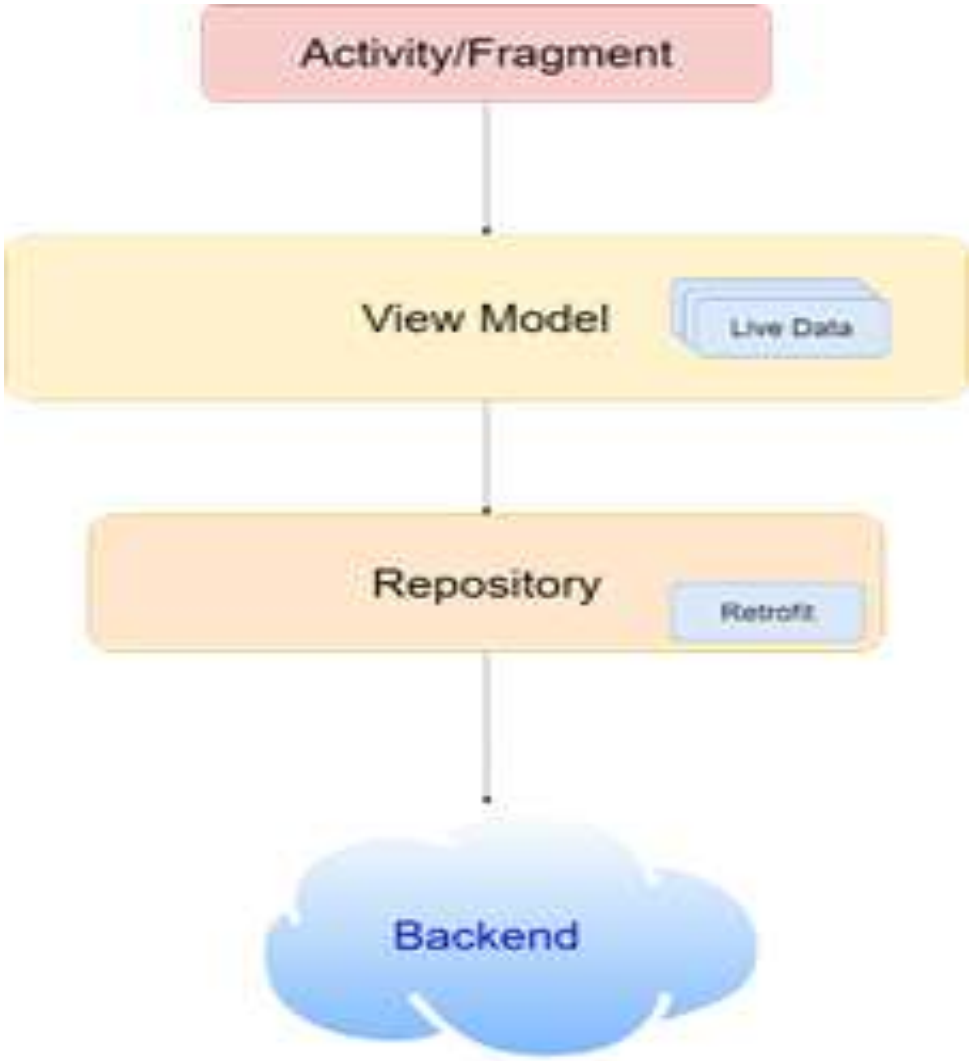


Figure XXV: Android Application Architecture

Results and Discussion

Results

Game Module

Results based on ML game.

Figure XXVI: - ML game

Test Case#	expected Results	Actual Results	Accuracy
1	1	1	100%
2	1	0	0
3	1	1	100%
4	1	0	0
5	1	0	0
6	1	0	0
7	1	0	0
8	1	1	100%
9	1	1	100%
10	1	1	100%
11	1	0	0
12	1	0	0
13	1	1	100%
14	1	0	0
15	1	0	0
16	1	0	0
17	1	0	0
18	1	1	100%
19	1	1	100%
20	1	1	100%

Table VI: Testing

Results Based on Android Game.

