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Automation in Pneumonia Detection

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***Abstract*— Pneumonia is a commonly known disease that causes an infection on respiratory system, where it causes inflammation in one or both lungs. In such disease happened in a restricted area are difficult to diagnose simply without any assisted vision. Thus, *'Automation in Pneumonia Detection'* is developed, and it is a model system using a Machine Learning model trained for pneumonia radiographic images detection from the collected chest X-ray image data. Unlike other researchers' method, this system has relied solely on the Shallow Learning approach with simple texture analysis feature obtained an accurate detection performance and results. The traditional technique is constructed with extracted features of the chest X-ray image and to classify its types and classes determining if a person is normal or infected with pneumonia viral or bacterial. The model aims to alleviate the challenges occur and to get its reliability and easy to interpret images for medical descriptive visual.**

Keywords—Pneumonia; Automation; Detection; X-ray image; Shallow Learning

I. INTRODUCTION

Malaysia has been struck again with the outbreaks and it has taken the lives of so many people around the globe; where the disease is widely caused by an infection towards a respiratory system and identified as Pneumonia where scientifically causes inflammation on the alveoli causes of fluids that filled into it. Thus, the air sacs inside the alveoli filled with fluids make it hard for oxygen to be transfer into the blood cells, and possible to lead to fatality. Pneumonia is seriously deadly, and the infection primarily affects people with low immunes, such as infants, young children, and senior citizens. In Malaysia, the press released in 2019 recorded that pneumonia top the second chart with 11.8% by the Department of Statistics Malaysia (DOSM) after the *Ischemic heart diseases* [1]. It infects the body at the most restricted area, lungs, to be diagnosed. The infection in the lungs can possibly because of bacterial or even viral.

In addition, both viral and bacterial are the type of pneumonia that mostly attacks a person the most, while others followed by fungal and atypical, also known as walking pneumonia [2]. The disease happens when the air sacs filled with fluids by the inflammation, then causes the oxygen hard to be transferred through all parts of the body. In consequence, it leads to shortness of breath, cough, chills, fatigue, chest pain and others [2]. On top of that, this research is to find an alternative way to classify viral and bacterial pneumonia because of its identical appearance on X-ray images. Moreover, bacterial can be treated with antibiotics. Thus, it is beneficial to be able to differentiate it well, so that any action can be taken immediately. Along with that, many doctors are faces with low aid supports and insufficient doctors related [4, 5] who are skills to measure and diagnose the radiographic images. Besides that, it is said that bacterial usually affects directly from air sacs in the lungs, while viral affects the bronchial tubes, because of its locality and from where it comes, as viral is a germ from outsides that need a host for it to reproduce and grow. Accordingly, with its restricted location, it causes hard to clarify the images [3] simply through X-ray.

The system proposed implied due to pandemic outbreaks on how to classify and differentiate the radiographic images between normal with Pneumonia infections, viral and bacterial since diagnosis the images for any symptoms and abnormalities could be cumbersome in a short time [6]. Other than that, for the implication avoiding human mistakes for the interpretations. Thus, the model aimed to reduce the challenges that occur and to get its reliability and easy to interpret images for medical descriptive visual.

II. MATERIALS

A. Collecting Dataset

The experiment is using the image processing technique, thus image datasets are collected. The X-ray images were used for detection and gathered from the Kaggle dataset. The total of images taken is about 150 images with every class collected for 50 images accordingly, the normal, viral pneumonia and bacterial pneumonia images. However, during the process, the images are then separated for the training and testing with a ratio of 80:20.

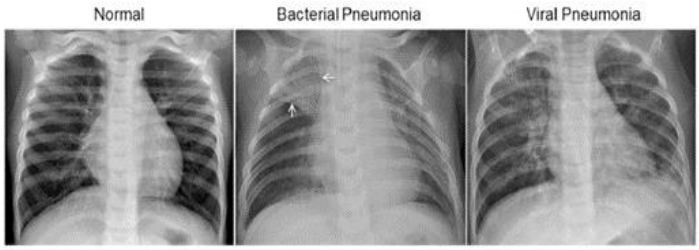

Fig. 1. Images of Normal and Pneumonia Type

B. System Tools

The system built and run wholly using MATLAB R2019a tools, the platform where it accelerates the science for engineers and scientists in any aspects with its complete tools for programming and numeric.

III. METHODS

Digitizing images for classifications are not a new thing at all. As artificial intelligence (AI) is a main-driven for emerging technology, it is mainly used in many areas to operate complexity and reduce scarcities [5] and human errors. Hence, the research and findings are to prove the image processing method to perform such operations to analyze and able to classify the images between normal and pneumonia (*viral and bacterial*) infected images. Image automation in classification has been operated with many techniques up until now. Thus, technology growing year by year to find the suitable method for automation to avoid human error and reduce the time taken, also to overcome the limited aids and resources availability.

The application applied using machine learning (ML), specifically shallow learning (SL) for a supervised technique classifying the labelled X-ray images from collected dataset such as normal, bacterial pneumonia and viral pneumonia.

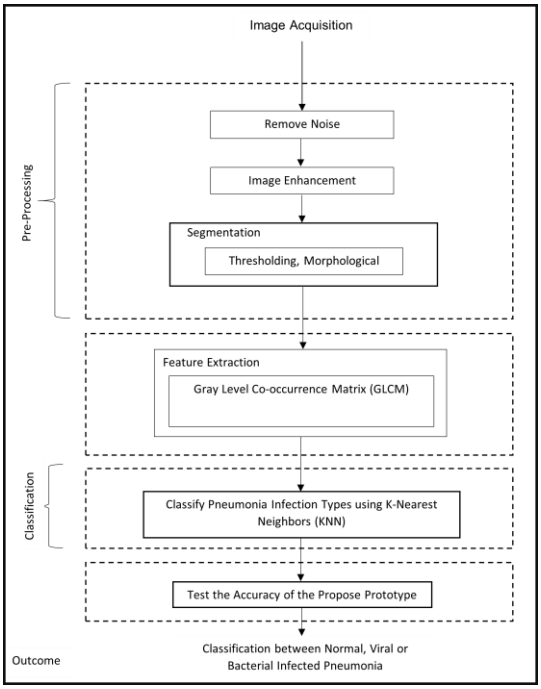

Fig. 2. System Framework Method

A. Technique

Image processing is applied in many fields of sciences and non-sciences related. There are consists of few common steps of processes:

1) Image acquisition: The projected images are digitized and collected from the Kaggle dataset consists of types of pneumonia and normal images.

2) Resize image: The image selected on the system resized into 800x800 row-column size.

3) Image Enhancemnet: To filter and denoise resized image into a clearer image with controlled image contrast. To get a balanced contrast control, the system used contrast-limited adaptive histogram equalization (CLAHE) and average filter.

4) Segmentation: To select the interest region automatically from the system using thresholding and morphological.

5) Feature Extraction: The gray level Co-occurrence matrix (GLCM) is used to extract the image feature values accordingly, with image features contrast, correlation, energy and homogeneity. GLCM also known as the second order feature under statistical methods out of three orders.

6) Classification: To classify the X-ray image whether the image shown and processed is a normal, viral or bacterial. The classification model used is K-nearest neighbors (KNN) model under the supervised technique for image detection.

B. Equations

In image processing, equations are not an exception as the application used a statistical structure and method for the image classification, and mostly used during the feature extraction process. It calculates and tables the image difference combinations value. Therefore, it provides the informative texture of processed image and enable it to classify the processed X-ray images between normal, bacterial, and viral images.

The GLCM is knowingly with its tabulation data of image elements level. It finds the difference of gray combination image elements level, then gets its rows and columns value, exchanging the gray levels. Subsequently, it combines both co-occurrence matrix image with the transposed matrix, then normalized it. Refer to the equations, (1) – (4), can be assume that the Pij as its normalized symmetrical GLCM, while N represents number of gray levels in image by quantization levels:

$$Energy = \sum_{i,j=0}^{N-1} (P_{ij})^2 \quad (1)$$

$$Contrast = \sum_{i,j=0}^{N-1} P_{ij} \, (i-j)^2 \quad (2)$$

$$Correlation = \frac{\sum (x_{i-} \bar{x})(y_{i-} \bar{y})}{\sqrt{\sum (x_{i-} \bar{x})^2 (y_{i-} \bar{y})^2}} \quad (3)$$

$$Homogeneity = \sum_{i,j=0}^{N-1} \frac{P_{ij}}{1+ (i-j)^2} \quad (4)$$

Other than that, the classification, KNN also measuring its distance, where the algorithm works by finding the shortest distance between the training and test samples. Although KNN is knowingly known as one of a simple method, with its adaptability and sturdy to large data and noise, its performance is a match as the other complex classifiers. The distance method used is Euclidian, (5).

$$distance(a,b) = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} \quad (5)$$

IV. RESULTS AND FINDINGS

The testing results of classifying the pneumonia images are divided into three classes and trained under KNN model classifier, using Euclidean distance before carried out the final evaluation. The features extraction data values are then loaded into the classifier after training and read the data using nearest the K value selected that is possible nearest to the data. The suitable distance was selected, the Euclidean (Equal) with its nearest neighbors value = 4. The result is then displayed.

Table 1 below indicates the summarized results of x-ray images detection for testing. The total of images for testing for every classes are 10 images for each. Based on the three classes of images, the overall testing accuracy obtained involving 30 images in total. The overall accuracy using the Accuracy formula equation (6).

$$Accuracy = \frac{TP}{Total\ Images} \, X \, 100 \quad (6)$$

Table 1. Summarized testing images results

Type of Classes	Total Number of Tested Images	Classified X-ray Images	
		True	***False***
Bacterial	10	9	1
Normal	10	9	1
Viral	10	8	2

The TP stands for the True Positive of the images, the total number of correct images classified after the process. It will then be divided by the total of images tested and multiply by 100 to get the percentage. Thus, the system classified the images correctly with the accuracy of 86.67% as more than a half for each class is classified accurately referred to Table 1 above.

V. CONCLUSIONS

The obtained results referring to the detection model and the system functionality visibly for the users are tested. The automation model is using the simple supervised model, KNN as its classifier with texture analysis features a technique to find its possible accuracy. This automation system includes the classification model with a few support features to help support the technique to gathered accurate data classification detection. This classification model system is meant for the clinician and researchers for research purposes to classify the radiographic images using Shallow Learning accurately.

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Terengganu Cultural Trail: Using Videography in a Participant-observer Study to Enhance Cultural Heritage Appreciation Among Children.

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Abstract—With the new technological improvements, video-based observation research is becoming a promising method in many areas. Video recording has been under-utilized as a data collection tool because of confidentiality and privacy issues. However, it has many benefits as opposed to traditional observations, and recent studies using video recording methods have introduced new research areas and approaches. This paper aimed to describe the videography project in a participant-observer study to enhance cultural heritage appreciation among children. It is also hoped to give some insights about children's appreciation of Terengganu cultural heritage when videography was incorporated as its observation tool. The researchers hoped to nurture active learning at an early age, and this includes a cultural appreciation for the participants. Participants embarked on a three-day journey to experience the cultural heritage of the mystical Terengganu, where silat, gasing and the wayang kulit were popular but unfamiliar to the participants. It hopes to nurture cultural appreciation where participants seek to understand and learn about Terengganu cultural heritage in an effort to broaden their perspective and connect with others.

Keywords—active learning, cultural appreciation, cultural heritage, observation, videography

I. INTRODUCTION

In this era where technology has become part of our daily life, the researchers were encouraged to attempt a short video-based participant-observer study to understand and establish cultural appreciation on cultural heritage among children. Videography in the field of education is not new.

Studies show that videography has been under-utilized as a data collection toolbecause of confidentiality and privacy issues. However, as opposed to traditional observations, videography in learning has many benefits, and it introduces new research areas and approaches.

When studying videography in relation to the appreciation of cultural heritage and its appreciation, let us begin with defining the concept of cultural heritage. The cultural heritage defined by UNESCO (1982) also includes, among others, the works of its artists, architects, musicians, writers in the expressions of the people's spirituality, and the body of values which give meaning to life

Zsuzsa Nagy-Sándor and Berkers (2018) noted culture as a way of life where cultural expressions, which includes singing, are the manifestation of an internal desire to voice the emotions of individuals, groups, and communities which rooted in their sociocultural environment.

The importance of cultural heritage is undeniably, especially to the recent generation, as some of the youth have rare opportunity to witness of experience Malays' traditions nowadays. Smith et al. (2010) defined cultural heritage as some broaderconcerns that came from some tangible assets.

Moreno (2020) refers cultural heritage as clear reference for the public in order to construct a potential sustainable city, socially, culturally and environmentally. In order for the youth to appreciate it, those cultural heritages must be exposed either using mass media platform, digital platform, or visiting the displayed culture monuments such as to on display at the state museums.

As example, according to Balqis (2020) Terengganu Cultural Village is the best platform for young people to identify some of the traditions of the ancestors as well as being able to feel the diversity of the community in Terengganu. Balqis (2020) also mentioned traditional games and instruments that have never been seen by today's generation are parts of the artefacts that shown in the cultural village.

In a BERNAMA articles, Nordin (2018) noted the Persatuan Dunia Seni Silat Melayu Malaysia (DSMM) who wanted the silat to be gazetted as an Intangible Cultural Heritage under the United Nations Educational, Scientific and Cultural Organisation (UNESCO).

Silat is one of Malays' martial art that was established long time ago. It's used by Malay community for self-defense techniques, hunting techniques as well as fighting techniques to stop an immediate or an unprovoked attack as well as combative art to fight against those colonials that came to Malaysia (previously known as the Malay Peninsula).

Meanwhile, as the cultural appreciation to is an important concept in this video project, the researched hope to understand its basic concept. The Finery Report (2020) pointed out the cultural appreciation concept refers to "cultural exchange, in which thetwo parties would have consented to participate in some culture.

This also participants to understand and respect each other's culture, which can be achieved through studying other cultures, traveling, listen to shows, and even making friends as mentioned by Les Elfes International (2019) Apparently, participants involved will also be able to respect culture, understand the values and beliefs of a population in order to respond to and meet the needs of diverse participants (Preemtive Love, 2020)

This paper too wished to highlight the benefits of using videography as a technique to enhance children's appreciation as compared to the traditional observation method in cultural appreciation. In a much notable study by Norton and Hathaway (2010), authors had pointed out that video production were accepted as an instructional strategy and not as an object of study, which in this era of a "unique media savvy, multimodal, and multitasking attributes of today's students" has an important role to play inK-12 content learning.

Petr C et al. (2015) pointed out that the use of video and visuals are increasingly important, and videos are no longer only for ethnographers and specialist researchers. Petr. C (2015) suggested videography is a new, artistic was to present results of research, as it is highly effective and engaging to the audience. Authors further noted that in the society of "user-content generation," these visual data are incredibly important, original, and powerful sources providing researchers with opportunities to inventively make their results more resonant and more broadly accessible.

Meanwhile, Knobloch et al. (2014) stated that videography technique has also been used in the field of social sciences for a while, and techniques including recording and replaying too were used to observe social interaction in the respective field of study. Furthermore, Norton and Hathaway (2010) saw videos as a tool which can better demonstrate complex ideas and concepts than verbal explanations can, and visual media helps cement the information in students' minds. Short format videos have been proven to increase knowledge retention.

Belk (2013) indicates that videography as part of visual research too has much a lot of potential in many areas especially inAsian context as Asian consumer cultures are rich in visual details, and "it is natural that using visual stimuli, capturing visualdata, and using visual presentations should be used in researching such topics".

II. METHODS

This journey to experience cultural heritage took a group of enthusiasts which includes five children who embarked on a three-day journey to experience the cultural heritage of the mystical Terengganu. Here, they experienced *silat, gasing* and *wayang kulit* were popular in Terengganu but unfamiliar to the participants. The study was initiated in conjunction with the Terengganu Cultural Village which took place at various events in Kuala Terengganu in September 2020. Videography was used as a recording method to this participant-observer study, which aims to enhance cultural heritage appreciation among children who took part in this journey.

After the video was completed and edited, the video was shown to the participants. This has helped them vividly discuss their experiences of the cultural heritage they encountered. This shows that videography can be a good technique to nurture cultural heritage appreciation which can lead to cultural appreciation which helps to broaden their perspective and connect with others.

III. RESULTS AND FINDINGS

The researchers took this project as an important part of the participants' personal growth and development, understandingof the cultural heritage, norms and values and arts, understanding about themselves and others in an attempt to

connect with theworld they live in which has been greatly influenced by industrialization and urbanisation.

Viewing the video of the TerengganuCultural Trail has motivated participants to vividly discuss their experiences of the cultural heritage they encountered with *silat,*the *gasing* and the *wayang kulit* became their main highlights in their discussion. The researchers found out that videography can be a good technique to nurture cultural heritage appreciation which helps to broaden their perspective and connect with others.

IV. CONCLUSIONS

The researchers concluded that videography is a fun way for children to experience, capture and strengthen their memory of their experience. The researchers believed this has succeeded to enhance their appreciation of the children's appreciation ofTerengganu cultural heritage when videography was incorporated as its observation tool. It is proposed that videography could become an excellent technique for children to look back and revisit memories of their cultural encounter, thus encouraging cultural appreciation and cultural respect. This study could be a preliminary work for a future study which involved more participants and in a different setting.

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Cassava Leaf Disease Detection System using Support Vector Machine

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***Abstract*—Cassava (Manihot esculenta Crantz) has been used as a staple food of many nations. It is also known as manioc, and tapioca. In Malaysia also cassava is used as a daily food source. Its tuber is the most popular form of consumption, although the leaves are also consumed at times for medicinal purposes. Even though cassava is a popular form of consumption, it is vulnerable to disease. The type of disease that can be found on cassava is bacterial blight and mosaic disease. Problems arise when farmers have to detect the disease using the expert's naked eyes which takes a lot of time and is a difficult process to be carried out on a large farm and it may lead to inaccurate results. This study is therefore proposed to solve this problem, which is to develop a prototype for the detection of cassava leaf disease by applying image processing techniques. In this project, a set of data is collected from Kaggle website, with a total of 200 images (100 images of bacterial blight disease and 100 images of mosaic disease) being successfully collected to take further steps in processing of the image. Image processing phases that are involved in this project are image acquisition, image pre-processing, segmentation, feature extraction and classification. All these phases are done to train the data before the prototype is ready to be tested. Support Vector Machine (SVM) is used to classify the disease as bacterial blight or mosaic disease. The accuracy of this prototype is 87.5%.**

Keywords—SVM, image processing, cassava, diseases

I. INTRODUCTION

Cassava, one of the important food sources also known as Tapioca is one of the crops that made into industry consistently growing because of its benefits and versatility. In Malaysia, it is widely grown in the orchard or local houses. Despite being the third-largest human carbohydrates and nutrients supplier [1] in the world, it is still easy to get exposed to some diseases. This top staple food cassava can also easily get an infection, such as viruses, bacteria and fungus. Thus, such diseases by fungus and bacteria can causes brown streak disease, green mite damage, mosaic disease, brown leaf and red mite damage [2]. As cassava is known as the most plants production in industries, it is needed to be taken care of and treated well to preserves the plant quality well. Therefore, it is vital to know if there are any diseases or infection towards the plant well. Plants that are infected would impact production and affect major economic losses [3]. The infection could lead to plant unnatural growth, low quality and nutrients, decrease crop quantity production and wilting. Thus, the project aimed to use image processing to improve the manual and traditional method by using the computerised-based process to correctly recognize leaf diseases on cassava crops collected from the Kaggle dataset [4].

The method applied in almost all science and non-science field and the system is performed widely in image operations to generate and improve the image or to retrieve some useful information. Many features can use for image interpret the object with automated operation. Hence, such features are colour, form, size and textures are commonly used in the operations. Image processing is also mentioned uses in agriculture applications for disease detection [5], and it is the most outstanding technique that functions well in agricultural application. This technique can be a promising solution for the farmers to overcome the time-consuming problem and such human errors. Other than that, it is also hard to detect with naked eyes in large crops. Besides, manual classification requires a lot of work, plant disease knowledge and often insufficient processing time [6]. Therefore, this system proposed to solve this problem, by developing a detection for cassava lease disease by applying image processing

technique using support vector machine approach. The system not only designed to detect and classify the diseases, but it can also carry out the accuracy of the system for every crop detected.

II. LITERATURE REVIEW

A. *Disease*

Cassava also known as tapioca is the world's most cultivated root crop. In tropical countries, cassava, other than rice and maize, is the third major calories source [7]. The different plants suffer from different disease. There are various of factors that may cause the plant disease such virus, bacteria and fungi. Fungus and bacteria cause cassava disease such as cassava brown streak disease (CBSD), green mite damage (GMD), cassava mosaic disease (CMD), brown leaf spot (BLS), and red mite damage (RMD) [8]. Cassava Mosaic virus Disease (CMD) and Cassava Bacterial Blight (CBB) are the disease that have been used in this project. CMD is the most serious and common infection of the virus affecting cassava. It considered to be a significant constraint for the cultivation of cassava is transmitted by white flies, CMD's common symptoms are yellow or pale green. Leaves affected by CMD appear reduced in scale, twisted and distorted. CBB is caused by the fungus and is spread around the world. the disease is representing in brown circular leaf spot with several varieties around the spots displaying a chlorotic halo. Severe infections can turn yellow or brown at the leaves.

B. *Support Vector Machine (SVM)*

Support Vector Machine (SVM) classifier is ideally to differentiate proof and arrangement of plant infection affecting crops [9]. In terms of plant diseases classification, the support vector machine technique produced better classification result and generated higher accuracy as a classifier. Support vector machine learns the input data and classifies it into different classes once it has been trained.

III. METHODOLOGY

Total 200 images of cassava leaf disease which consists of Bacterial Blight disease (CBB) and Mosaic disease (CMD) are used in this project, which 100 images are Bacterial Blight and 100 images are Mosaic disease. The images have been divided into 80% for training and 20% for testing. To classify, the data set is trained using the Support Vector Machine classifier before the accuracy test is carried out.

A. *Image Acquisition*

This system analyses cassava leaf images taken from smartphone devices. Normal images are usually captured with the presence of various objects on complicated backgrounds.

B. *Image Pre-processing*

Aims to make the image data input size compatible before the image is processed using SVM. The activities include resize and enhance the brightness of the leaf image. This technique function would help to make computation in SVM faster.

C. *Segmentation*

The images divide into multiple segments to make processing easier and simpler. The results only extract leaf regions from a real image. For segment cassava leaf, ROI is used to separate the image from the background and unnecessary parts of the image. In this prototype, the *roipoly* function is used to allow the user to manually select the affected parts, so that no necessary elements of the image are removed. The extracted ROI will be displayed to the user after the process is completed.

D. *Feature Extraction*

This process involves extraction of the feature which consists of three features that are shape, color and texture. For disease spots, texture and colour features are extracted to identify diseases. Color Moment and Gray level Co-occurrence Matrix (GLCM) uses for calculating the frequency of various combinations of pixel brightness values in an image. The values calculated in color moment are mean, standard deviation and skewness. GLCM uses to extract statistical features such as contrast, similarity, energy and homogeneity.

E. *Classification*

Support Vector Machine (SVM) used as a classifier to classify the diseases. In SVM, each data item is plotted as a point in n-dimensional space where n is the number of features that were obtained with the value of each feature being the value of a given coordinate. Then, classification performed by finding the hyper-plane which differentiates the two classes very well. SVM classification consists of two phases, which are phases of training and testing. It will train all data classes in the training phase. Then, the data will be tested using the model obtained on the trained dataset during the testing phase.

IV. RESULTS AND FINDINGS

80 images of each disease are used to train the Support Vector Machine and the system produced an accuracy of 88.1% for training. The confusion matrix will summarize the results after the training is completed. Fig. 1 shows the positive predictive value and false discovery rate for bacterial blight disease and mosaic disease.

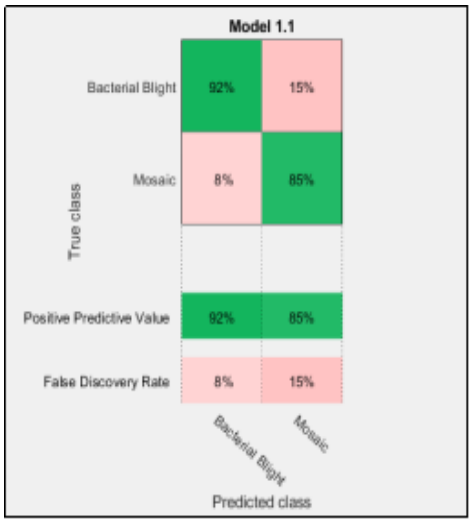

Fig. 1.Positive Predictive Value and False Discovery Rate.

To test the accuracy of the prototype, the remaining images are used. The example result of the testing images is shown in Table 1.

Table 1. Testing Images Result

Input Image	Expected Output	Prototype's Output	Result
	Bacterial Blight	Bacterial Blight	True
	Mosaic	Mosaic	True
	Bacterial Blight	Mosaic	False

By using a trained model of SVM, the result shows that 35 of 40 testing images produce the correct outcome and the accuracy is 87.5%.

V. CONCLUSIONS

The Cassava Leaf Disease Detection System is a system that can help users identify the type of disease on cassava leaf. The accuracy is 87.5%. With the help of this system, users can automatically detect the type of disease on cassava leaf either it is bacterial blight or mosaic disease. The manual disease monitoring does not produce satisfactory results because naked eye

monitoring is an old process that takes longer time to classify the diseases. This system can potentially help farmers with less experience to identify cassava leaf disease without taking too much time to find people who have knowledge or someone with expertise that takes time and sometimes the result can be inaccurate. So, this prototype is developed to save time and ease the farmer's work.

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Learning Mathematics using Fun-Math Mobile Application for Pre-School

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***Abstract*- The use and development of game application nowadays is in very fast pace and most kids like to play games rather than studying especially in mathematics. Mathematics syllabus is usually formal and theoretical, and it is not interesting for kids is the attitude of kids in pre-school is more to playing and learning. Therefore, the aim of this paper is to propose a Fun-Math mobile application to help pre-school in learning and understanding basic mathematics. The method used is ADDIE model consists of analysis, design, development, implementation, and evaluation. The proposed mobile application is evaluated to verify its capabilities in helping kids. The results showed that the proposed Fun-Math mobile application can improve kids' understanding of mathematics.**

Keywords—Learning Mathematics, E-learning, M-learning, ADDIE model

I. INTRODUCTION

Mobile application and technology have seen increase and growth rapidly since the early year 2012. Mobile application is essential to the mobile user, especially students. There are many things that can be done using a mobile device such as education, games streaming, serve the internet and etc. Mobile applications consist of software or a set of programs that runs on a mobile device and perform certain tasks for the user. The main goal of a mobile application is to have an interactive engagement with the user. Mobile applications are available via distribution platforms such as App Store and Google Play Store, there are many free applications, as well as paid apps [1]. Nowadays, the development of game applications is increasing rapidly. Kids tend not to study and just want to play games. Most of them like to play games compared to reading books. Kids are not attracted to traditional studies (books) and easy to lose their focus. Mathematics at the pre-school is formally, theoretically, and book-based learning, and it is not interesting as playing games. One of the difficult subjects in basic education is mathematic because it has more logical and needs high problem-solving skills.

A survey conducted in America showed that mobile devices have become a part of children as it is of the children development process, especially in education. As a result, mobile learning (M-Learning) has come into modern's life and become the best way of learning mechanism that can improve children learning process by using mobile learning applications [2]. Games applications help the teachers to conduct activities during the break. Besides, the aid of instructional technology, digital devices, and the advancement of educational mathematics games can help the teachers to use in the learning process. Since the educational mathematics game has gained considerable interest in education circles due to its capability of enhancing the learning process among students, the teachers need to have their criteria and set goals in order to achieve the desired learning outcomes. It is good when a mobile application adds a game element that includes entertainment, challenges, and competitive spirit like video games. These elements could encourage them in their study. By providing some recreational activity they could escape from everyday routine for a bit. By adding the fun element into a casual application, it helps to reduce some stress and relax for a moment. Therefore, the aim of this paper is to propose Fun-Math mobile application to help pre-school to learn

mathematics. This paper is organized as the following: Section II discusses the materials, Section III explains the methods, Section IV shows the results and findings. Lastly, Section V explains the conclusion and future work.

II. MATERIALS

A. *Mathematic*

The mathematics syllabus at the primary school is book-based learning, and it is known as a formal and very theoretical subject. Mathematic is a boring and complex subject [3]. It would easily give one headache if the students are unable to understand the basic number and operations such as addition, subtraction, multiplication, subtraction, and division. Besides that, Mathematic is one of the most challenging subjects for students [4]. This is due to kids that are not focused and always lose interest quickly.

B. *E-Learning*

Electronic learning (E-Learning) is a platform in the form of electronic media that focuses on education. E-Learning is online learning that includes various types of media such as videos, audio, text, images, animation, and many more [4]. The Internet is playing a big role in children's s life nowadays as they prefer to use and interact with the content and images on the screen rather than books and papers. There are many advantages of online learning. Students can access the content at anytime and anywhere [5]. There are days when students could not attend school; they must learn the topic on their own. Students do not have to worry about the lesson they have missed. Students could access updated content with more creative material unlike a book with online learning.

C. *Mobile Game-Based Learning*

Mobile game-based learning has grown rapidly and gaining popularity among teachers and students. Mobile games in education provide an interesting learning method that is acceptable and workable for pre-school students of different levels and gender to improve their basic skills in Mathematics. Mobile learning can be defined as the ability to obtain and provide educational content on personal pocket devices such as PDAs, smartphones, and mobile phones [6]. According to [7], mobile learning is learning that is using small portable devices small/ portable computing devices. These include smartphones, PDAs, and handheld devices. It also will take the education process away from any fixed points [7]. Learning in the 21st century does not have to be chained with the way it was before, which is the traditional method in delivering information to the students. Mobile game-based learning will make the way to learn in fun and entertaining ways [4]. At the end of the day, it will improve the student's mathematic knowledge. Besides that, mobile game-based learning is much engaging the students' attentions more than book-based learning of teaching system as it is unique and fun [3]. It is also embedded with interactive, immersive content to the students and provided an exciting experience to them, which is better than memorizing the facts. Games provide parent-child interaction as well as opportunities for exploring ideas and more opportunities for communication and discussion that are normally available in the classroom [8].

III. METHODS

Fun-Math mobile application is developed using ADDIE model. According to [9], ADDIE model is one of the systematic learning design models. ADDIE model is structured with sequences of systematic activities in an effort to solve learning problems. ADDIE model is simple, linear, and easy to understand, and it is suitable to use in mobile development applications [10]. This study developed a prototype for Android mobile platform to learn Mathematics Operations. This model consists of five stages namely analysis, design, development, implementation, and evaluation as shown in Fig. 1. Fig. 1 depicts the phases of developing the Fun-Math App. The explanation of each stage is described below.

Fig. 1. ADDIE Model

A. *Analysis*

During this initial stage, the potential requirements of the application are methodically analyzed and written down in a specification document that serves as the basis for all future development. The result is typically a requirements document that defines what the application should do, but not how it should do it. The system will be analyzed in order to properly generate

the models and business logic that will be used in the application. At this stage, the objective, problem statement and environment are being clarified in order to understand the project goal.

B. Design

Design is the second stage in ADDIE model which is at this stage covers technical design requirements such as sketches storyboard for Fun-Math App, the programming language that can be used, data layers, services, etc. A design specification will typically be created that outlines how exactly the business logic covered in the analysis will be technically implemented. In this stage, the structure and flow of the project must be clearly stated which is include framework, object, icon, and interface layout.

C. Development

In the development stage, the Build Box framework is a medium that is used to develop Fun-Math App. Build Box is a drag and drops game engine and one of the no-code game development platforms. It is focused on game creation without programming. Android Studio will be used to convert the app to the Android platform so that it can be installed in a smartphone that using an android operating system.

D. Implementation

Fun-Math App will be testing at this stage. Implementation is a stage in which Fun-Math App is installed into smartphones. At this stage, Fun-Math App has been tested and working smoothly. On the start-up and main page of Fun-Math App, the organization logo and "Quiz Matematik" will be displayed and introduce the application in the form cartoon character.

E. Evaluation

During this stage, Fun-Math App is installed on different smartphones with different android versions. The evaluation stage entails not just the evaluation and deployment of the application, but also subsequent support and maintenance that may be required to keep it functional and up to date.

IV. RESULTS AND FINDINGS

The usability test is conducted on 19 kids as a respondent to evaluate the Fun-Math App. Each respondent has to play the Fun Math App and after that, the test administrator explained about the test session and asked the respondent to answer the questionnaire. Since the respondents were kids below 12 years old, so the test administrator helps them by reading the question and fill the answer from the respondent. The result of the evaluation is shown in Fig. 2.

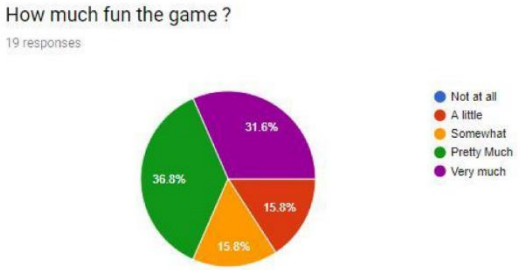

Fig.2. How much fun the game?

Fig. 2 shows the question of how much fun the Fun-Math App is. Based on the survey conducted; the highest percentage is 36.8% which is seven respondents who are voting for pretty much. Six respondents indicate 31.6% votes for very much. 15.% (three respondents) votes for a little and somewhat. This shows that users pretty much enjoy using this app. The next question is shown in Fig.3. Fig. 3 shows the question for how much would you like to play the game again for the Fun-Math App. The result shows that 31.6 % are pretty much like to play Fun Math again, while 26.3 % of the users feel a little like playing the game again and 21.1 % of the users feel very much and somewhat. The next question is shown in Fig. 4.

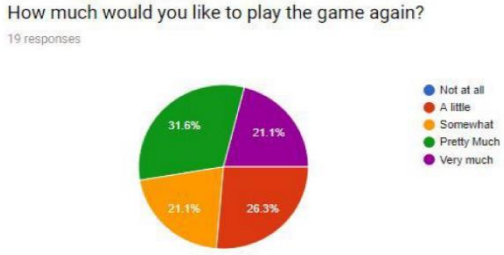

Fig.3. How much would you like to play the game again?

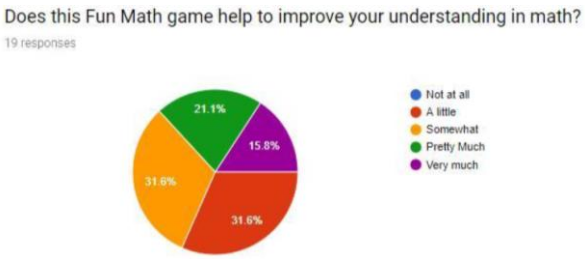

Fig. 4. Does this Fun-Math App help to improve understanding in mathematics?

Fig. 4 shows the result of respondents towards the ability of this application in improving their understanding of mathematics operation. The highest percentage which is 31.6% show that respondent vote for a little and somewhat. 21.1% of the respondent, which is four people, are voting for pretty much and 15.8% (thereof the respondent) votes for very much.

V. CONCLUSIONS

Fun-Math App provides a mobile application that enables users to immerse themselves in a learning environment anywhere and anytime. On top of that, it helps the user to understand the basic operation and counting by following thirty different questions that have been integrated into the application. During the testing, this application can perform the activity as expected without any bug and error. Moreover, users can handle the application without any problem as the interfaces are easy to use and learn. As the result of users' evaluation, Fun-Math App can inspire and motivate users to learn the basic operation and counting via smartphone as long it has Android Operating System. For future work, more operations or categories should be added to the application so that it can be used by different ages of users.

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OSH-DBG as a Method of Digital Problem-Solving for Learning Construction Safety and Health Course

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***Abstract*— Occupational safety and health (OSH) awareness at the sites are challenging for students. Nowadays, students can be very demanding because they have raised their learning criteria compared to the past generation. Therefore, new pedagogical paradigms need to emphasize creative thought. In this case, gamification in teaching and learning is a creative way to inspire students to learn by incorporating game features to achieve an enjoyable and exciting learning experience. Game-based learning incorporates new skills and concepts by voluntarily enhancing learning engagement and encouragement among players. Gamification is also a successful way to improve students' habits and attitudes towards learning. Here, OSH-DBG is a digital board game project created for OSH awareness. The board game promotes knowledge and information creation, particularly for built environment students. The result shows that students' experience in the game is more likely to encourage OSH learning. Besides, the built-in digital and online gamification was found interactive in terms of outcomes and playability. Therefore, this gamification project can help develop knowledge and information about OSH and improve essential skills for the construction industry's students and future personnel.**

Keywords*— *e-learning, gamification, interactive, learner engagement, direct digital learning.

I. INTRODUCTION

The construction industry is an important key sector in stimulating Malaysia's economic growth to achieve a high-income, inclusive, and sustainable economy. Over the last 30 years, it forms a significant component of the national Gross Domestic Product (GDP). The industry is expected to grow at 10.3% per annum, contributing to RM327 billion (5.5%) to GDP [1]. The industry also provides about 1.2 million employment opportunities representing 9.5% of Malaysia's total workforce [2]. Therefore, the construction sector is considered one of the country's primary sources of economic growth. In Malaysia, occupational safety and health (OSH) are important sources of green growth highlighted in the Construction Industry Transformation Plan (CITP) 2016-2020 [2]. Therefore, improving OSH is one of the strategic thrusts formulated by policymakers. In the construction industry, workers perform several physically demanding work tasks with varying exposures and risks [3]. Frequent accidents have plagued the construction industry. As noted, fatal accidents tend to occur more in the construction industry than in other industries, even though more accidents can occur in other industries as well [4]. According to the DOSH statistical report, between 2002 and 2009, most of the fatalities in the construction industry were caused by "falls of persons," being "caught in or between objects,", "stepping on, striking against or [being] struck by objects," being "struck by falling objects," and "electrical shock" [4].

Unfortunately, when looking at fatal and nonfatal injuries, construction workers have significantly higher rates than other industry workers. Therefore, the rapid change in workforce demographics previously described (the new generation of workers) is undoubtedly a critical factor in allocating OSH educational and training resources. Education and training have been suggested as an effective means of influencing attitudes and practices in relation to OSH at work [5]. Better educated/trained workers are

more aware of the hazards in the work environment. Appropriate training and education on OSH are now widely recognized as crucial in reducing and preventing injuries. OSH has become an important issue for stakeholders to manage human resources effectively [6].

As a result, OSH training conducted aims to overcome the higher rate of accidents on construction sites and related construction deliveries. Further, as mentioned by Brunette [3], the training must also provide a sense of responsibility towards OSH's importance. The education must start early, such as tertiary level, to ensure the successful promotion of the OSH concern in the construction industry. However, currently, available OSH training approaches are still lacking in terms of delivering hands-on training and are more theoretical- instead of being more practical-based [7]. Thus, in recent years, gaming products have increasingly been used to enhance learning and training development in the academic and commercial sectors. Gaming is an approach that applies technology to provide an almost real experience interactive field training and supports the theory of learning by doing with the real case scenario. Furthermore, students at the tertiary level with no real experience on the site can use the gaming approach to nurture their interest [8]. Student motivation and engagement are an ongoing challenge for classroom instructors and the basis of various research endeavors [9].

In terms of knowledge, understanding, and awareness in construction OSH, the student should grasp the OSH's importance in the construction industry. Moreover, the interactive gaming approach also provides positive reinforcement for working with others to accomplish the activity's goal. As a result, the game outcomes and playability must be measured using proper instruments to ensure the gamers/students feel the board game's learning and entertainment objectives are fulfilled based on the developed features [10]. Therefore, this study aims to identify students' perception of OSH-DBG board game based on the outcomes and playability for developing a teaching tool.