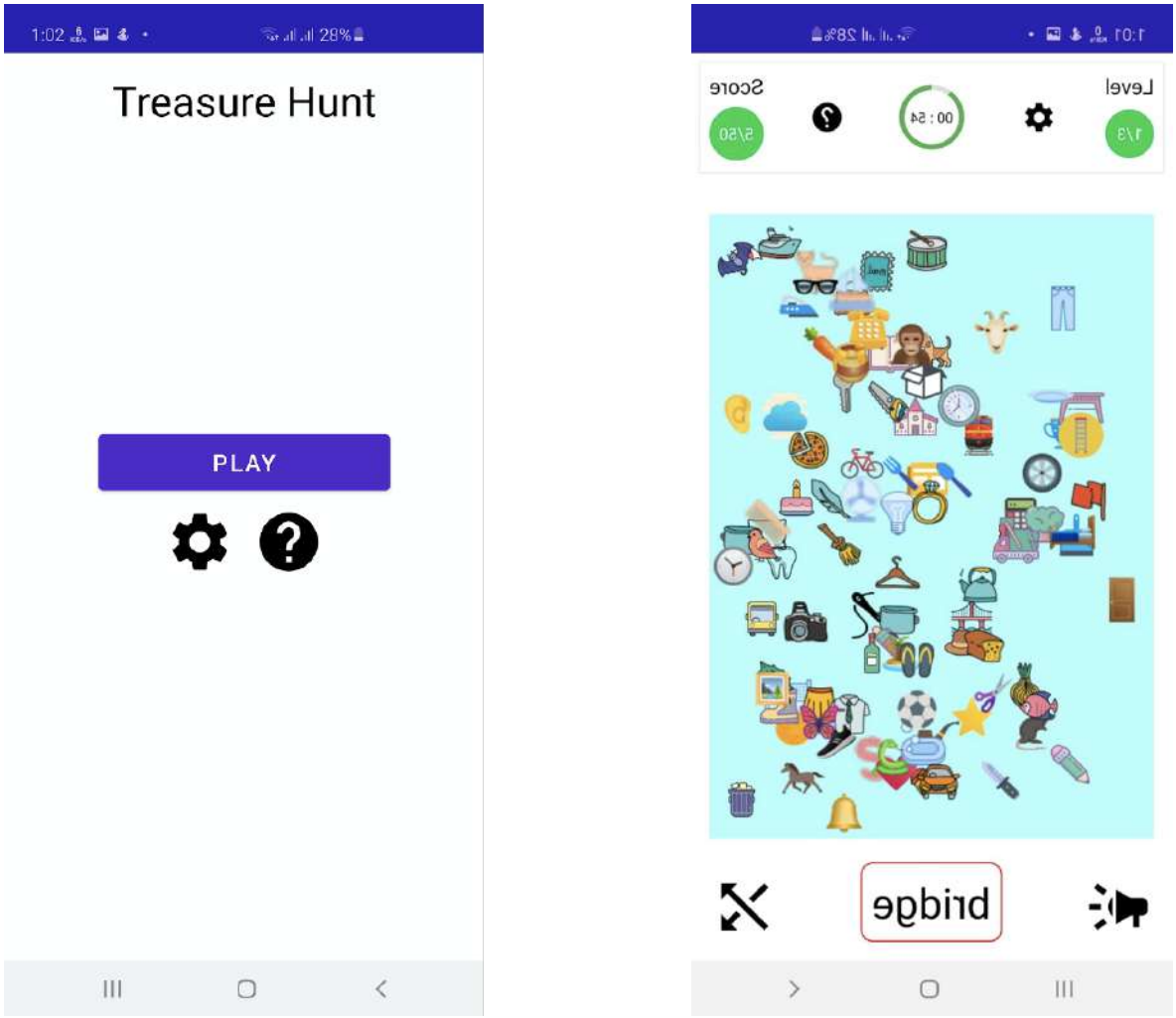


Figure XXVII: Android game UI

Test Case#	Expected Resulyts	Actual Results	Accuracy
1	pen	pen	100%
2	car	car	100%
3	bird	bird	100%
4	bat	bat	100%
5	pipe	pipe	100%
6	van	van	100%
7	mobilephone	mobilephone	100%
8	weel	weel	100%
9	cat	cat	100%
10	rat	rat	100%
11	mat	mat	100%
12	table	table	100%
13	skirt	skirt	100%
14	shirt	shirt	100%
15			
16			
17			
18			
19			
20			

Table VII: Testing

Writing Module

As discussed in the testing section the testing process of the Written English module was carried out based on 2 major aspects as,

1. Accuracy calculation and Selection of the mechanism
2. Evaluating the user experience of the interfaces

Based on the above 2 aspects the result analysis of text classification is divided into 4 main parts for decision making.