II. METHODS

This preliminary study uses a quantitative approach. The instrumentation involved in this study is the questionnaire survey. The multiple-choice questions based on five (5) points Likert scale were used to grasp respondents' opinions. The respondents' key selection criteria are they should be students who currently or have attended Construction Safety and Health subject (BGN292) in UiTM, Sarawak Branch. The students have tested and engaged in the interactive board game developed. The survey will be a cross-sectional survey since it took place at a single point in time. This study involves five (5) students that meet the criteria. The sample was drawn based on a random sampling method where the respondents were chosen. It is a small sample study since the board game is still in the prototype version. None of the questions can identify the respondent's identity. The respondents responded to the survey using the Google Form application. The measure of central tendency, i.e., mean score is used to analyze respondents' opinions. A score of more than 2.5 points means that the respondents agree with the statement.

III. RESULTS AND FINDINGS

A questionnaire survey was conducted to find out students' experience playing OSH-DBG Board Game. The survey consists of respondent's background and game outcomes, and playability. Here the word respondent is used interchangeably with the student. It was found that all respondents are 21 years old when they responded to this survey. It indicates that 40% (2) are female while 60 % (3) are male. Figure 1 shows the result of the students' experience playing this game. Each item of number represents the students' experience as tabulated in Table 1.

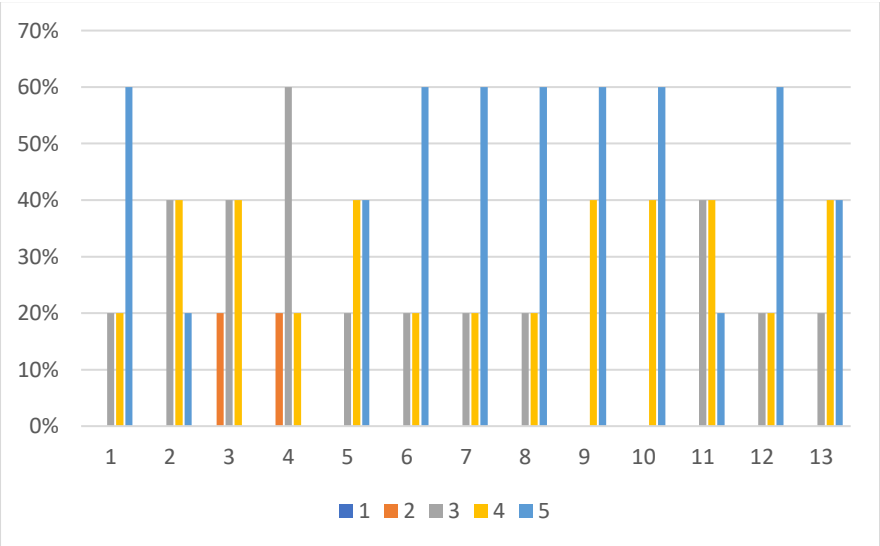

Fig. 1. Bar chart of students' experience based on percentage versus Likert scale.

Table 1. Students' experience based on game outcomes and playability.

Item	Students' experience	Item	Students' experience
1	Familiarity playing board games	8	The level of achievement on the learning objective
2	Respondents' level of knowledge	9	How straightforward the game information?
3	The course's level of difficulty	10	How instant to learn to play the game or read a manual?
4	The view on traditional teaching method	11	The level of confidence while playing the game
5	The game can improve respondents' knowledge	12	The game is liked because they were informative and exciting
6	The level of easiness to play the game	13	The game can help to understand OSH
7	The level of easiness to navigate the game interface		

Figure 1 and Table 1 indicates that, for item no. 1, most respondents are familiar with the game rules and style because it is similar to ordinary board game rule. The average score for item no.1 is 4.4. The result shows that, for item no.2, most respondents are quite knowledgeable on the course's subject. The average score for item no.2 is 3.8. However, the level of difficulty of the course can be more than average (item no.3). The average score for item no.3 is 3.2. For item no.4, in term of learning, most respondents think that the traditional face-to-face learning can be uninteresting for this subject. The average score for item no. 4 is 3.0. They agree that this board game can improve their knowledge of OSH (item no.5). The average score for item no. 5 is 4.2. Also, for item no.6, most respondents think that the game is easy to play. The average score for item no.6 is 4.4. In addition, for item no.7, most respondents think that the game interface is relatively easy to navigate. The average score for item no. 7 is 4.4. Also, they believe that the game can achieve the course's learning objective (item no.8). The average score for item no.8 is 4.4. Here, for item no. 9, the game information is straightforward to be understood by respondents. The average score for item no.9 is 4.6. For item no.10, most respondents find that the game manual is easier to read, and they can start the game almost instantly. The average score for item 10 is 4.6. They are confident in playing the game (item no.11). The average score for item no.11 is 3.8. For item no. 12, most respondents think that the game are informative and exciting to play. The average score for item no.12 is 4.4. Lastly, most respondents believe that the game can help them to understand OSH more (item no.13). The average score for item no. 13 is 4.2.

IV. CONCLUSIONS

The need to raise construction occupational health and safety awareness (OSH) is challenging. Accidents at construction sites can be fatal than in other industries. Accidents can also be problematic for construction resources because the loss of human resources can affect productivity and project deliveries. The current green growth policy is looking for better ways to improve OSH levels to promote sustainable development in the construction sector. Therefore, it is essential to equip students with a high level of OSH awareness. However, the pedagogy approach can be challenging due to the current needs for a better teaching approach that should include creative thought using a hand-on approach. In this case, this paper proposed the OSH-DBG boardgame as a method of digital problem-solving for learning construction safety and health. The result shows that the board game has achieved its objectives and playable for students who undertake an OSH course at the tertiary level. Therefore, a better-refined teaching tool can be further developed as part of the mass introduction as a teaching tool for this subject. It is also hoped that future development on this boardgame can raise its application to other construction and health education in the future.

ACKNOWLEDGMENT

We thank Universiti Teknologi MARA, Sarawak Branch for the assistance provided the Dana Kemerlangan Fund.

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"What to Cook?" Mobile Application

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***Abstract*—**Home-cooked food provide many benefits. However, due to current lifestyle, people tend to takeout food or order fast food. This project address the problems where people have trouble on what to cook based on the limited ingredients, they have to spent some time in order to search for the recipes which do not contain ingredients that they are allergic for them to cook and also they need to know the allocation time to prepare the food which is suitable to them. In order to solve the problem, modified waterfall methodology was applied. It consists of three phases which are requirements gathering and analysis phase, design phase and implementation phase. Three objectives have been achieved after the project have been completed, which are gathering and analyzing the requirements needed for developing the mobile application, designing the mobile application according to the requirements that has been analyzed and developing a mobile application that can recommend a variety of recipes for people to cook based on the available ingredients and to exclude recipes that contains the allergy ingredient. Last but not least, an Android mobile application with three features is the result of this project. The features of the application are people can search for recipes either by entering the ingredient, allergy ingredient or time for food preparation.

Keywords—mobile application, food recipes

I. INTRODUCTION

Home-cooked food defines as food that is prepared at home according to the Oxford Online Dictionary. There are many benefits of home-cooked food. One of the benefits is people have the knowledge of ingredients that they put in the food and they can even control their intake of sugar and salt. This can be proved when, an article of The Benefits of Home Cooking stated that when it comes to providing your body with healthy nutrition, nothing beats home cooked meals [2]. This means it is better to prepare food by ourselves rather than buying outside food. Besides that, people can even avoid putting any allergy ingredients that they have in the food that they cook. This is on the grounds that as indicated by the law, in the European Union, prepared suppers may contain a blend of various known allergens without demonstrating information on the individual parts of the bundle. Moreover, people can even save their money when cooking by themselves as it is stated in The Star newspaper in an article about the benefits of home cooking [2].

According to the observation that have been done, in this modern era, people tend to choose with fast and easy lifestyle which basically everything that they do must be fast. This is because people consume more time in working and hectic social lives. Besides that, travelling time from home to work place is also time consuming. As for that, they do not have much time allocated in preparing their food. Therefore, people would just takeout food or order fast food as they feel it would save their time rather than cooking by themselves. This is because it just takes a few minutes to order and then they will just have to wait for a while in order for the food to be ready. Moreover, people would have to go for grocery shopping in order to cook their food and this will consume some of their time.

Furthermore, they feel searching for recipes that is suitable with the ingredients that they have in kitchen is time consuming. This is because they need to skim and scan for the recipe ingredients in order to know whether the recipe have the ingredients that they want to use. As a result, they tend to cook the same dishes for many times because sometimes they do not have an idea on what to cook based on the ingredients that they have and they feel it is more time saving. This can be proved in the survey that have been conducted whereby 98.2% cook with the same ingredients that they have while 75 % feels its's time consuming to search for recipes to cook as attached in Fig. 1 and Fig. 2 respectively.

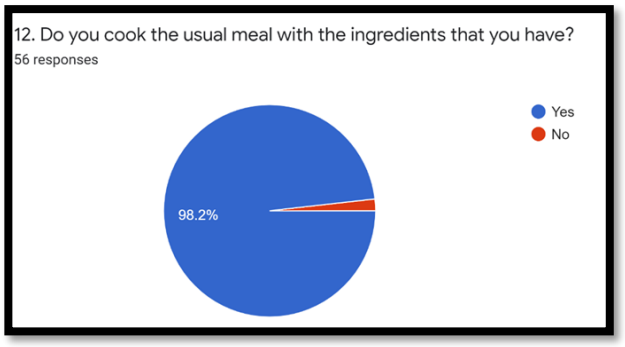

Fig. 1. The respondents whether cook the same meal using the same ingredients.

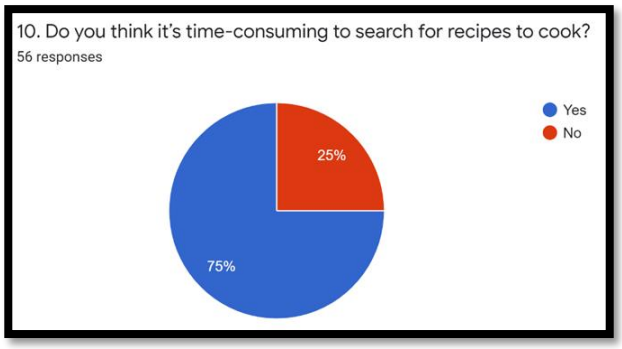

Fig. 2. Searching for recipes either time consuming or vice versa.

Based on the situation explained, there is a need to have an application that can help to solve this problem. In the application, people can enter the ingredients that they have and recipes regarding the ingredients are shown. Besides that, people can enter their allergy and the application will only show recipes that is not related with the allergy ingredients. Last but not least, people can enter the allocation time that they need to prepared the food and the system will show recipes that are related to the time allocation that has been chosen. This mobile application is easier to be access by many people because in this era most of the people are equip with mobile devices. Moreover, this helps people to access the application at anywhere with the use of their mobile device.

II. MATERIALS

A. *Hardware*

The hardware that has been used to developed the mobile application is a laptop. The laptop model that has been used is Asus Vivo Book S. The processor of the laptop is Intel Core i7 with a 4GB of internal RAM. The operating system of the laptop is 64 bits and the windows type are Windows 10. Besides that, a smartphone has been used in order to test the application after the mobile application has been developed. The features of the smartphone that is being used is it has a processor of Octa-core 1.6 GHz Cortez-A53 and the system memory of 32GB 3GB RAM. The operating system of the smartphone is Android 7.0 Nougat.

B. *Software*

There is a few software that have been used in developing the mobile application. The language that has been used in developing the mobile application is Java and XML. Android Studio and Java Development Kit (JDK) SE 7 are the platform that has been used in developing the mobile application. SQLite is being used for the database. All the data in the application are stored in SQLite. The prototype is tested using Geanymotion before transferring it to the real devices.

III. METHODS

In order to develop a successful What to Cook? mobile application, a methodology which is modified waterfall model has been chosen. The initial waterfall model has been modified so that it can suit the development of the application. [1] The phases in the modified waterfall model which consists of requirements gathering and analysis phase, design phase and implementation phase which the phases have been taken from the original waterfall model by Govardhan. Each of the phases have to be completed in order to proceed with the next phase. This is because the result of one phase acts sequentially as the reference for the next phase. In the requirements gathering and analysis phase, all possible system specifications that needs to be created are collected and recorded in a configuration specification document. Meanwhile, the requirement specifications from the first phase are studied and the design of the system is prepared in the second phase which is design. The overall architecture of the system is going to be defined in the design phase. Implementation phase is where the application has been developed according to the design in design phase.

The reason waterfall has been chosen as the methodology in developing the mobile application because it consists of consistency and completeness in documentation. The developers that use waterfall methodology will even get step by step approach thus this will lead to specific and clear guidance in creating a fully functional mobile application [1]. Besides that, each phases of the waterfall model have specific deliverables and review process. Last but not least, the phases that are in the modified waterfall are defined clearly as for that it is easier to understand and be implemented.

A. *Phase I: Requirements Gathering and Analysis*

There are a few main steps in this phase which are gathering the requirements, searching for the suitable cookbook, analyze the data from questionnaires survey and cookbook and analyze the features of the application and lastly document all of the requirements in software requirement specifications (SRS).

The first stage is to gather the requirements for the application from the users by conducting surveys. The way of information gathering that have been used to gather the information is by doing questionnaires through google form. There is a total of 22 questions that have been asked in the questionnaire. The total number of respondents of the questionnaire are 56 people where it consists of 33 females and 23 males. The deliverable of this activity is survey data have been gathered.

Next, searching for the suitable cookbook that have the recipes which consists of time to prepared the food have been search and this will result in identifying the suitable cookbook recipe that have been use in the mobile application. The characteristics of the cookbook is that it has recipes and the time to prepared the food. The characteristics of the chosen cookbook have been determined by the features of the application. In order for the application to search for recipes by time preparation, the recipe uploaded must have the time preparation of the food. After this activity is done, an appropriate cookbook with the recipe that consists of time to prepared the food have been identified.

Besides that, the data from the questionnaires survey have been gathered and the cookbook that have been found has been analyzed for the requirements that is being needed in the mobile application. The deliverable of this activity is the list of requirements of the mobile application has been obtained. After the list of requirements have been obtained, then the features of the application have been analyzed. This results in producing the use case, activity diagram, class diagram, and sequence diagram.

Last but not least, all of the requirements that have been gathered is documented in software requirements specification. Therefore, a software requirements specification (SRS) is produced. After this phase has been done, one of the objectives that have been defined before have been achieved. The achieved objective is to gather and analyze the requirements needed in mobile application development.

B. Phase II: Design

In this phase, designing the mobile application have been done. The activities that have been carried out is designing the user interface and the database of the application according to the requirement that have been developed. There are a few main steps in this phase. The main steps are developing entity relationship diagram (ERD), design class diagram, the design for user interface and document all of the design in software design description (SDD).

The design phase is after the requirements and analysis phase. This is because all of the information on designing the application is gathered from the first phase. Design phase is one of the most important phases in developing a successful application. The design phase starts with developing the entity relationship diagram (ERD). This is because the developer will get to see clearly the features of the application that have been developed. ERD is used to view the database of the application in a clearer version. In the ERD, the primary key, foreign key, candidate key and other key have been assigned to each entity if needed according to the dependencies.

After the ERD have been developed, then the design class diagram, package diagram, detail class diagram and multilayer sequence diagram have been developed. The user interface has been designed according to the requirements that have been identified in the first phase. The deliverable of this activity is entity relationship diagram (ERD), design class diagram, package diagram, detail class diagram and multilayer sequence diagram and the user interface structure of the application have been produced.

Last but not least, all the design of database and user interface of the application have been documented in the software design description (SDD) while the deliverable of this activity is that a software design description (SDD) have been produced. At the end of this design phase, one of the objectives that have been achieved is to design the mobile application according to the requirements that have been analyze that have been defined before.

C. Phase III: Implementation

The main steps in this phase are implementing the database, developing the mobile application, doing a functional test for the mobile application and the documentation of the final development of the mobile application.

In the implementation phase, the database has been developed based on the design of the database that have been generated during the design phase. After the database have been developed, then the development of the mobile application begins. The development of the mobile application is according to the requirements that have been identified in the requirements and analysis phase. The user interface design that has been implemented is based on the design phase that have been produced before. After the development have been done, then the functional testing is done by the developer in order to make sure all of functions in the application works according to its function. At the end of this phase, all the documents related in developing the mobile application have been documented. The documentation consists each of the phases of the activities that have been done. The documentation is important for a successful application operation and maintenance as for future reference.

The deliverable of this phase after the activities have been carried out is the application have been developed with all the features and the functions that have been gathered. To develop a mobile application that can recommend a variety of recipes for people to cook based on the available ingredients and to exclude recipes that contains the allergy ingredients is the objective that have been achieved after this phase have been done.

IV. RESULTS AND FINDINGS

The result of the project is “What to Cook?” Mobile Application. The main features of What to Cook? is it allows user to search recipe. The user can search recipe either by ingredient, allergy ingredient or time preparation.

Fig. 3 shows the search recipe by ingredient interface. The user and admin have the same interface. This interface allows the user and admin to search for recipe by an ingredient and the application will show the recipe that contains the ingredient that have been entered. This will solve the first problem statement which is people have trouble on what they want to cook based on the limited ingredient that they have.

Fig. 4 shows the search recipe by allergy ingredient interface. The user and admin have the same interface. This interface allows the user and admin to search for recipe by an allergy ingredient and the application will only show the recipe that does not contain the ingredient that have been entered. This is the solution for the second problem statement which is people will need to take some of their time in order to search for the recipes which do not contain ingredients that they are allergic for them to cook.

Fig. 5 shows the search recipe by time preparation interface. The user and admin have the same interface. This interface allows the user and admin to search for recipe by time preparation and the application will only show the recipe that have the time have been entered. Lastly, this will solve the third problem statement which is people would need to search the allocation time to prepare the food which is suitable with them.

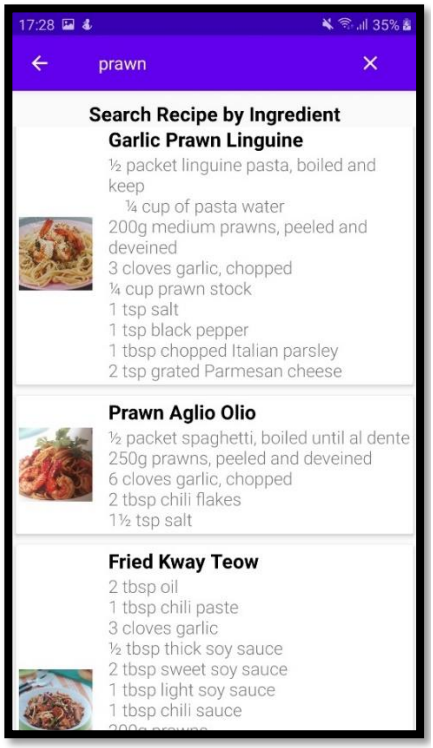

Fig. 3. Search Recipe by Ingredient Interface.

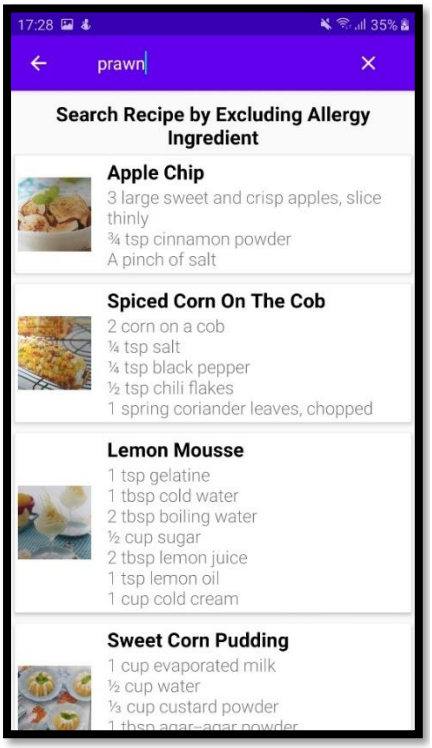

Fig. 4. Search Recipe by Allergy Ingredient Interface.