Evaluating the test results of user Interfaces related to Written English Module

Testing process for user experience of the Interfaces related to the Written English module was carried out by 2 testing parties as internal testing and 3rd party testing. Each testing party was given 2 testing approaches as free flowing attempt and time specified attempt. The testing mechanism of each testing party and each approach was discussed in detail under the testing section above. The results obtained after the testing phase is illustrated in the Table given below.

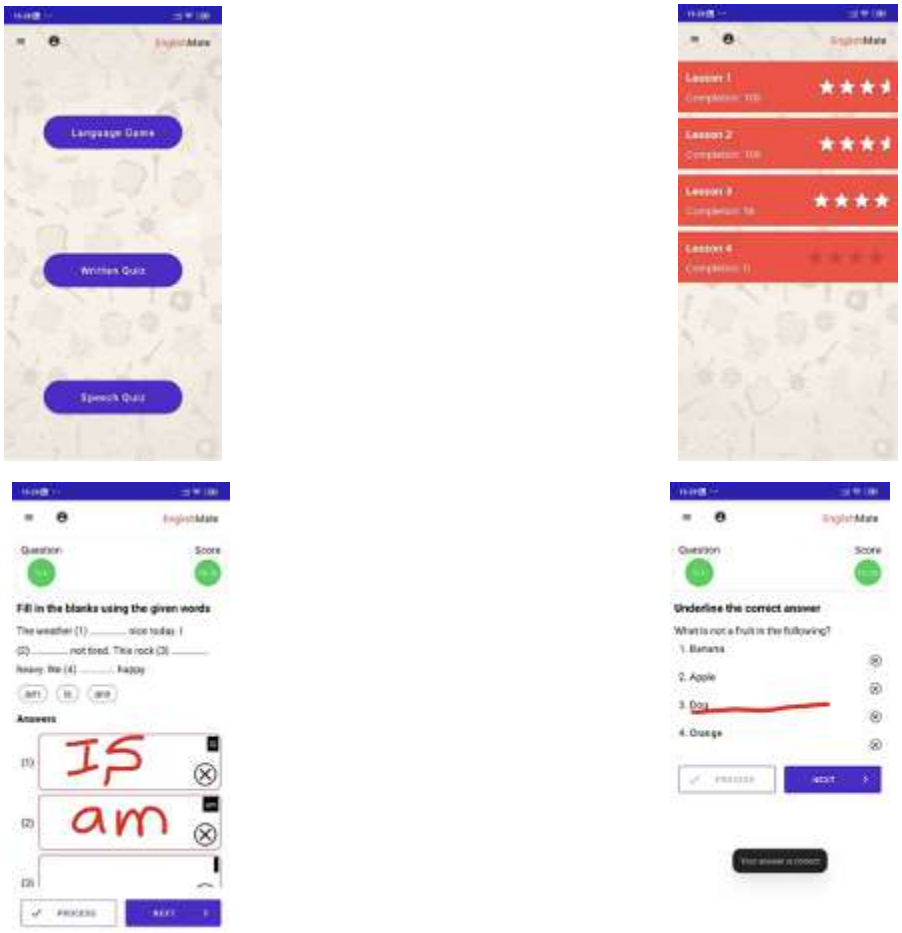
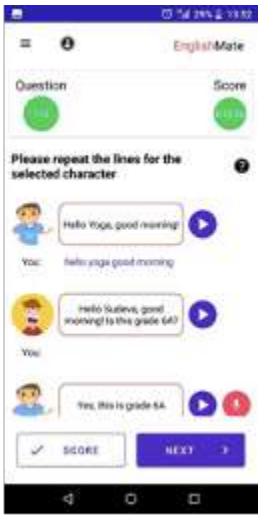


Figure XXVIII: Writing Module UI

Test Case#	Expected Result	Actual Results	Accuracy
1	Apple	Apppe	80%
2	elephnat	Elephant	100%
3	Car	Car	100%
4	Bat	Bad	66.60%
5	Cut	Cur	66.60%
6	Mat	Mat	100%
7	van	van	100%
8	ball	ball	100%
9	vass	vass	100%
10	pick	pick	100%
11	ant	ant	100%
12	monkey	monkey	100%
13	iron	iren	75%
14	is	is	100%
15	am	ar	50%
16	are	ara	66.66%
17	you	you	100%
18	has	has	100%
19	have	have	100%
20	but	but	100%

Table VIII: Testing

Spoken Module



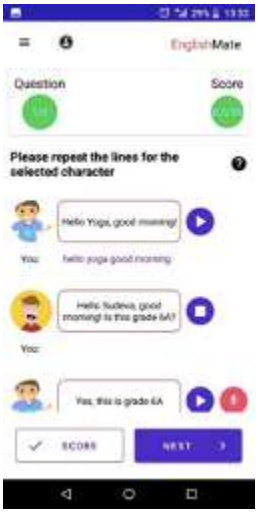


Figure XXIX: Spoken module UI

Test ID	01
Test Case Scenario	Navigate to the speech module page after log in to the system
Test input data	Sapnadivyanjali221@gmail.com Sapna1996
Test Steps	1. Successfully log in to the system 2. Press the 'Speech Quiz' button 3. Navigate to the lesson dashboard of the speech module
Expected Outcomes	Successfully user can navigate to the speech module
Actual Outcomes	As expected
Test results	Pass

Table IX: Test case

Test ID	02
Test Case Scenario	Verify user can read and record the selected character's dialogue sentences while pressing the record button.
Test input data	
Test Steps	1. Long press the record button until stop the reading. 2. Read aloud 3. Stop the button press after stop the reading
Expected Outcomes	Successfully user can read and record the dialogue
Actual Outcomes	As expected
Test results	Pass

Table X: Test case

Test ID	03
Test Case Scenario	Verify user can automatically listen the other character voice after read the own character part.
Test input data	
Test Steps	1. Read and record the own character part 2. Press next button
Expected Outcomes	Successfully user can automatically listen the other character voice after reading own part.
Actual Outcomes	As expected
Test results	Pass

Table XI: Test case

Test ID	04
Test Case Scenario	Verify user can get the score of the activity from the whole lesson

Test input data	
Test Steps	1. Finished the activity 2. Click the score button 3. Display the score of the activity
Expected Outcomes	Successfully user can get the score for the activity from the whole lesson.
Actual Outcomes	As expected
Test results	Pass

Table XII: Test case

Test ID	05
Test Case Scenario	Verify display the error pronouncing word with highlighted to the user.
Test input data	
Test Steps	1. Read and record the wrong word in the sentence part

Expected Outcomes	Successfully user can view the error pronouncing word with highlighted
Actual Outcomes	As expected
Test results	Pass