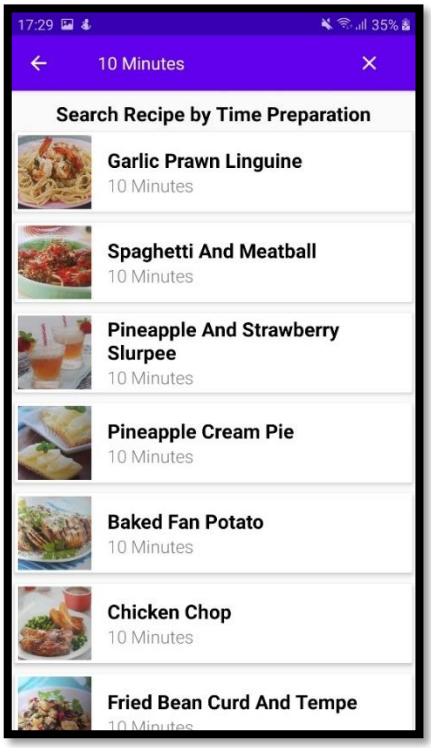

Fig. 5. Search Recipe by Time Preparation Interface.

V. CONCLUSIONS

"What to Cook?" Mobile Application have been developed and achieved all the project objectives. This application will help in solving the problems that people faced when searching for recipe. By using this application, people can search recipes either by ingredient, allergy ingredient or time preparation.

ACKNOWLEDGMENT

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Learning Arabic Communication Skill Through Mobile Application

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***Abstract*— Arabic language is listed as one of the third language courses in Universiti Teknologi MARA (UiTM). This course aims to equip students with the ability to communicate using Arabic. It is found that most of the students are facing difficulties to converse in the Arabic language because they have less vocabulary and lacking in practice. Therefore, this mobile learning application is developed to help students to improve their communication skill in Arab. Agile model is used as the project development methodology as it encourages a continuous improvement during the development. This application is using FRAME approach which implements accessibility, interactivity, immediateness, awareness context, permanence and functionality to construct an effective mobile learning application. The effectiveness on improving students' performance after using this mobile application is evaluated using dependent t-test. The test is conducted at 5% significance level and analysed using Minitab 19. The result shows that this application is effective in improving students' performance in Arabic. However, there are few improvements that can be implemented such as add more topics: grammar topics, past, present and future tense to provide a better learning tool for the students.**

Keywords— Arabic, E-learning, mobile application, third language

I. INTRODUCTION

The Arabic language is one of the most spoken foreign languages in the world. It uses an Arabic script and writes from right to left. In the 1970s, the Ministry of Education of Malaysia (MOE) paid attention to Arabic language teaching by adding Arabic students to syllabus teaching (Yahaya et al., 2019). At the university level, Arabic language is increasingly pervasive as an elective language and as a specialization program in its area (Yahaya et al., 2019). Universiti Teknologi MARA (UiTM) has made Arabic as one of the university's requirement courses, in line with other foreign languages. Students need to learn the communicative skill for the third language course. Among the methods used for the communicative course are public speaking, group discussion, and roleplay (Mat et al., 2019).

Students who take Arabic as a third language course will be assessed using roleplay and discussion in Arabic. Roleplay is part of drama practices (Mat et al., 2019). Generally, Arabic learners must become proficient in reading, writing, speaking, and listening in the third language (Brosh, 2019). Students must develop their language skills by engaging actively in their positions. Furthermore, the students also must perform a video project focused on role play within a community of five or six participants (Mat et al., 2019).

However, their performance in the Arabic language course is weak and disappointing. Recent studies have shown that the standard of language skills among students is still unsatisfactory (Azlan Shaiful and Rosni 2015). Even now the Arabic language has been one of the elective courses at the university, but it is not useful as the mastery of the students in this language is poor (Al-Muslim and Zamri 2012). Most students have no confidence in speaking Arabic because they fear to ask something, and are extremely shy of speaking Arabic, afraid to be mocked, and accused of being show-offs (Yahaya et al. 2019). Among the challenges faced by speakers of different languages is the ability to overcome the fear and anxiety of using the language to communicate. (Abdullah and Daud 2017).

Therefore, this project is developed as one solution to ease students to strengthen language skills in Arabic. Improving vocabulary will improve the confidence to converse in a foreign language. Practicing communicating in Arabic could be done by learning from this application and perhaps help to improve students' performance in the third language course.

II. OBJECTIVES

There are three objectives in this paper and all the objectives listed tend to be achieved. The objectives are as follows:

i) To design a 2D modelling environment and characters to improve the performance of the mobile learning application.
ii) To develop a mobile learning language application that contains audio-visual aids in the vocabulary teaching.
iii) To evaluate the effectiveness of this mobile application in improving students' communication skills in Arabic language.

III. METHODOLOGY

The methodology used in this project is Agile model. Agile model emphasizes the individual and interactions over processes and tools, working software over comprehensive documentation and customers' respond towards the changes over the project (D. Cerna, 2018). Fig. 1 shows the architecture of the Agile methodology model.

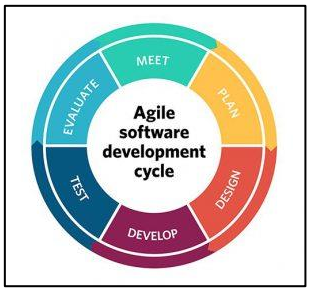
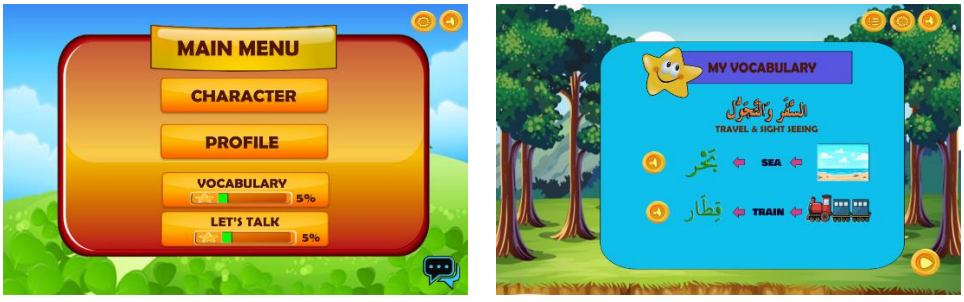


Fig 1. The architecture of Agile model

The Agile model consists of five main phases, which are requirements gathering (meet and plan), design, development, testing, and review. Each of these phases must be carried out to develop a successful application. Fig. 2 shows the part of the scene that were produced during the design phase.



(a) (b)

Fig. 2. Part of scene (a) and (b) in Learning Arab Communication Skill mobile application

IV. RESULTS AND FINDINGS

The participants of this project were the students who taking Arabic Language as their third language course in University Teknologi MARA Cawangan Melaka. The instruments used to test the effectiveness of the developed application is a set of Arabic questions based on syllabus of Arabic Communicative Language Level 3 book. The scores were recorded according to three different sections which are vocabulary section, Arabic sentence and sentence construction section.

The data is collected through a set of Arabic questions using Google form. The link of Google from is distributed through Whatsapp application. A sample of 7 students were selected using simple random sampling.Then, the data is analyzed using

Minitab 19. In order to analyze the collected data, paired t-test is conducted to identify the effectiveness of this mobile application on improving students' performance in Arabic language.

A. Demographic Profiles

Table 1. Demographics Profiles

Gender	Frequency	Percentage (%)
Female	6	85.7
Male	1	14.3

Table 1 shows that majority of the respondents are female with percentage of 86.7% while male with percentage of 14.3%.

B. Pre-Test & Post-Test Scores

The respondents were given a 20-score test. Fig. 3 and Fig. 4 depicts the scores of the pre-test and post-test, respectively. Bar chart in Fig. 1 shows that only one student scored highest score which is 11 and one student scored the lowest score which is 4. The mean score for pre-test is also calculated where the value is 7.29 over 20. Here, the result shows that most of the participants have weak performance in Arab language.

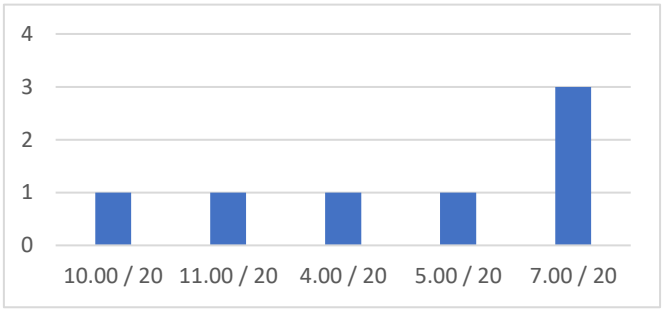


Fig. 3. Pre-Test Score

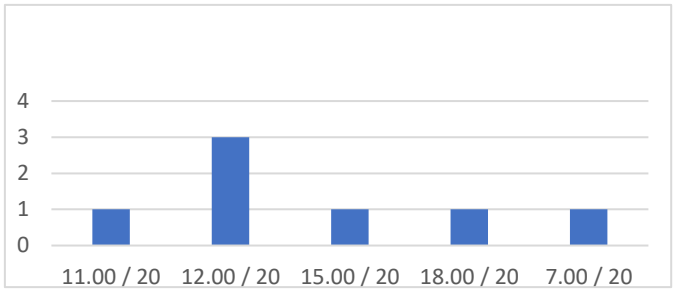


Fig. 4. Post Test Score

Fig. 4 shows the scores obtained after the students using the developed mobile application. From the post-test score, the mean score is 12.43 out of 20 which is higher than the mean score of pre-test. It implies that the students have a better improvement in the Arabic after completing learning through the Arabic mobile application.

C. Effectiveness Evaluation using Dependent t-test

The previous finding can be statistically supported by conducting a dependent t-test. This dependent test is conducted using 5% significance level. The scores for pre-test and post-test were analyzed using Minitab 19. For the test, the hypotheses are:

H_0: There is no difference in the score of pre-test and post-test.
H_1: There is a difference in the score of pre-test and post-test.

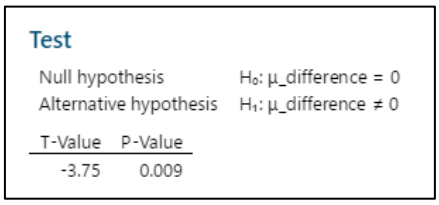


Fig. 5. Minitab Output

The result in Fig. 5 depicts the probability value is 0.009 which is less than 5% significance level. This means the null hypothesis is rejected that there is no difference in the score between pre-test and post-test. Hence, it can be concluded that this application is effective in improving students' performance in Arabic language.

V. CONCLUSIONS

The problem statement shows the unsatisfying performance of student, the lacking practice and vocabulary, low confidence and discouraging of classical environment in Arabic language. However, after the project implementation, testing and evaluation has been conducted and shows positive result. The result shows clearly that all three objectives have been achieved. In conclusion, learning communication skill in Arabic through mobile application provides an effective learning platform for students to enjoy in learning Arabic.

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Enhanced Gamification in Study Skills

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***Abstract*— Educators are facing challenges when face-to-face teaching method cannot be implemented due to the Covid-19 pandemic outbreak. In order to ensure learning outcome is achieved, they have to shift from traditional to online distance learning method to teach the students. This raises concerns in regards to students' performance and engagement. Hence, gamification was introduced in Study Skills to allow students to engage with the learning materials in a new and dynamic way and essentially improve their performance. Gamification can be considered as one of the technologies used to support the traditional ways of teaching and learning. This study aims to apply the gamification techniques in Study Skills course. Kahoot!, Quizizz and QuizWhizzer were the tools used in creating the gamified learning activities. A questionnaire was conducted to gather responses from the students after the completion of the course.**

Keywords—Study Skills, Gamification, Online Distance Learning

I. INTRODUCTION

The social distancing procedure that has been globally implemented to curb the spread of Covid-19 has caused a sudden change in the operation of educational institutions worldwide. Since the face-to-face elements are taken out, it is a challenge to monitor the participation of students. Despite the difficulties, educators need to deliver their teaching method as effective as possible with respect to the current predicament. In previous research, students acknowledged having issues that dampen their progress such as excuse, stress, bored and lazy [1]. Students also hoped that lecturers can design interesting, persuasive, communicative and artistic content so that the communication can be felt even though they were not physically present [2]. As such, active learning is a strategy that can be adopted especially when student's motivation has decreased due to the absence of physical communication with their lecturers and peers. One of the methods of active learning that could potentially be helpful in enhancing the effectiveness of online class is gamification. The term 'gamification' is defined as the technique used in a non-game setting [3].

II. MATERIALS

There are a lot of free online interactive games available such as Kahoot!, Quizizz, Quiznetic, Quizlet, QuizWhizzer and others that can make learning process more interesting. These tools are free and can be easily accessed through tablets, computers, laptops or even any smartphone with an internet connection. The user-friendly interface and features of these interactive games like avatars and music provide a game-like experience to their users. These interactive games allow users to create their own questions related to their course.

A quantitative approach through a survey on the feedback of implementation of gamification in Study Skills course was used in collecting the data to investigate the most preferable learning platform between Quizizz, Kahoot!, and QuizWhizzer. The survey was conducted on Diploma students of Mathematics at Universiti Teknologi MARA, Perak Branch, Tapah Campus. These three gamification tools were used during semester October 2020 – February 2021.

III. METHODS

There are 7 topics in Study Skills course; Topic 1 - Getting Ready to Learn, Topic 2 - Goal Setting and Learning Management, Topic 3 - Time Management and Organization Skills, Topic 4 - Getting to Know the Campus, Topic 5 - Memory, Improving Concentration and Reading, Topic 6 - Taking Lecture Notes and lastly, Topic 7 - Academic Integrity & Performance. Out of all these topics, Topic 1, 3 and 6 were selected to be incorporated with gamification tools while the learning session took place.

Quizizz, Kahoot! and QuizWhizzer are online quiz applications that can be the choice to make learning attractive and joyful [4]. These self-paced learning tools are remarkable in engaging students with others be it used face-to-face or online. In fact, they allow every student to celebrate their achievements in a fun way. Quizizz was used in Learning Styles and Characteristics of Successful Students under Topic 1, while Kahoot! and QuizWhizzer were respectively used in Time Management and Organizational Skills under Topic 3 and Taking Lecture Notes under Topic 6.

There were 87 respondents who took Study Skills course selected to answer the questionnaire to get their feedback after gamification method was adopted in their learning process. The study was made up of 21 items broken down into three parts. The first part was demographics profile which consisted of two questions namely gender and group. This was to find out about the student's background. Part two consisted of items to determine the perceptions of the students on gamification tools, whereas part three measured student's feedback on gamification tools. Four items in part two and all items in part three were measured using a 5 point Likert Scale of the level of agreement.

IV. RESULTS AND FINDINGS

A total of 87 students from three classes who took Study Skills course participated in this study; 31 from group A (35.6%), 31 from group B (35.6%) and remaining 25 from group C (28.7%). Out of all of the students, 24 were male while 63 were female. The demographic profiles of the students who have responded to the questionnaire are shown in Table 1.

Table 1. Demographic profile

No	Category		Frequency	Percentage (%)
1	Gender	Male	24	27.6
		Female	63	72.4
2	Group	A	31	35.6
		B	31	35.6
		C	25	28.7

Study Skills is the course introduced in the first semester of diploma for all the respondents. The online interactive game such as Kahoot! has already been introduced to them during their secondary school. Therefore, it can be said that this was not a first-time experience of using gamification as a tool in their learning for more than half of the students.

Out of the three gamification tool options that were used in Study Skills course, 74.7% of the students chose Quizizz, 25.3% chose Kahoot! and none of them chose QuizWhizzer as the most preferred gamification tool. Students chose their preferred gamification tool based on the fun factor and ease of use.

Table 2 summarizes the perceptions of the students towards gamification tools while taking this course. Most students chose to agree (49.4%) and strongly agree (44.8%) that gamification can help them create more engaging experiences. Plus, they also agreed (50.6% agreed and 40.2% strongly agreed) that gamification can make learning more rewarding. A total of 77% of the students agreed and strongly agreed that gamification can give them the opportunity to apply it in real-world situations. One of the advantages of using gamification is that it can improve knowledge and skills in learning. This is reflected by the agreement of the students (47.1% agreed and 46% strongly agreed) that gamification can improve their knowledge in studying skills.

Table 2. Perception towards gamification tools

No	Category		Frequency	Percentage (%)
1	Is this your first-time using gamification as a tool in your learning?	Yes	38	43.7
		No	49	56.3
2	Please choose the Most Preferred gamification tool in Study Skills.	Quizizz	65	74.7
		Kahoot!	22	25.3
		QuizWhizzer	0	0.0
3	Based on the above answer, what is the Most Reason you chose this gamification tool?	Fun to play	47	54.0
		Easy to use	30	34.5
		It is a free tool	3	3.4
		More user friendly	7	8.1
4	How strongly do you agree with the following statements about gamification?			
a)	Gamification can help create more engaging experiences for students.	Strongly Disagree	1	1.1
		Disagree	2	2.3
		Neither	2	2.3
		Agree	43	49.4
		Strongly Agree	39	44.8
b)	Gamification can make learning more rewarding.	Strongly Disagree	1	1.1
		Disagree	2	2.3
		Neither	5	5.7
		Agree	44	50.6
		Strongly Agree	35	40.2
c)	Gamification can give students the opportunity to apply it in real world situations.	Strongly Disagree	1	1.1
		Disagree	2	2.3
		Neither	17	19.5
		Agree	37	42.5
		Strongly Agree	30	34.5
d)	Gamification can improve your knowledge and skills in learning.	Strongly Disagree	1	1.1
		Disagree	1	1.1
		Neither	4	4.6
		Agree	41	47.1
		Strongly Agree	40	46.0

The students' feedbacks were analysed along three dimensions; student's engagement, enjoyment of learning experience and student's motivation. For each of these dimensions, students indicated their level of agreement on a 5-point Likert scale (strongly disagree (SD), disagree (D), neither agree nor disagree (N), agree (A), strongly agree (SA)) to answer the related statements. The students' feedbacks on gamification tools are summarized in Table 3.

Referring to students' engagement questions, 50.6% of students strongly agreed and 44.8% agreed that they wanted to complete this gamified activity and majority of them (80.5%) found that time passed quickly during the gamification. Only 18.4% stated they did not care how this gamification is ended while 4.6% felt bored when playing it.

When the students were asked about the enjoyment of these gamification activities, majority of them answered that they felt happy (96.5%) and felt entertained (95.4%) while playing it. When they were asked about the negative statement, i.e., if they felt exhausted playing it, 44.9% disagreed and 25.3% strongly disagreed. They also disagreed (37.9%) and strongly disagreed (33.3%) that they felt miserable while playing in this gamification activity.

In this questionnaire, it was also revealed that gamification activity may increase students' motivation. Majority of their responses were positive; 90.8% of the students stated that it is very important for them to do well in this activity, and 73.5% of them felt that they tried very hard on this activity. When they were asked about the unenthusiastic statement, i.e., if they did not pay attention in this activity, 46% disagreed and 37.9% strongly disagreed.

Table 3. Students' feedbacks on gamification tools

No	Items	Level of Agreement (%)				
		SD	***D***	***N***	***A***	***SA***
1	Student's engagement					
a)	I wanted to complete the game.	0	1.2	3.4	44.8	50.6
b)	I felt time passes quickly.	0	1.1	18.4	49.4	31.1
c)	I did not care how the game ended.	16.1	37.9	27.6	16.1	2.3
d)	I feel bored when playing it.	39.1	46	10.3	2.3	2.3
2	Enjoyment of learning experience					
a)	I feel happy when playing it.	0	2.3	1.1	47.1	49.4
b)	I feel entertained when playing it.	0	2.3	2.3	50.6	44.8
c)	I feel exhausted when playing it.	25.3	44.9	14.9	10.3	4.6
d)	I feel miserable when playing it.	33.3	37.9	15	10.3	3.5
3	Student's motivation					
a)	It was very important to me to do well in this activity.	0	2.3	6.9	44.8	46
b)	I tried very hard on this activity.	1.2	5.8	19.5	40.2	33.3
c)	I did not pay attention in this activity.	37.9	46	12.6	2.3	1.2
d)	I did not use much energy in this activity.	11.5	20.7	20.7	36.8	10.3

V. CONCLUSIONS

Gamification is an easy and effective method in online learning. Its mechanisms and techniques can be applied in the learning process as one of the activities which purpose to achieve certain learning goals, increase student's motivation to complete them and engage students in a friendly, competitive environment with other students [5].

Examined study showed positive feedbacks from students based on the application of gamification method in Study Skills course. Out of the three tools applied, the majority of the students preferred Quizizz as this tool is easy to use and more fun to play compared to Kahoot!; whereas all of them were reluctant to choose QuizWhizzer. Enhanced gamification in Study Skills is proven to be positively impactful on a student's engagement, learning experience and style, and increases their motivation to improve skills in learning.

Online learning is suitable for easy and effective integration of gamification. The implementation of gamification concept in higher education can make learning activities livelier and engaging. Therefore, it can be adopted to enhance the overall learning experience of students especially in the midst of online learning.

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Flexible Learning Using ANATEKS Flexi e-Content Medium: An Innovative Effort in Times of Covid-19 Pandemic

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***Abstract*—Learning the Technical Analysis subject for the part-time students during the Covid-19 pandemic era is definitely challenging. The online learning method quickly outpaced the conventional physical face to face learning drastically. The part-time students attended a much less lecture session per semester for the same course coverage and course assessments as opposed to their full-time counterpart. Apart from their hard work and intelligence, additional flexible learning medium must also be in place to complement their study process so that at the end, the learning outcome is achieved. Guided by the six phases e-content development method adopted from Nachimuthu (2012) [1], we propose an e-content educational learning platform named Anateks Flexi (AF) which is developed to complement the existing learning method for the part-time students. Using the common and user-friendly technology, students have access to the recorded Google Meet class sessions for easy and repeatable viewing. Apart from that, additional e-content learning materials via Anateks platform namely website, Youtube and Google accounts is also made available to complement the scheduled class sessions. The e-content material includes eLecture video collection, introductory educational videos, eSlides, eSeminars and eCharting. Anateks Flexi's e-content platform suits the part-time students well as student is able to organize their busy time with the learning part at their convenience. At the end, Anateks Flexi tries to make the part-time students at par with the full-time students in terms of learning experience within the constraints of part-time online learning course during the Covid-19 pandemic.**

Keywords- e-content, flexible learners, ANATEKS, technical analysis, charting

I. INTRODUCTION

Learning the Technical Analysis subject for the part-time students during the Covid-19 pandemic era is definitely challenging. The online learning method quickly outpaced the conventional physical face to face learning drastically. The terms of name, distance learning is often used as a synonym with online learning. The online learning is viewed as a much safer mode of delivery during the Covid-19 pandemic as physical gathering is not encourage given the risk of disease spread. It looks like online teaching and learning is no more an option, but a necessity [2]. Interestingly, e-learning is then associated with distance and online learning given the restrictions on face-to-face meeting.

e-learning is associated with easy accessibility, affordable, flexibility and lifelong learning. Combining e-learning with face-to-face lectures produces another learning method named blended learning. Apart from the conventional full-time students, education is also made available to people who wanted to study but have other commitment especially their work commitment. This is where the part-time student adopting the blended learning method was introduced. Distance education on the other hand is a computer-based teaching method in which the interaction between students and education practitioners is provided from a certain center in cases where classroom education cannot be performed due to limitations in general education and training process [3]. This is exactly the case the Covid-19 pandemic crisis as the conventional face-to-face lectures was forced to go online to cater for the crisis. Distance education is considered as a promising innovation with its flexible learning environments [4].

This paper describes an example on how an innovative effort using e-content medium can be applied in the online and distance learning environment in times of Covid-19 pandemic. In this study, the part-time students adopting the blended learning method has the flexibility to learn online at a distance however has difficulty to attend the physical on-campus normal class lectures. Hence, the more appropriate option is the online lectures. These students attended a much less lecture session per semester for the same course coverage and course assessments as opposed to their full-time counterpart. Interaction with peers and lecturer is now limited to the online class session and the university online learning management system in contrast with the physical classes prior to Covid-19 pandemic. Apart from their hard work and intelligence, additional flexible learning medium must be in place to complement their study process so that at the end, the learning outcome is achieved. One option is the e-content methodology that can assist learners in the learning process.

Hence, the purpose of this empirical study is to gauge the opinion of the users of an e-content project named Anateks Flexi. It is preliminary study in nature based on a pilot test study conducted on a group of part-time students in a public university. Anateks Flexi was developed to cater for the part-time students within the online and distance learning environment. Feedback from the users is critical for further development of this innovative learning tools.

II. MATERIALS

A. e-Content Learning Methodology and Developments

e-content includes all kinds of content created and delivered through various electronic media from old media such as print and radio to the increasingly sophisticated electronic tools with combination of sounds, images and text. e-content requires huge amounts of creativity both at 'information' level as well as the 'technology' level [1]. e-content increases convenience and accessibility via internet devices such as smart phones in a fun, very cheap and time friendly environment [5].

The e-content development method for this project is adopted from Nachimuthu (2012) six phases development namely the analysis phase, design phase, development phase, testing phase, implementation phase and the evaluation phase. The project was designed accordingly and produce an e-content educational learning platform named Anateks Flexi (AF) which is developed to complement the existing learning method for the flexible learning students.

B. The Course

The Introduction to Technical Analysis course is one of the core subject for the finance major. It is designed to equip the students with an alternative stock investment technique called Technical Analysis. In this 14-weeks semester, students are exposed to the concepts and application of technical analysis, the various technical indicators and investment decision using technical tool as depicted in Table 1. At the end of the course, student must be able to illustrate various types of investment decisions using technical analysis tools and build a hands-on skills through technical analysis software.

Table 1. FIN555 topics, availability, e-content types and accessibility medium.

	Technical Analysis Topic	***Lecture Videos***	***Seminar Videos***	***Slides***	***Educational Videos***	***Charting Videos***
1	Introduction	✓ MP4/GDrive	✓ MP4/GDrive	✓ Pdf /Website	✓ MP4/Youtube	✓ MP4/GDrive
2	Support & resistance	✓ MP4/GDrive	✓ MP4/GDrive	✓ Pdf /Website	✓ MP4/Youtube	✓ MP4/GDrive
3	Trendlines	✓ MP4/GDrive	✓ MP4/GDrive	✓ Pdf /Website	✓ MP4/Youtube	✓ MP4/GDrive
4	Volume	✓ MP4/GDrive	✓ MP4/GDrive	✓ Pdf /Website	✓ MP4/Youtube	✓ MP4/GDrive
5	Moving Average	✓ MP4/GDrive	✓ MP4/GDrive	✓ Pdf /Website	✓ MOV/Youtube	✓ MP4/GDrive
6	Envelopes	✓ MP4/GDrive	✓ MP4/GDrive	✓ Pdf /Website	✓ MOV/Youtube	✓ MP4/GDrive
7	Bollinger Band	✓ MP4/GDrive	✓ MP4/GDrive	✓ Pdf /Website	✓ MP4/Youtube	✓ MP4/GDrive
8	Rate of Change (ROC)	✓ MP4/GDrive	✓ MP4/GDrive	✓ Pdf /Website	✓ MP4/Youtube	✓ MP4/GDrive
9	Relative Strength Index	✓ MP4/GDrive	✓ MP4/GDrive	✓ Pdf /Website	✓ MP4/Youtube	✓ MP4/GDrive
10	MA Convergence	✓ MP4/GDrive	✓ MP4/GDrive	✓ Pdf /Website	✓ MP4/Youtube	✓ MP4/GDrive
11	Stochastic	✓ MP4/GDrive	✓ MP4/GDrive	✓ Pdf /Website	✓ GOM/Youtube	✓ MP4/GDrive
12	Charting Basic	✓ MP4/GDrive	✓ MP4/GDrive	✓ Pdf /Website	-	✓ MP4/GDrive

Note: All materials are available via ANATEKS website and linked to the respective medium such as Google Drive, Youtube and the web itself.

C. *Anateks Flexi*

Anateks Flexi is an extension of the previous e-content innovation named Anateks Econ which comprise a series of educational videos to help students and public beginners' learners in technical analysis subject. The objective is to assist part-time students in their undergraduate study in the public university. The innovation suits the working-class part-time students' learning process as they are able to organize their busy time schedule with the learning part at their convenience. In this improved version, focus is directed to the part-time students who may have difficulties in learning in the era of Covid-19 where online learning is practiced as oppose to the conventional face to face and physical learning. Apart from the videos, lectures series and handful of other assistance in the form of e-content is made available to students. Materials can be assessed through Anatek Flexi website by using laptop or smart phones at the users' convenience. This innovation stimulates learners to get involved with learning in a flexible way. The structure of Anateks Flexi is as demonstrated in Figure 1.

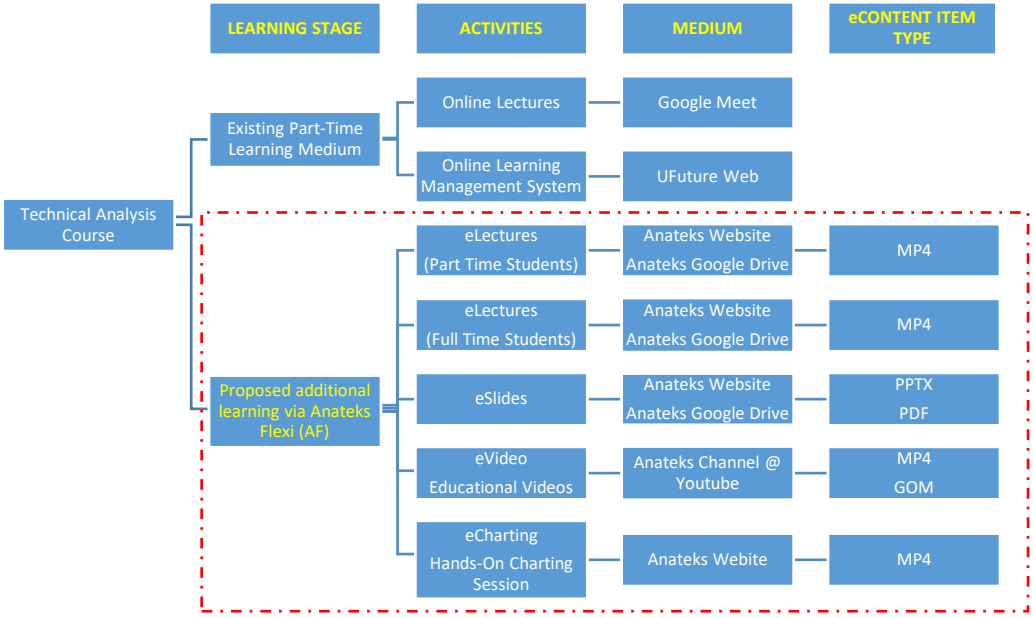

Fig. 1. ANATEKS Flexil learning flow

III. METHODS

A. *Methodology*

This is a quantitative research based on a survey on a population of 15 samples being the students of a Technical Analysis course in a public institution of higher learning. The students are a part-time student who is directly involved in this Anateks Flexi project. This research employs the descriptive analysis technique to gauge the usability of Anateks Flexi in flexible learning students learning process. Data were collected using an online survey method via Google Forms platform.

B. *Pilot Test*

A pilot test was undertaken to gauge the feedback on the website, specifically the e-content materials within the website. The group consisting of 17 students have undergone a 14-week semester. Adopting the flexible learning method, students have to attend 5 lecture sessions in the form of seminars equivalent to 10 hours online lecture time and manage the online Learning Management System (LMS) as opposed to the previously conducted face to face session before the Covid-19 pandemic. Materials were shared with these students via Anateks Flexi website periodically. Major materials were the recorded online classes for the full-time students which was made available so that these part-time students have the advantage of learning the 56 hours class lectures and charting sessions at their convenience. Practical and hands-on session is mandatory and was also recorded for the students revision later on. Upon completion of the course, each student was asked to complete a survey on feedback of using the e-content materials along with the websites. Structured questions were developed in three parts i.e Flexible Learning@ Online, Course Delivery and Anateks Flexi Features.

IV. RESULTS AND FINDINGS

A. *Demographic Profiles*

The respondents, a 100% Malaysian nationality, comprises of 47.1% male and 52.9% female. A bigger chunk of the respondents (52.9%) aged more than 25 years old followed by 47.1% in the range of 23 to 25 years of age. The situation reflects the working-class level that enrolled in the part time course. In terms of years of study, 47.1% is in the 3rd year, 17.6% each in the 2nd, 4th year more than 5th year. All the students have completed the Technical Analysis subject.

B. *Flexible Learning@ Online*

23.5% and 17.6% of the respondents strongly agrees and agrees respectively that the Technical Analysis subject is very challenging as a flexible learner while 52.9% is neutral and another 5.9% strongly disagree. Majority of the respondent agree that online lectures via Google Meet is not sufficient: 41.2% strongly agrees, 29.4% agrees, 11.8% is neutral, 5.9% disagree and 11.8% strongly disagree.

C. Course Delivery

Majority of the respondents or 76.5% strongly agrees that learning TA via lectures is interesting while 82.4% strongly agrees learning TA using software is interesting. Nevertheless, a mixed view was found in terms of using books as a medium to learn TA where 23.5% strongly agrees, 29.4% agrees while 35.3% neutral and 11.8% disagree. On the other hand, 76.5% strongly agree while 11.8% agrees that learning TA using videos is interesting.

D. Anateks Flexi Features

Overall, a total 88.3% of the respondent in this pilot study (comprising of 76.5% strongly agrees and 11.8% agrees) believes Anateks Flexi e-learning platform helps in learning the Technical Analysis subject.

V. CONCLUSIONS

Anateks Flexi (AF) is part of an innovative effort using e-content platform that assists part-time students in their undergraduate study in the public university. Such noble effort add values to these students as the e-content platform suits the part-time students learning process. With AF, the students, majority of them are working class people are able to organize their busy time with the learning part at their convenience. This innovation stimulates learners to get involved with learning in a flexible way. At the end, Anateks Flexi tries to make the part-time students at par with the full-time students in terms of learning experience within the constraints of part-time online learning course. Overall, a total 88.3% of the respondent in this pilot study (comprising of 76.5% strongly agrees and 11.8% agrees) is of the opinion that Anateks Flexi e-learning platform helps in learning the Technical Analysis subject. Apart from that, the website is also assessable to the public making it as an alternative platform for technical analysis beginners to learn. Anateks Flexi contribution at this instance, although minor, is significant in support of the education industry struggle in times of Covid-19 crisis.

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Web-Application For Securing Message Using LSB Algorithm Steganography And Hybrid Encryption

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***Abstract*— The study of data security has become a critical issue as data communication across computer networks has grown. Sending data through normal network traffic poses a high risk, particularly in the case of a man-in-the-middle attack, and even if the user uses encryption on the data, it poses a risk because it raises suspicions about the nature of the data. The objective of this study is to develop a web application for securing messages using steganography with the Least Significant Bit (LSB) Algorithm and Hybrid Encryption that encrypts user input and conceals it in an image file to provide the highest level of security for messages sent and received. The steganography technique is used to mask the data as it hides inside insusceptible image files and is secure to send through normal traffic since Rivest–Shamir–Adleman (RSA) algorithm is used as an additional layer of security, which can only open it via the intended target with its private keys. The benefit of using this system is the messages are hidden in an ordinary-looking image file, and it will be undetectable and unaffected. Even if the steganalysis is successfully decrypted, the hybrid features of encryption will undoubtedly impede or significantly will slow down the decryption process in terms of security.**

Keywords—steganography, hybrid encryption, security, LSB Algorithm

I. INTRODUCTION

In this era of modern technology, one of the biggest concerns is the security of data exchanged through the Internet. Many researchers have devised a variety of techniques to limit the risk, including cryptography. Even still, cryptography is not enough since hackers are getting better and faster at breaking it down. As a result, they devised a technique known as steganography.

Encryption is a form of cryptography that converting an original representation of data known as plaintext into an unreadable alternative known as cyphertext. Asymmetric and symmetric cryptography are the two types of encryptions. Rivest–Shamir–Adleman (RSA) is the most popular asymmetric algorithm [1], while Data Encryption Standard (DES) is a symmetric algorithm (DES). Steganography, on the other hand, is much more unique because it employs the science and art of concealing the existence of messages through another medium, such as an image file, an audio file, or even a video file. Each type of file into which it can be hidden employs a different algorithm. Although both cryptography and steganography methods provide security, combining cryptography and steganography into a single system provides greater security and confidentiality [2].

This project is focused on how cryptography, encryption, and may be used to help protect messages from sender to recipient by offering a high level of security. The reason for not using encryption alone is that steganography can mask the existence of the message, reducing the risk by lowering its susceptibility to being an important message. The messages to be sent are practically safe because they arrived in an unobtrusive format such as a picture or video, and if the steganography is discovered and decrypted, the second layer of encryption is available to prevent or slow down the decryption. Fig.1 shows the combination of cryptography and steganography.

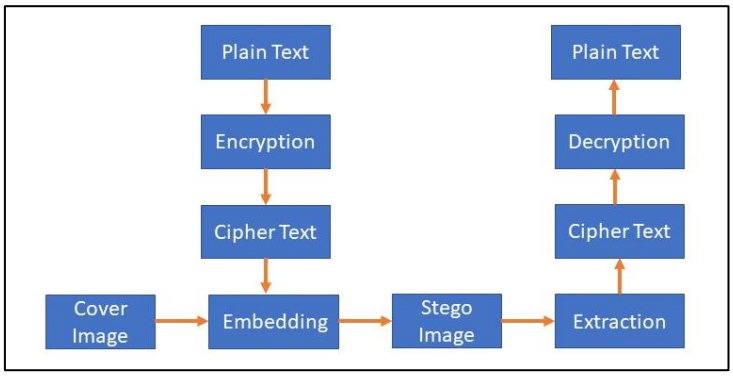

Fig. 1. Cryptography and Steganography

II. LITERATURE REVIEW

A literature review is discussed in this research to identify sources and gaps in the current knowledge. These include, review the existing system, procedures and techniques which can be used in this project development

A. Image Steganography Technique

Image steganography is one of the techniques in steganography which the information is hidden inside an image files either in a form of JPEG, BMP or any other forms. Steganography is the combination of science and art used to write secret messages so that only the intended recipient is aware of their existence [3] [4]. The original image, before any message is hidden in it, is referred to as the cover image. After hiding the message in it, it is referred to as the stego image [5] . Image steganography is the most frequently used especially for creating a project as it can be considered as the easiest to make.

B. LSB – Steganography Algorithm

LSB (Least Significant Bit) is the most common algorithm used for image-based steganography due to its simplicity and better for a beginner to use. However, it is the most easily to be detected because the noise it is created are a lot In the LSB method the 8th bit of every byte of the carrier file is substituted by one bit of the secret information. Instead of hiding a fixed number of bits in the LSBs of each pixel, one can also embed different number of bits in LSBs of different pixels based on pixel value range calculation [6].

C. RSA- Encryption Algorithm

RSA encryption is an asymmetric cryptographic algorithm which used to encrypt and decrypt message. It features public key and private key which the public key is used to encrypt message while the private key is used to decrypt message. This is the most commonly used public key cryptographic algorithm [7] , and it is considered secure when sufficiently long keys are used. The security of RSA depends on the difficulty of factoring large integers. Difficulty of factoring n to find the original primes p,q defines the strength of RSA [8].