Table XIII: Test case

Activity Prediction Controller Panel

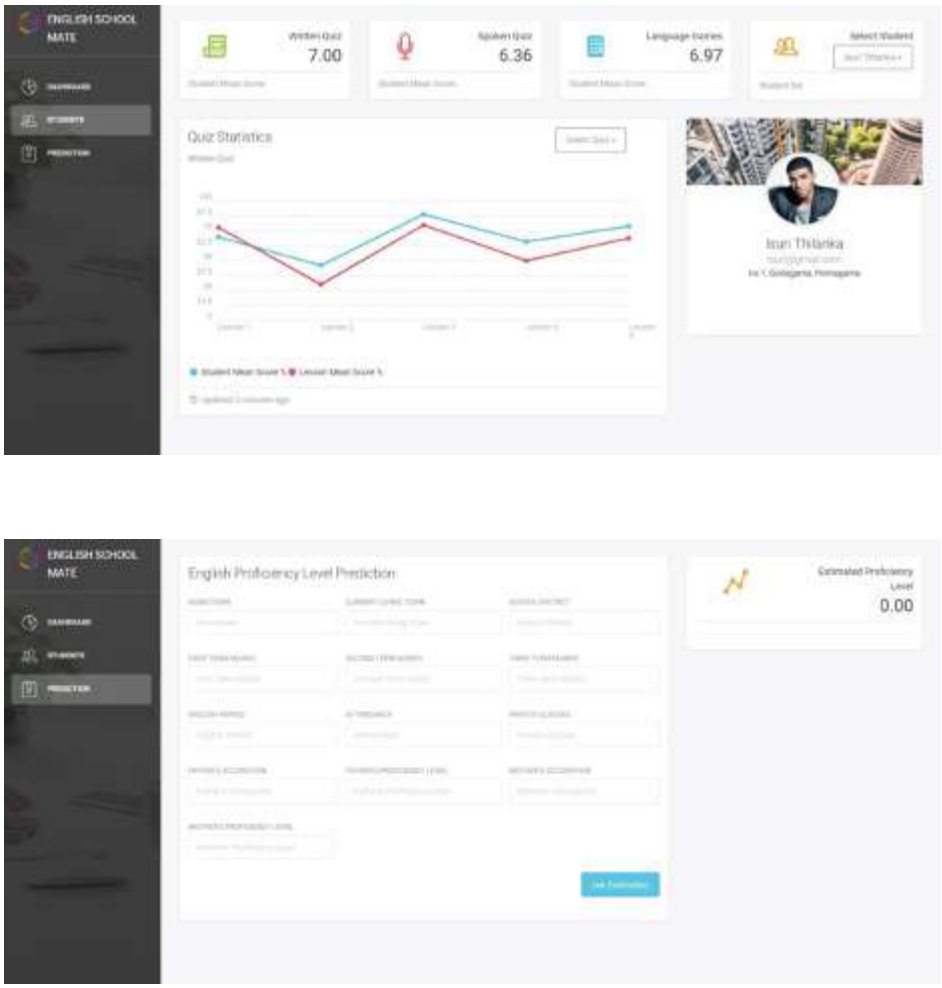


Figure XXX: Prediction module UI

In this part of the study, we predicted the numbers of students from the different activities of a VLE course using features related to student activity. To answer the research questions of the current study, we performed several experiments. We used the ML algorithms and the Rapid Miner tool to build the learning models, Data Visualization and Statistical Analysis of the Data. To understand the student data, we performed statistical analyses of the number of times students clicked on activities and the student engagement level. We also visualized the dataset. ,is step is important in ML studies because the performance of a predictive model sometimes decreases when the data quality is poor We visualized the input variables (student clicks on VLE activities) of the OU course to illustrate how important the input variables are in predicting.

Research Findings

Game Module

- Give best solution for distance learning using an android application to learn English for rural area students in Sri Lanka.
- Give solution for the lack of resources problem in sri Lankan rural area students to learn English using Information Technology.

Writing Module

- Use an android application to learn English.
- Use 3 tier architecture to improve the scalability of the application.

Spoken Module

- Use the backend part to connect the application and the web portal to improve the scalability of the application

- So lesson can be change day by day so then can change only the backend not the application. It's easy to data get to the teaching web portal.

- In the speech model using the speech recognition library but this mainly used to short forms. In this research handle the temporary array from tracking the record press button. Every 30 second library stopped and again started. But it not feel the user because that continuation handle from above mentioned temporary array.

- Use the 3T architecture, its helps to the reduce errors in the future update versions.

Activity Prediction Controller Panel

- Use the backend part to connect the application and the web portal to improve the scalability of the application

- new way to get predictions.

- In the predictting model using the panda libraries and use many techniques all are mention above.