D. Related Work

Al-Shabby and Al-Kharobi [9] proposed a method that encrypts the message with the AES algorithm and hashes the key with the SHA-12 algorithm. Following that, the encrypted message will be embedded into an image, video, or audio using a modified LSB technique. Because of the skimming mechanism used in the process, the percentage of concealment in this method is lower than in traditional techniques of space left without hiding. As a result, it is recommended to utilise an image with a lot of details.

Sathiaraj et al. [10], proposed a method that involves first transcribing text written in handwritten documents into digital text, which can be accomplished using a neural network deep learning approach. The proposed model employs a key that encrypts the key and is padded with extra bits to create a 256-bit unique key. After obtaining the text, it will be converted to unintelligible or ciphertext using the pad cypher technique. The encrypted text will then be tainted with LSB steganography. Because each encryption uses a unique 256-bit key, the proposed method is resistant to brute force attacks.

The proposed method in [11], combines Double-Stegging and RSA encryption. The secret data is encrypted in the first stage using the public key in the RSA algorithm to generate the cypher key as well as the public and private encryption keys. Using Haar's wavelet steganography, this text will be converted into 8-bit binary codes and embedded in the 2-Dimensional Discrete Wavelet Transform (2-DWT). Because it can transmit confidential data with minimal distortion to the cover image, double-stegging produces the best peak signal-to-noise ratio (PSNR) value.

According to [12], the proposed method employs double-layered encryption in conjunction with LSB steganography. First, the intended text will be encrypted with the DES algorithm and a key. The key is then concealed using the RSA technique, which encrypts the key before sending it separately. Using the LSB algorithm, the encrypted text is then embedded in an image. Because LSB is easily decoded, this proposed algorithm adds an extra layer of security.

III. METHODS

Iterative waterfall model has been chosen for this project methodology. In this model, each stage need to be completed before the next phase begin. This method is improvised version of normal waterfall method that more suitable for this case.

The design of system as shown in Fig. 2 involves the process of the front end and the back end of the system. It depicted the user uploading the image into the system. Then, the user will input the message and confirm to be encrypted. The process however will be done in the Google Drive. After it is done, the output will be located at the same Google Drive. The other party who wants the message will download the encrypted image located in the Google Drive and with the same system, decryption is available. The decryption process will be done in the Google Drive too.

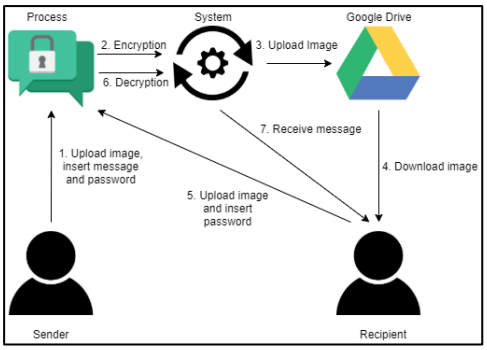

Fig. 2. System Design

The project's implementation is divided into six stages, which are as follows; (1) Upload the image file (.png), (2) Encrypt the text data using RSA and generate the encryption keys, (3) Encrypt the Public key and message with AES, (4) Embed the private key and encrypted message into the image using the LSB algorithm, (5) Extract the encrypted data from the Image files, (6) Decrypt the text data using the decryption key.

IV. RESULTS AND FINDINGS

The analysis of the result from the steganography with LSB algorithm and hybrid encryption will be recorded and checked whether it managed to achieve all the objectives aforementioned while having a perfect effectiveness in its functionality.

A. Encode The Message Into The Image

For the encode part which is encrypted the user's message and then embedded it into the image previously uploaded, the user is required to input the message they desired and the password for the verification when decoding later as shown in Fig. 3. Below are the following steps and flow of the system:

1) The user is required to upload a PNG file, or it will prompt an error showing that it will only receive a PNG file and none other.

2) The user is required to input the message they desired and the password for the verification when decoding later.

3) After the successfully encode the message into the image as well as clicked on OK button, the system will then automatically try to upload the image into the Google Drive that the path has been set beforehand.

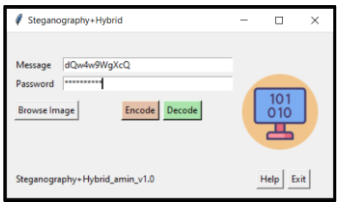

Fig. 3. Encode the Message into the Image

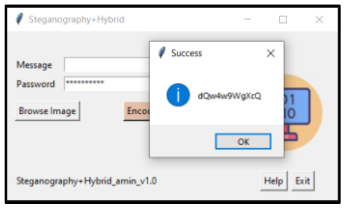

Fig. 4. Encode the Message into the Image

B. Decode The Message From The Image

The intended flow of the system is that the second party will download the encrypted image in the Google Drive to decode it. That second party then, supposedly will run the system and to decode it, it will be required only uploading that particular image and input the password for verification as shown in Fig. 4. Below are the following steps and flow of the system

1) The intended flow of the system is that the second party will download the encrypted image in the Google Drive to decode it.

2) The user now only required to upload that particular image and input the password for verification

The steganography used a simple algorithm which can be easily detected and decoded. It is so simple to the point that it can be done through uploading the encrypted image to any steganography decode software or website. However, the hybrid encryption became the second layer of security that protected the image to be easily decoded.

A testing has been conducted on other application with similar method which steganography. One of the applications only managed to read a long string of unreadable characters because the tools does not able to decrypt through the hybrid encryption.

Another application has been chosen for the test and this time, the tools itself unable to find the existence of the encrypted message. So, it prompts a message that there is no hidden message at all found in the image. Similar result has been found to yet another application which result in unable to find the existence of encrypted message from the image uploaded.

V. CONCLUSIONS

This web application system was successfully developed and managed to meet the aim and objectives of the project by providing back-end security using LSB algorithm for steganography and hybrid type of encryption. The objective of this project is that the project is design and develop for the security purpose. While the aim of this project is that the user is able to embed a message into the image chosen and upload it to the Google Drive whilst the second party or the receiver will then download the image and able to extract the message back into the original plain text.

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Web-Based Science Lab Inventory System for Faculty of Pharmacy in UiTM Bertam

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***Abstract*—Inventory is the most important part of a business. Inventory can be either raw materials, in-process goods or finished product depends on the business. Business inventory is always in large numbers therefore to manage and keep track of every inventory; a systematic system is needed to avoid from any shortage or surplus problems. However not only business, but university laboratory also such as Faculty of Pharmacy in UiTM Bertam owns an inventory that keeps all apparatus and chemical substances to be used by students for experiments. However, the process of keeping inventory is still being managed manually. The staff in charge, assistant science officer add and update the inventory manually. This can lead to problems like data inaccuracy when adding and updating list of inventories. Moreover, to use the inventory, lab assistant needs to fill in form and submit it to assistant science officer, which takes long time for lab assistant to wait for approval. There is also problem where there is no notification to notify assistant science officer about expired and low quantity inventory. With these problems, objectives are made that is to gather and analyze requirements from stakeholder to design and develop Science Lab Inventory System for Faculty of Pharmacy in UiTM Bertam. The system was developed based on the waterfall model that only involved three phases: requirement gathering and analysis, design, and implementation. Each phase has their activities and deliverables done to accomplish the objectives. Interview are conducted with the stakeholder to identify the problems, to collect requirements, and documented in Software Requirements Specification (SRS). Diagrams are constructed and documented in Software Design Document (SDD). As a result, a web-based system named Science Lab Inventory System for Faculty of Pharmacy in UiTM Bertam is developed by using SRS and SDD documents as reference throughout developing this project.**

Keywords*—*Information Technology, web-based, inventory.

I. INTRODUCTION

Inventory is raw materials, work-in-process goods and fully finished products that are considered as a part of business' assets that are ready or will be ready to be sold (Ziukov, 2015). Hence, instead of inventory that only focuses on business, inventory of Science Laboratory in university is also crucial to ensure that every record of laboratory equipment such as apparatus and hazardous items as chemical substances are kept. Presently, many universities still depend on manual system when it comes to management of laboratory. On that account, it is vital for a university laboratory's inventory to have a systematic way to keep record and track of every equipment in the laboratory and to lessen the gap with today's technologies. A good system can not only help increase university laboratory management level, but it can also boost the efficiency of experimental teaching and research (Liu et al., 2012). Therefore, a good system of inventory is the root of everything because by having a consistently good system, the management of laboratory will be operating smoothly and can avoid any problem. Moreover, even if there are any problems, it will be easier to track and solve it.

Nonetheless, Faculty of Pharmacy in UiTM Bertam is still keeping record of its science lab inventory manually. It is definitely tiring and somehow contribute to problems occurred. Total of 162 chemical substances and 121 apparatus are being stored in Faculty of Pharmacy's inventory that located at seven labs in two building (Building 4 and Building 5). First, six labs that located at level 1 in Building 5: namely Lab Sciences (05A01 038/0), Anatomy Lab (05A01 039/0), Microbiology 1 Lab (05A01 005/0), Microbiology 2 Lab (05A01 006/0), Solid Dosage Form 1 (05A01 017/0), and Liquid Dosage Form Lab (05A01 015/0). There is also one store (05A01 003/0) that is also at level 1 in Building 5 that is specifically used to store apparatus Then, one lab located at level 1 in Building 4; Pharmaceutical Chemistry Lab (04A01 018/0). Chemical substances are being stored in different laboratory in any of the seven labs according to the where it is assigned to be located at.

The responsibility in managing the inventory is held by one person that is assistant science officer. The process starts with assistant science officer needs to enter data about the apparatus or chemical substances at Microsoft Excel. Data that are needed are inventory name, inventory received date, expiration date, size of the inventory, location of where the inventory is assigned, location code of where the inventory is assigned, balance of the inventory and chemical hazardous. All the data mentioned, need to be enter manually. Thus, if there are any changes, or any update need to be done, it needs to be done manually. There are seven lab assistants in total and to use any inventory for students' lab experiments preparation, they need to request by filling in form manually and send it to assistant science officer. For the request to be approved, it might take two or three days or can even be a week depends on the amount of application received. Approximately, in a week the amount of application sent is five.

The application is viewed based on the date it is being sent. It is a first come first serve based of approval. Amount of every chemical substances and apparatus to be taken out has no limit and duration but it can only be requested in accordance with its necessity (Ropishah, personal communication, 1 March 2020). Once the application has been approved, assistant science officer also needs to update the balance of the item at Microsoft Excel manually. Lab assistant also needs to write in a book prepared as a record when they have used the equipment. The book is used as a 'backup' if assistant science officer happened to make a mistake in updating the inventory manually. If the requested equipment(s) are not available, assistant science officer still need to approve but it might take time because they need to wait for new stock to arrive. Otherwise, if any equipment(s) need to be used at certain time but it is out of stock and cannot be received in that particular time, lab assistant will need to consult with the lecturer in charge to see if they can use other equipment(s) as substitute.

II. RELATED WORK

This section will explain about current system that exist and is relevant with the project.

A. LabWare

Since its introduction to the market, LabWare LIMS (Laboratory Information Management System) has been the most technologically advanced Laboratory Information Management System in the industry and it continues to hold the position until today. Figure 1 shows the homepage of LabWare website.

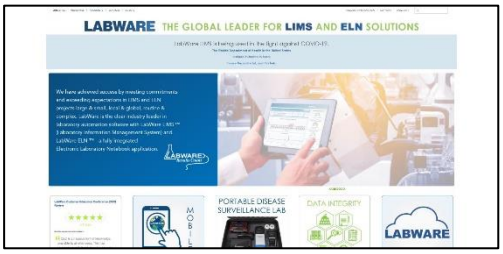

Fig. 1. LabWare homepage
(Source: https://www.labware.com/en/p/About-Us, 2020)

LabWare is very famous with its success in comprised of LIMS (Laboratory Information Management System) and ELN (Electronic Laboratory Notebook) functioning as an integrated single solution. LabWare provides complete sample login functionality, provide many difference manual sample login and file import schemes as well as powerful schedulers that will produce the samples to be collected or processed in the laboratory. Also, LabWare's Inventory Manager provides the features for monitoring item quantity, location, expiry date and vendor details. Moreover, LabWare provides laboratory stakeholders with many LIMS and ELN reporting options.

B. The DocLogix Laboratory Management

DocLogix Laboratory Management solution is recommended for small to midsized laboratories. It helps handle the laboratory inventory better, optimize the productivity of sample analysis, test processing and reduce the time devoted to reporting. All laboratory staffs and management can use this solution. Figure 2 shows the homepage of DocLogix.

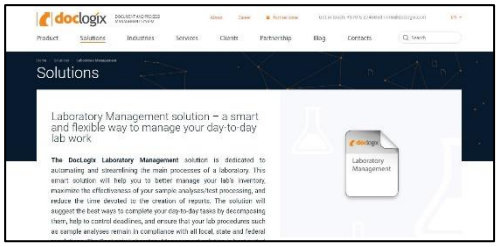

Fig. 2. The DoxLogix homepage
(Source: https://www.doclogix.com/solutions/laboratory-management/, 2020)

Some of the system features are decomposition of lab task and streamlining of processes, monitor inventory locations and quantities, plan the preventive maintenance of lab equipment, create usage reports and delivers out-of-stock notifications.

III. METHODS

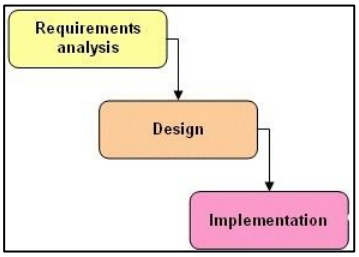

Fig. 3. Waterfall methodology

This model contains five major phases that start with requirement gathering and analysis, design, implementation, testing and maintenance phase. However, for this project only three phases will be implemented that is requirement gathering and analysis, design, and implementation phase.

IV. FINDINGS

The tools that are used to develop the system are Eclipse JEE, Oracle SQL Developer as database to store and manage data. Programming language used is Java and Tomcat 9.0 is being used as server to run the localhost.

A. Manage inventory

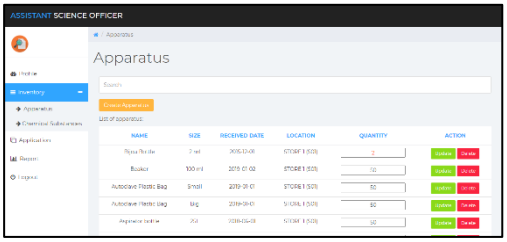

Fig. 4. View inventory interface

Based on Figure 4 above, it shows the page for inventory menu that consist of two submenus that is apparatus and chemical substances. The inventories that are stored in science lab of Faculty Pharmacy consist of only apparatus and chemical substances. Therefore, by dividing it into submenu makes it easier for lab assistant and assistant science officer to view. In this page, assistant science officer can also search inventory by typing inventory name at the search bar. To add new inventory, assistant science officer can click on create new apparatus or create new chemical substance button. While to update or delete, they can click the respective buttons at the table in action column. For inventory that has expired and low in quantity, the inventory expired date and quantity will be red in colour.

B. Manage application

Figure 5 given below display the page for manage application. In this page, assistant science officer can view the information of the application sent by lab assistant. Then, assistant science officer can either approve or reject the application. If assistant science officer chooses to reject, reason for reject must be inserted. Once the application has been managed, email notification will be sent to lab assistant. The contain of the email is only the date of the application submitted, the date to use the inventory, the reason of the application and reason of reject if the application is rejected. Other details can be viewed in the system. If the application is approved email notification as seen in figure 6 below will be sent to lab assistant while if the application is rejected, email notification as seen in figure 7 will be sent to lab assistant. Also, if the inventory that has been approved is low in quantity, email notification will be sent to assistant science officer as shown in figure 8 below.

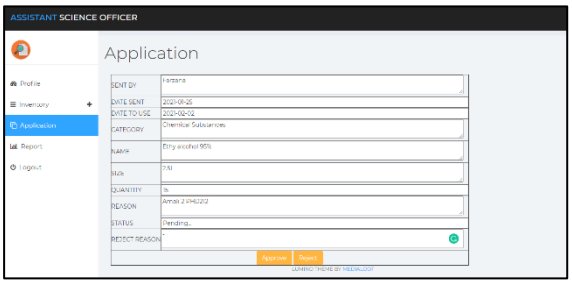

Fig. 5. Manage application interface

Fig. 6. Email notification for approved application to lab assistant

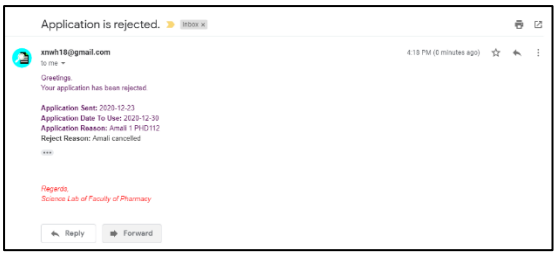

Fig. 7. Email notification for rejected application to lab assistant

Fig. 8. Email notification if inventory is low in quantity to assistant science officer

C. *Notify expired inventory*

Fig. 9. Email notification if inventory is expired to assistant science officer

For expired inventory email notification, after successfully login the system will automatically detect if there is any expired inventory on that day and assistant science officer will receive an email notification as shown in figure 9 above.

V. CONCLUSIONS

This project is developed based on three problems: data inaccuracy when adding and updating list of inventories, takes longer time for lab assistant to wait for approval and no alert or notification to notify assistant science officer on expired and low quantity inventory. With all these three problems statement, three objectives are made to solve the problems based on the analysis made on the requirements stated by stakeholder. Each objective has their own activities and deliverables. With the accomplishment of all the activities, three of the objectives are achieved. This system will help assistant science officer to monitor and check the stock of the inventory and this system will send notification to notify if there is any expired and low quantity inventory, ease assistant science officer to approve applications sent by lab assistant thus quantity of inventory is deducted automatically once the application has been approved. Moreover, make it easier for lab assistants to view availability of chemical substances and apparatus and submit application based on the availability and receive approved or rejected email notification about the application status once it has been approved. Furthermore, takes lesser time for assistant science officer to generate report.

ACKNOWLEDGMENT

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Dental Treatment Orientation for Children using Role Playing Game

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***Abstract*—Dentistry is the act of practicing the diagnosis, prevention, and treatment of diseases, injuries and disorders of the teeth and surrounding structures of the oral cavity. Dental needs are related to one's body health so one should bear the responsibilities to take care of it. However, some children get too overwhelmed by anxiety at the mention of dental treatment making the dental visit become a hard work. They are also lack of awareness about the importance of dental health due to the young age. Therefore, the goal of the developed game is to help them reduce their fear of going the dentist by demonstrating the procedure through an enjoyable orientation using Role Playing Game. Modified Waterfall Model has been chosen as the methodology for this project because whenever required, the phases in this model can be overlapped. Hence, the development for this project will be flexible as few tasks will function concurrently. Game elements such as challenge, rule, reward, theme, and progress are employed in the game. The platform chosen for the game is a stand-alone on PC. The design of the game is Role Playing Game where the player has to accomplish few missions during their trip to the dentist. Usability testing for the developed game involves 20 respondents. The result of the test shows a positive result as most of the respondents enjoyed and satisfied with the content of the game. However, the majority of the respondents requested more missions. Further enhancement can be added to the game such as add online features to the game.**

Keywords—dental treatment orientation, role playing game, children

I. INTRODUCTION

Dentistry is the act of practicing the diagnosis, prevention, and treatment of diseases, injuries and disorders of the teeth and surrounding structures of the oral cavity. Dental needs can be quite connected to one's body health so one should bear the responsibilities to take care of it. Responsibilities include the repair and restoration of teeth, the replacement of missing teeth, and detection of diseases that might require treatment by a dental specialist or doctor [1]. Usually, dental needs may depend on the personal habits, self-care routines, and one's lifestyles. The importance of dental hygiene are acknowledged as to enjoy eating, achieve stability in emotion, as well as contributing to a lovely smile.

Orientation is like a training session before actually performing or doing a specific task. It can helps in adjusting to a new surrounding to make an event flows smoothly when the time comes [3]. For example, secondary school students go through about one week of orientation before actually starting to go to usual everyday classes to get to know the new atmosphere of secondary school such as where the classrooms are, how to buy foods at the canteen, when to be at the assembly point, who are the teachers to certain subjects at so on. In this case, the orientation will benefits both the students and the school itself as students will become less nervous about facing a new surrounding as well as the school will become more organized when the real study session starts.

On the other hand, role playing game is a game where the player controls the character's role in an imaginary world for a certain quest. The flow of the game depends on that choices did the player made as though the player is living the moment themselves. Some advantages of role playing games are that it can cultivates creative and critical thinking under a certain situation, levels up social and problem solving skills, as well as enriching language and communication [5].

II. OBJECTIVES

To reduce children's fear of going to the dentist, they will be comforted by positive words during the role playing dental treatment orientation. It also could help the children to be ready before actually going to the dentist as the children already go through the step by step procedure of going to the dentist to get a dental treatment. Thus, there are three objectives to be fulfilled in this project.

i. To design a role playing game of dental treatment orientation for children.

ii. To develop the designed game.

iii. To test the usability of the game.

III. METHODOLOGY/ TECHNIQUE

The methodology used in this project is Modified Waterfall model which is the modified version of Waterfall model. But, the updated model, unlike the conventional waterfall model, allows project phases to overlap and still includes phases in the traditional waterfall model: requirement analysis design implementation (or coding), testing and evaluation, and maintenance [2].

The reason this Modified Waterfall model is chosen as this project's methodology is because whenever required, the phases in this model can be overlapped. Hence, the development for this project is flexible as few tasks function concurrently as mentioned by [4], the simultaneous running of subprojects can reduce overall development time and can help to identify potential problems earlier in the design and development process. Therefore, changes to the basic design can be made easily, as there are a number of phases active at one point of time. There are four phases for this Modified Waterfall model which are Requirement Analysis phase, Design phase, Implementation phase, and Testing and Evaluation phase. Fig. 1 shows the phases of the Modified Waterfall model.

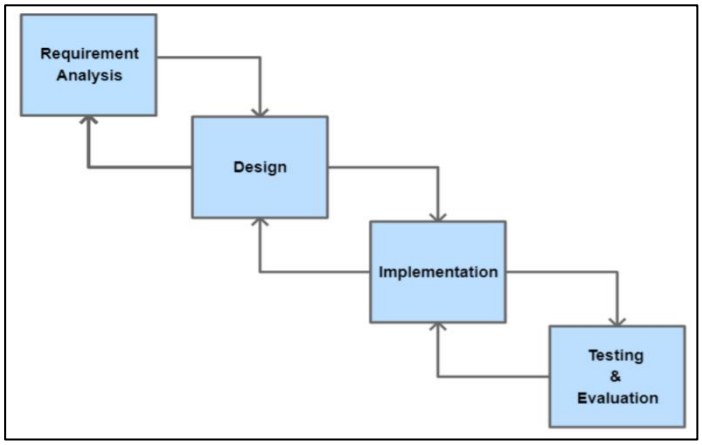

Fig. 1. Phases of Modified Waterfall Model

IV. RESULTS AND FINDINGS

A testing session to evaluate the usability of the developed game has been conducted. The objective of this testing is to check whether children get less anxious about the thought of going to the dentist after playing the game. The test has been carried out with six children aged from eight to eleven years old. The testing is based on the questionnaire given and observation of the recorded reaction of the participants while playing the game.

The testing was conducted in participants' house with their own PC. The PCs are first installed with the developed game. A camera is set up facing them to observe their facial expressions while playing the game. A pre-test questionnaire has been distributed to the participants and had to be answered before they start to play the game. After done playing the game, they must answer the usability test questionnaire.

A. Analysis of Observation

Based on the observation, most children do not bother to read the role play dialogues. They just skipped whenever there are too many words shown. Some participants also stated that some parts of the instructions are a bit unclear. For example, during the Checkup Mission, most of them took quite some time to figure out what the password is. This might be because they are not familiar with this type of game due to their young age. The children also could not find the inventory feature where they can check the items that they had collected. Fig. 2 shows the children confused reaction during the gameplay.

Fig. 2. Participants' Confused Reactions

B. Analysis of Questionnaire

Fig. 3 shows the result of the gameplay/challenge section. Based on the result, most of the questions ask for this section received balanced feedback. This might be because of the balanced distribution between children who often play games and those who rarely play games.

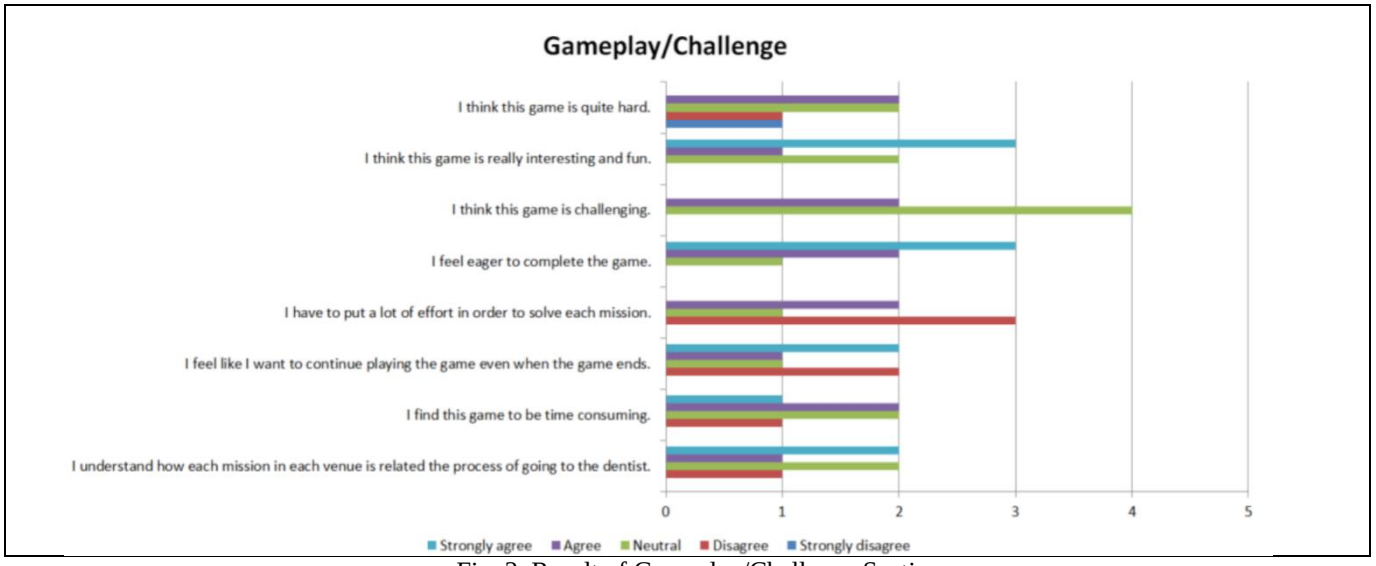

Fig. 3. Result of Gameplay/Challenge Section

Fig. 4 shows the result for the content section. Based on the overall result, most of the participants gave positive feedback regarding the content of the game. It is hardly anyone disagreed with the statements in this section except for the question about whether the content of the mission was easy to understand. This is likely due to the poor instruction flow in the game.

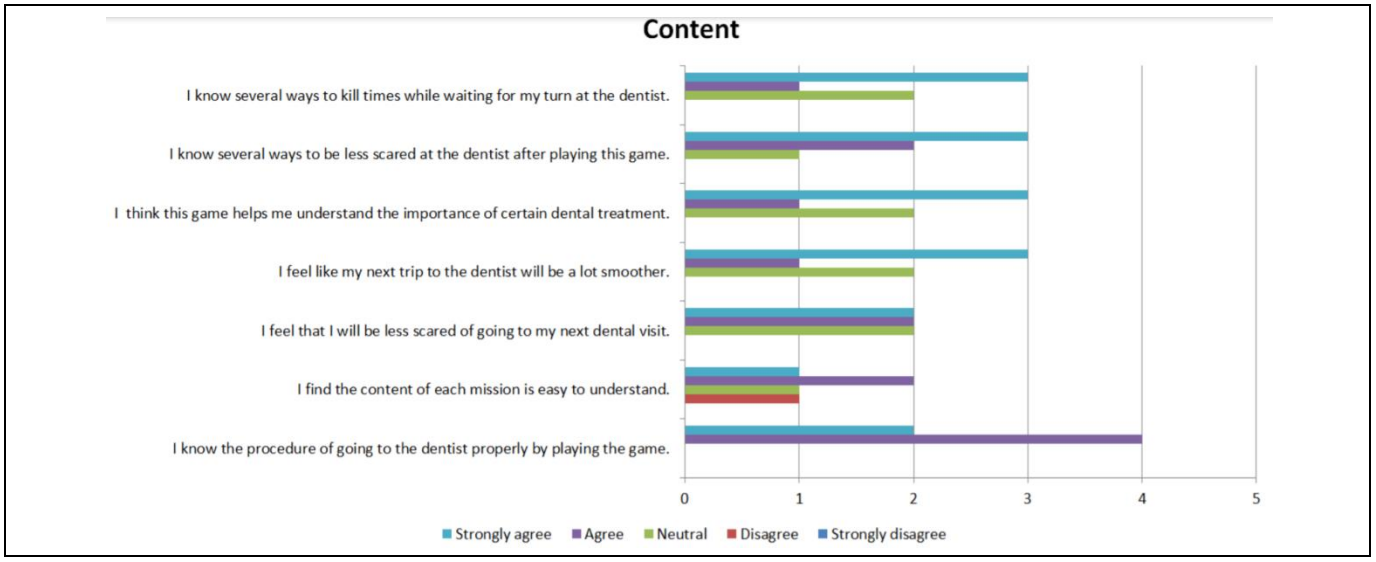

Fig. 4. Result of Content Section

V. CONCLUSIONS

Usability testing has been done through observation and questionnaire. The testing is conducted with six children aged from 8 to 11 years old. The questionnaire is divided into six different sections and each section contains difference findings. The behavior of the children is observed during the gameplay. Based on the evaluation, usability testing gives positive feedback resulting in 82.92% of students like the content of the game.

Overall, all the objectives of this project have been completely achieved. The first objective is to design a role playing game of dental treatment orientation for children that is done by conducting several researches about children dental fear, technique of reducing anxiety, and game elements. The second objective is to develop the designed game which is done using game developing software named RPG Maker MV. The third objective is to test the usability of the game by handing out some questionnaire to get responses and feedback for the developed game for further improvement purposes.

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EZ Forecast 2.0: A System of Univariate Models

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***Abstract*—Forecasting is a process of analysis that is performed using past and present data. It involves the analysis of trends for predictions of the future and helps organizations to cope with future uncertainties. However, forecasting techniques involve complex tasks. In EZ FORECAST 2.0, data forecasting is made easy since the system is developed to be user friendly where the user only needs to key in the data set and the analysis will be done automatically by the system. An upgraded version of EZ FORECAST 1.0, a system of univariate modelling techniques is introduced to forecast and evaluate the best techniques identified by the time series model. This new system is proposed to recommend the best model of the data. This system assists the decision-maker in forecasting the time series data accurately and systematically. The objectives of this system are: (1) to monitor the performance of the time series data set using a univariate model, (2) to forecast the time series data set one step ahead, and (3) to propose the best model based on minimum error measures. There are five methods used in this system which are Naïve Forecast, Naïve with Trend Forecast, Single Exponential Smoothing, Double Exponential Smoothing, and Holt's Method. Real-life data from a Food and Beverages (F&B) company is used to demonstrate the effectiveness of the system. The findings show that the system is able to recommend the best model with forecasting values which have minimum error measures. This system benefits an organization by providing valuable information that helps the top management to make decisions on the future direction of the company.**

Keywords—forecasting, time series, univariate model

I. INTRODUCTION

Decision making is a complex task. Many forecasting techniques have been developed to handle the complexity of decision-making problems. Choosing the appropriate forecasting technique is crucial. This study proposes a time series forecasting system of univariate modelling techniques to assist the decision-maker in forecasting the time series data accurately and systematically. Univariate analysis is concerned with the forecasting technique based on past data of one variable without taking into consideration the effect of the other variables. EZ FORECAST 2.0, an upgraded version of EZ FORECAST 1.0, is introduced to forecast the future and to evaluate the best techniques identified by the time series model. The objectives of this system are: (1) to monitor the performance of the time series data set using a univariate model, (2) to forecast the time series data set one step ahead, and (3) to propose the best model based on minimum error measures.

Empirical data for a sample of time series observations of the closing price of a Bursa Malaysia Food and Beverages (F&B) listed company was used to assess the effectiveness of the system. The system is expected to estimate the best model to forecast the future price of the company one-step ahead with minimum error measures. The forecasting techniques involved in this experiment are Naïve Forecast, Naïve with Trend Forecast, Single Exponential Smoothing, Double Exponential Smoothing, and Holt's Method. These methods are based on the inclination of the development of a situation in the past, which are then extrapolated into the future with an assumption that the regularities that happened in the past will continue in the future [1]. This system is user friendly, simple in application, efficient and can minimize human error. The system can provide valuable information to the top management and future investors or the shareholders of the company. This paper is organized as follows: (1) Introduction, (2) Literature review, (3) Methods, (4) Results and Discussion, (5) Conclusions.

II. LITERATURE REVIEW

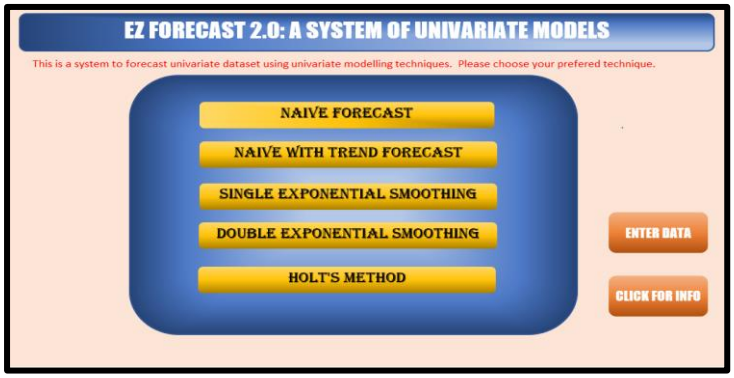
In many areas, decision-making is essential and often based on forecasting and making predictions. The areas that have gained benefits from the use of forecasting approaches are economics, business, engineering, science and many more [2]. Today, the accessibility to statistical packages or software has simplified the process of developing statistical models, based on data such as cross-section, time-series, cross-section over time, and panel data [3]. Software packages such as Microsoft Excel, Statistical Package for the Social Sciences (SPSS), SAS, Eviews, and R have shown the ability to perform statistical analysis. Deciding which of these software packages is better for data analysis is based on the number of variables, size of data, and the advantages and disadvantages of each statistical software [3,4]. Microsoft Excel is a popular and powerful spreadsheet program that is used to perform mathematical and statistical calculations. The most popular free add-ins in Excel are the Analysis Toolpak and Solver, while MegaStat includes a cost. Free add-ins can perform data analysis, develop a forecasting model, and present the results [5].

On the other hand, users would have to subscribe to use SPSS, SAS, and Eviews. The SPSS software is widely used in social sciences and offers a statistics base, advanced statistics, custom tables, decision trees, forecasting, and many more [4]. Forecasting time-series data involves the study of components such as trend, seasonality, cycle, and irregular changes in the data [6]. If users are looking for specific tools to manipulate time series data or econometric data, Eviews is one of the options. The program allows users to easily add or upload data series, construct new series from existing ones, view and print data series, perform statistical analyses of series relationships, and manipulate results and output [7].

SAS and R are programming languages designed for intermediate and advanced users because they are extremely powerful, can handle very large data sets, and can perform complex and advanced analyses. SAS has functional packages built-in for many sectors, including health care, banking, insurance, retail, utilities, sports, and more. It also works well with advanced statistical techniques like forecasting, time series analysis, and many others. SAS provides comprehensive online documentation, specialist technical assistance, advanced training courses, and a community on the internet. With many choices of software packages in the market, however, there are limited findings on the decision support system that can suggest the best model from a single interface. Decision-makers still have to decide which model is the best. Thus, EZ Forecast 2.0 was developed to propose the best model from a variety of models based on minimum error measures.

III. METHODS

The system uses five methods which are Naïve Forecast, Naïve with Trend Forecast, Single Exponential Smoothing, Double Exponential Smoothing, and Holt's Method. Figure 1 shows the interface of the system.



Fiq. 1 Interface of the system

A. *Naïve Forecast*

$$F_{t+m} = y_t \text{ for } m = 1,2,3,4,... \quad (1)$$

where m refers to the number of periods into the future for which the forecast is desired and *y* is the actual value at time *t*.

B. Naïve with Trend Forecast

The one-step ahead forecast is represented as

$$F_t = y_t \frac{y_t}{y_{t-1}} \qquad (2)$$

where y_t is the actual value at time *t* and y_t is the actual value in the preceding period.

C. Single Exponential Smoothing

The model requires only one parameter, which is the smoothing constant, α, to generate the fitted values and hence forecast. The advantage of this procedure over the moving average is that it considers the most recent forecasts. The general equation is as follows:

$$F_{t+m} = \alpha Y_t + (1-\alpha)F_t \qquad (3)$$

where

F_{t+m} is the single exponentially smoothed value in period $t+m$ for *m* = 1, 2, 3, 4,…

Y_t is the actual value in period *t.*

α is the unknown smoothing constant to be determined with value lying between 0 and 1, i.e. ($0 \le \alpha \le 1$),

D. Double Exponential Smoothing

This technique is useful for a series that exhibits a linear trend characteristic. The following are five main equations used in this method.

$$S_t = \alpha Y_t + (1-\alpha)S_{t-1} \qquad (4)$$

$$S'_t = \alpha S_t + (1-\alpha)S'_{t-1} \qquad (5)$$

$$\alpha_t = 2S_t - S'_t \qquad (6)$$

$$b_t = \left(\frac{\alpha}{1-\alpha}\right)(S_t - S'_t) \qquad (7)$$

$$F_{T+m} = a_T + b_T xm \qquad (8)$$

where S_t be the exponential smoothed value Y_t of at time *t* and $S_t^{'}$ be the double exponentially smoothed value of Y_t at time *t.*

E. Holt's Method

This technique not only smooths the trend and the slope directly by using different smoothing constants, but also provides more flexibility in selecting the rates at which the trend and slopes are tracked.

$$S_t = \alpha Y_t + (1-\alpha)(S_{t-1} + T_{t-1}) \qquad (9)$$

$$T_t = \beta(S_t - S_{t-1}) + (1-\beta)T_{t-1} \qquad (10)$$

$$F_{t+m} = S_t + T_t xm \qquad (11)$$

where α and β are the parameters to be determined with values from 0 to 1.

F. Mean Square Error (MSE)

Error measures are used to differentiate between a poor and a good forecast model. The error measures are employed to find the best model where the smallest error is said to be the best model. MSE is chosen as an error measure because it is easy to understand and to calculate, and generally the outside-sample criteria tally with the within-sample criteria where the summation of square errors is divided with the total number of samples.

IV. RESULTS AND DISCUSSION

The proposed system was developed using Excel to identify the best model that suits the data by measuring the error measure, namely Mean Square Error. The proposed system of EZ Forecast 2.0 can be seen using an example of Naive forecast as shown in Fig. 2.

Fig. 2. Example of Naive forecast in proposed system

In the EZ Forecast 2.0 system, users can enter the raw data in specific columns as stated in the system. The EZ Forecast 2.0 system can automatically display the trend of the data using the line chart and provide the value of Mean Square Error (MSE) for the estimation and evaluation parts. Not only that, but this system also helps the users to generate the forecast value for the data itself. Based on Fig. 2, the forecast value for one-step ahead of the data is 63.10. Once users have entered the data in five different methods, the EZ Forecast 2.0 system compares the value of the MSE evaluation part, and the best model with the minimum value of the MSE evaluation is displayed at the finding and analysis sheet as shown in Fig. 3.