Discussion

In here we get “English” as a language because in rural areas students unable to learn with various kinds of matters such as lack of teachers and lack English knowledgeable parents. Students are shy and English learning is not easy.it demands dedication and time which may hard to afford if you have other if you have other responsibilities. Some people abandon their mother tongue entirely. Once the basics are over, noticing a change becomes hard, and the only way to know that you are learning is through this. Learning English is very important because it improves one’s chance of getting a good job, helps one communicate in foreign countries, and broadens one’s social networking. First, learning English improves the chance of getting a good job.

There are 4 tasks that we did for this implementation.

They are ,

1. Brain Development Game
2. Written English Module
3. Spoken English Module
4. Activity Prediction Controller Panel

Educative games that are clearly intended or have incidental or subsequent informative points for educational goals. In a knowledge context, all types of games can be applied, but educational games are games that are intended to help individuals learn about certain points, broaden ideas, increase, understand a historical event or culture, or help them learn a skill while they play. Educators and the government realize the benefits that gaming has on learning. Games teach us goals, rules, problem solving as a story. In English writing module we have done Implementing image processing techniques and keyboard typing, writing screen features,

Implementing lessons for English grammar using grade wise English pupil book., Implementing additional lessons for English grammar., Implementing examine papers., Generate student

learning progress reports using recorded data. In Spoken English module This module focuses the category of spoken English. This module uses Machine learning algorithms, speech recognition features and visualization. So target to improve spoken English skills of students. In here we implement speech recognition and visualization techniques. In here activity prediction and controller panel, the teacher dashboard contains information on the overall performance of a set of students assigned to the teacher. The graphical distributions shown under this component provides the mentor an analyzed information set about the students who are registered to the system. Here we Data collected through Google Forms, Data Cleaning and Dataset Creation, Data preprocessing and developing a model using Jupiter notebook as the IDE, Sklearn and pandas libraries will be used for models and utilities needed for data preprocessing, training models, model evaluation

Contribution Summary

Member Details	Component	Tasks
IT 17102056 D.S. Shehan	Brain Development Game	Logical game design (Nature, interactions, levels)
		Gather mock data for game result analysis model
		Train the model for game result analysis
		Game UI
		Game interactions and animations
		Game logic implementation
		Game result analysis implementation
		Design apis and dtos
		Add jwt authentication to apis

Member Details	Component	Tasks
IT 17155212 H.A.B. Sankalpa	Written English Module	Find/prepare dataset for child handwriting recognition
		Train a model for handwriting recognition
		Written english question views for each type of questions

		Integrate handwriting recognition model
		Implement other input logic for written question module
		Score view
		Question paper
		App sign in UI
		Implement student mock sign in with jwt
		Add jwt authentication to apis

Member Details	**Component**	**Tasks**
IT 17400596 S.N.S. Divyanjali	Spoken English Module	Find/Implement a suitable pre trained model for speech recognition trained for accent of Sinhalease
		Train a model
		Spoken english question views for each type of questions
		Integrate Speech recognition model

		Score view
		Question paper
		Design database structure (ERD)
		Initial Project Setup (Database, Spring boot, Swagger)
		Database integration

Member Details	**Component**	**Tasks**
IT 17027670 N.G.H Madushani	Activity Prediction Controller Panel	Initial project setup
		Sign In UI
		Backend integration
		Student results visualization
		Mock data set creation for lesson prediction
		Train a model for lesson prediction
		Implement basic views (user profile, welcome page)
		Add mock data to service

		layer
		Design architecture and navigation of the app
		Integrate backend apis

Table XIV: Contribution summary

Conclusion

This discussion about our English school mate developed for students to improve English knowledge. Also this paper briefly illustrates how the system will generate for students and teachers. The main reason for having such a huge destruction is students' lack of English

knowledge. After collecting data through a survey our team is able to identify what are the difficulties of learning and teaching English it is effective for many reasons.

In order to improve in each phase there are different stages that needed to improve. Currently students are more addicted to mobile phones and most of the time performing tasks with brain development.

According to the existing research papers, among the different types of solutions for teachers and parents and spoken writing and brain development tasks. In here students improve their effective decision making ability.

A data set was generated using information that has been collected through the google forms. This paper discusses all the methodologies use of form was filled by the students. A future work of our team is to make his application more user friendly and give it to the students , teachers and parents.

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