Fig. 3. Finding and analysis of EZ Forecast 2.0

V. CONCLUSIONS

The EZ Forecast 2.0 system, which has been upgraded from the previous system, has benefits such as helps the users to calculate a large number of data in a short period of time. Apart from that, this system is user friendly as such that the users just enter the raw data and the system would calculate and give the results of the MSE estimation and evaluation part as well as generate the forecast value for each method. Hence, this system has proved that it assists the users by providing an accurate and systematic calculation in order to monitor the performance of the time series data set using univariate models. The EZ Forecast 2.0 would help decision-makers to smoothly run their businesses by implementing this system. However, the method is only applied for univariate methods. Therefore, for further research, it is suggested to consider another method in time series forecasting rather than the univariate methods.

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Arduino-based Farm Feeder Helper

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***Abstract*— Farmed domestic animals usually lives in cramped and filthy conditions with insufficient food, and drinks in enclosed areas. Instead of treating them as living beings, the modern industrial way in which this industry produces dairy and other animal products has turned them into mere production units. In this project, the animal will get its food based on the preset time in the programming. Other than that, it will ensure that animals in the farm will kept hydrated by providing enough water all the time inside the farm. Additionally, this project also ensures that the air inside the farm will remain fresh and clean from any unpleasant smell that have been produced by the animals inside the farm. As the result, animals in the farm will live a good life and act as the base in generating quality product in the future, as well as helping farm owners to control feeding time. This project utilizes the use of Arduino microcontroller to control the conditions in the farm by controlling proper ventilation system, feeding water level and appropriate feeding time. Both motor servo and exhaust fan are used to supply water and expel smelly odors respectively to achieve the optimal condition in the farm. Necessary information is displayed on the Liquid Crystal Display (LCD) unit.**

Keywords—Farm feeder, Arduino, MQ-02, ventilation, water level controller

I. INTRODUCTION

Automatic farm feeder is an innovation concept that refers to managing farms using modern information and communication technologies to increase the quantity and quality of products while optimizing the human labor required [1]. Whenever a farm was mentioned, people always think about it as overcrowded, dirty, and often in confined spaces. Upgrading the facilities regarding this matter must always involve human intervention and this can increase workload of a farm worker. Subsequently, the crowded space then leads to an inadequate living condition and amount of food among farm animals. The farm feeder project where farm animals will be provided with enough food and water along with good air ventilation. With this, the animals can sleep with a full stomach every single day. After all, good animal health will produce good quality food for humans [2]. Therefore, this project can ensure that the animal on the farm live in a good condition to produce good food in the future.

The other reason why the Farm feeder is created is to reduce human labor on the farm. This is because food chain workers are among the lowest-paid laborer in Malaysia, yet they face disproportionately high risks for injury, illness, and exploitation [3]. Workers can suffer long-term exposure to dangerously polluted air and diseases such as antibiotic-resistant superbugs at factory farms. Animals are not the only ones suffering because of these unnatural and inhumane conditions. Consumers, rural communities, farmers, workers, and the environment are being hurt by the intensive farming systems employed on factory farms. Non-properly maintained farms can be breeding grounds such as Salmonella, E. Coli, and other pathogens that can be transmitted to humans through meat, milk, and eggs, as well as through contact between people. To combat unsanitary conditions, animals are fed large doses of antibiotics. Misuse, overuse, and dependence on antibiotics in our food system create the potential for dangerous, drug-resistant strains of bacteria to develop and spread among people and animals [1,4]. So, we need to keep our farm clean in order to produce good quality food for humans. In order to keep the farm clean, this project suggest using the gas sensor as a medium to sense methane gas that have been produce from feces. Generally, feces contain a lot of bacteria. In order to clean it, this project also suggesting using ventilation fan which can make air inside the farm clean beside can also notify the workers about the presence of the feces inside the farm [5].

In existing system of feeder, manpower usually the one who will take care of providing the food to each cage in the farm [5,6]. The quantity for each cage might be slightly different or sometimes manpower forgot to deliver the food on time to those animals. This will lead to animals could not get enough food that they should have. In order to produce a good quality of product in the future, food and water need to be taken care for these animals inside the farm [1]. This project will ensure that animal inside the farm will be provided with enough food and water that will keep the animals hydrated.

II. METHODOLOGY

A. Project Block Diagram

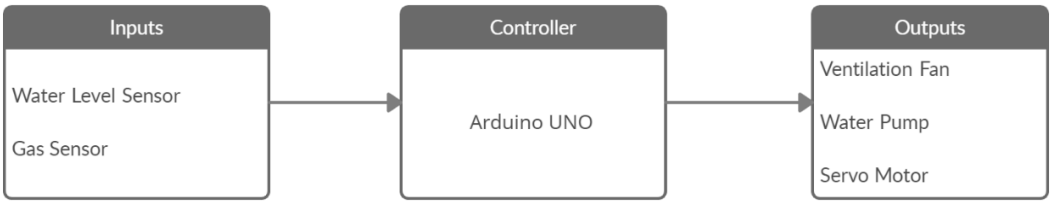

Fig. 1: Hardware Block Diagram of Farm Feeder

In this project, Arduino Uno microcontroller is used as the main controller of the system. The hardware bock diagram is as shown in figure. It has two sensor inputs which are the gas sensor MQ-02 and water level sensor, while the outputs are divided into three main components, namely the ventilation fan, water pump and servo motor to control the food feeder. 20 x 4 Liquid crystal display (LCD) is also included to display necessary information to the user.

B. Flowchart of the project

The project's programming flowchart is shown in Figure 2. Three main functions of the system are simultaneously operating according to the program flow. Those three systems are; detecting methane gas, activating the timer for feeder motor as well as detecting the water level of the water tank.

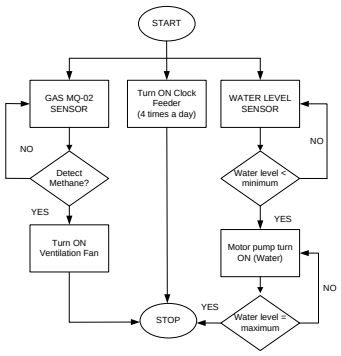

Fig. 2: Overall project flowchart

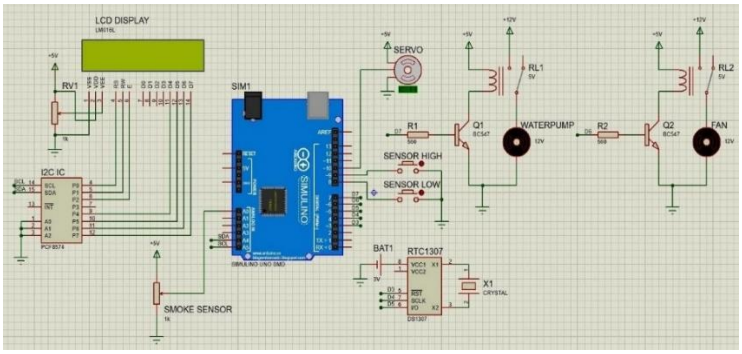

Fig. 3: Simulated schematic diagram for Farm Feeder project

The methane gas sensor (MQ- 2) sensed any methane gas released by faeces inside the farm. If the gasses concentration detected above the sensors' concentration ppm level, the ventilation fan will be turned ON to allow the gasses from inside the farm to be exhausted out. The fan turning ON could also be an indicator for the farm workers to do cleaning works. For this ventilation process, it will automatically turn on and off when the gas sensor senses the presence of faeces inside the farm making sure freshest air is available. As for the food dispenser, the timing are set through the Arduino by setting the actual time for the food dispense in each bowl at the same time all over the farm into four times daily. By that, animal in the farm will receive enough quantity of food per day without any delay. For the automatic water dispenser, this project uses gravity float switch systems as water level detector. The gravity float systems use "float switch" that acts as water level sensor that rises as the tank fills with water. This project uses two water level sensors. One of the water level sensors act as the minimum point of water level and the other one as the maximum level of water. When in the water container contains no water or the water in the water container was below than the minimum level of water, the water pump will start functioning by pump in the water from the water tank to the water container. Once the level of water reaches the maximum level, the water pump will stop pump in the water as the water container already full. When their water container reaches the minimum point of the water level or low water level which means almost no water in the bowl, then the water will automatically be filled to the tank using the water pump.

III. RESULTS AND FINDINGS

This project uses Arduino Uno Integrated Development Environment (IDE) for programming, while Proteus Design Suite for designing purposes. All the hardware implementations are made using standard electronic components soldering and hardware troubleshooting techniques done in instrumentation and electronics laboratory.

A. Software Implementation: Cicuit simulation and programming

Figure 3 shows the general simulated schematic diagram of the Farm Feeder Project using Proteus software. It consists of an Arduino Uno as the main controller, 16x2 LCD with I2C module, MQ-2 gas sensor, Real Time Clock (RTC), Float sensor (high and low), servo motor, water pump, DC fan, and relay 2-channel. The float sensor is replaced by the push button for simulation purposes including the water and gas sensors. This simulation shows the hardware connections for the farm feeder circuit later. The programming of the circuit is made by using Arduino IDE software using C++ coding before uploaded into the circuit for testing and troubleshooting. Meanwhile, Figure 4 shows example of coding done including the input initialization and declaration of the pin of Arduino microcontroller and setting the feeding time of the feeder motor.

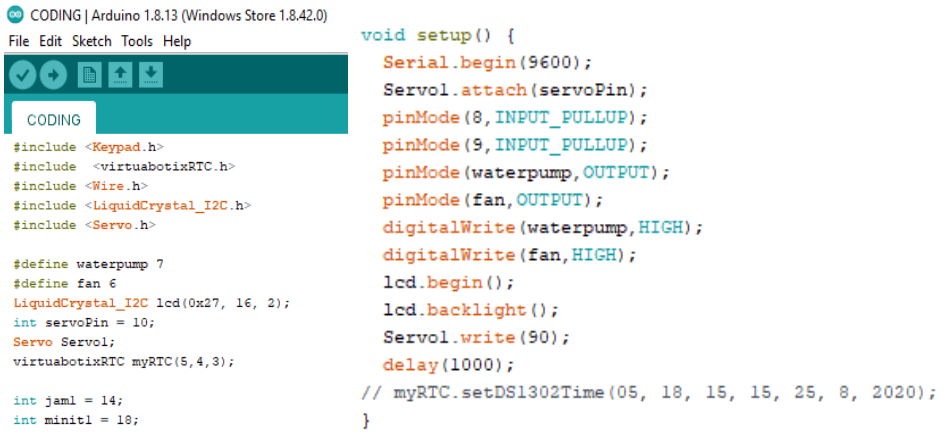

Fig. 4: Example of coding for the project

B. Hardware Implementation

In hardware implementation section, the circuit components are connected according to design of the simulated result. The result of the prototyping is divided into (a) Food dispensing process (b) Water level indicator and (c) Gas sensing / ventilation.

a) Food Dispenser Result: Figure 5 (a) shows that the LCD display words “READY” at 12:29 a.m. In Arduino IDE, this project already set the timer for the first batch of food dispenser at 12:30 a.m. The servo motor is in ready condition before the servo horn rotate 90 degree from the starting point at 0 degree. Meanwhile, figure (b) shows that the LCD display “FOOD DISPENSE” where servo motor followed the controller command to dispense food on 12.30 a.m. as it has been set the timer in Arduino IDE. The servo motor rotates to 90 degree to open the lid of the food container to release food inside the cage and stays in position for 4 seconds to dispense the food. After 4 seconds, the servo motor will rotate 90 degree back to it place at 0 degree. The LCD display will be changed to display “READY” means it ready for the second batch or another 4 hours to dispense the food.

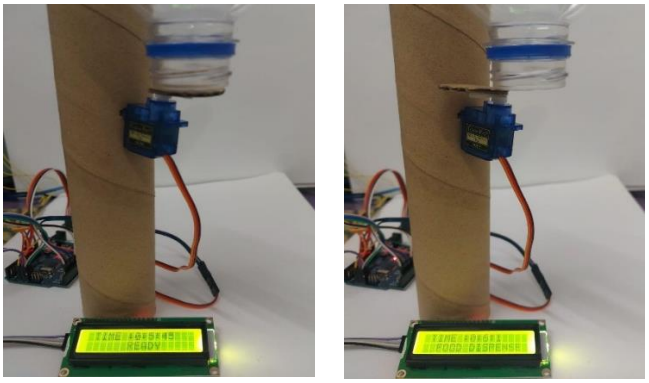

Fig. 5: (a) System ready mode (b) Food Dispense Mode

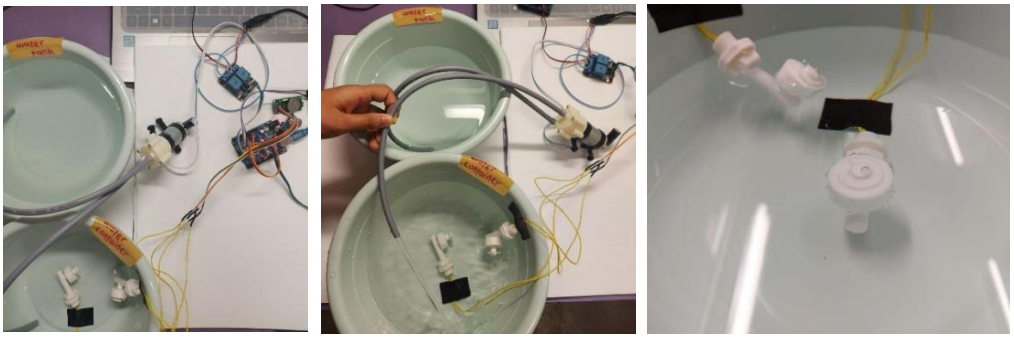

Fig. 6: (a) Minimum water level (b) Water filling process (c) Maximum water level

b) Water level dispenser Result: Figure 6 (a) shows clear water tank at minimum without any water inside. There are two float sensor used for minimum and maximum water level sensor with 3 cm and 10 cm programmed respectively. As the sensotr detects minimum water level, the controller will turn on the pump through motor relay circuit and fill the water from water tank to water container as in Figure 6 (b). It will continue to fill up until the second sensor detects the maximum level and stops as in Figure 6 (c).

c) Gas Sensor and Automatic Ventilation Fan: Figure 4.10 shows that the circuit connection of gas sensor and automatic ventilation fan. The DC fan is connected to the relay and have been supported by the adaptor (12Volt). Meanwhile the MQ-2 gas sensor is connected to the controller which is Arduino Uno. Practically, it needs to be methane gasses that is released by the animal's feces but for simulation purpose, butane gas is used instead. In Arduino IDE, the MQ-2 has been set until the reading of gasses reach 400. Once it reaches 400, the relay will be turned on and the ventilation fan will automatically be turned on. As conclusion, once the MQ-2 gas sensor detects gasses in the farm, the DC fan will automatically be turned on to notify the workers about the presence of feces (methane gas) as well as keep the farm's air clean and fresh from unpleasant smells.

IV. CONCLUSIONS

In summary, the objective of this project is accomplished where the project is capable to provide a comfortable barn for the farm animals. This project will benefit farm owners as it will boost the growth of the farm animals as well as their environment and surrounding. In this project, future recommendation of implementing internet of things (IoT) is suggested for easier management for the end user of this project.

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PictoEZodit (E-Comic In Teaching Practice)

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***Abstract* — Learning auditing as a theory subject for accounting students can be very dull and mundane. The audit theory is commonly memorized by students from textbooks which is textual and challenging for the students to apply into real case scenarios. However the students have not yet been exposed to the audit working environment, hence lack knowledge of how to apply audit theory in practice. As a result, *PictoEZodit* was created as an interactive educational tool to address this issue. This "comic strips" makes use of visual images mostly pictorial as a learning tool and designed to be used in both offline and online classrooms. As such, *PictoEZodit* intended to create harmony between theoretical learning and the real working environment of auditing practices. This innovation aims to replace the traditional method of teaching audit subjects with a more enjoyable learning experience.**

Keywords: audit education, e-comic, interactive

I. INTRODUCTION

Education today is very challenging and requires new techniques in teaching and learning process. The movement of new teaching and learning process covers within all tiers of education system from primary level to tertiary level. As for accounting students in the tertiary level, the new learning technique is expected to be practiced in order to create more joyful environment with more interest and attention particularly for theory papers such as auditing subjects. Previous study had proven that majority of students in the social science stream are more attracted towards experiential learning rather than traditional classroom style since they believed that the experiential learning assisted their learning and felt what they have learned could be applied elsewhere [1]. The traditional way of teaching auditing papers found to be very dull and mundane since this subject was merely technical and very descriptive, solely receiving information through oral presentation, fully memorizing notes from textbooks and only required to complete the assignments. Hence, accounting students feel pressure, bored and less interested in this subject which could affect their performance in the practical training semester. Students are unable to build up their self-confidence and competence during the audit training because they are unable to grasp the audit theory of the real audit working environment. Consequently, this creates some problems especially among the industry players (employers and professional accounting bodies) in having fresh accounting graduates with excellent soft skills, high critical thinking skills and a very good in problem solving skill.

Therefore, to address this issue, more interactive teaching tools and materials are required to be designed to facilitate accounting students in understanding better in a learning audit subject. ***PictoEZodit*** is created as one of the interactive educational tools which is based on comic strips using cartoon images to be used in the classroom either offline or online. The depiction of cartoons or comic strips can provide a joyful environment and make students think differently and encourage them to create their own. It is a visual media that covers a lot of humour either in the form of a single picture or series of pictures, captioned or non-captioned and can be seen in magazines, newspapers, books, and social media [2]. Prior research shown that learning through visual elements such as cartoons and comic strip could increase the student's interest and intrinsic motivation,

and reduce boredom, academic stress and anxiety [2][3] Furthermore, cartoons materials can grab student's attention to make them healthy and interested in learning and this approach could help the teachers to develop imaginative power amongst students by engaging proper knowledge, stimulating in critical thinking, supporting their own ideas and opinions as well as identifying other conceptions of a particular topic with cartoons [4]. Findings from [5] on the effects of educational practices using cartoons in learning outcome for social studies subjects indicated that teaching done with cartoons affect students' achievements and knowledge retention positively since the use of cartoons have ensured the continuity of interest in this subject and make learning fun and understandable if these subjects are presented in more interactive form.

This paper is organized as follows whereby Section 1 addresses the introduction and background of the study. Section 2 discusses the objectives and significance of the study. Section 3 explains the methodology of development of ***PictoEZodit,*** Section 4 discusses results and findings, Section 5 highlights potential commercialisation of ***PictoEZodit*** and the last section concludes this paper.

II. OBJECTIVES AND SIGNIFICANCE

The objective of this innovation includes as one of the interactive learning tools for auditing subjects in order to assist accounting students to have better understanding for audit theory and be able to engage the knowledge in real life audit working environment particularly during their practical training semesters. Besides that, ***PictoEZodit*** offers a hands-on opportunity to understand the real scenario happening in the audit working environment and provide ways to solve the audit problems and issues. Learning through ***PictoEZodit is able*** to enhance the quality of soft skills among accounting students in critical thinking, problem solving and comprehension in a real audit working environment, thus being able to produce quality fresh accounting graduates for the benefit of industry players as a whole.

The significance of this innovation could add to the traditional learning method that has been provided in order to ensure audit knowledge is able to grasp comprehensively at the tertiary level. The demonstration of audit scenarios as presented in ***PictoEZodit*** is to facilitate students on how to apply the audit theory in a right manner effectively and efficiently. Educators should use ***PictoEZodit*** as one of the platform of audit learning either offline or online as this innovation intended to create harmony between theoretical learning and the real audit practices in the working environment, thus the learning activities become more assisted and joyful as this e-comic give a new insight towards understanding audit theory well among students.

III. METHODOLOGY

The idea to innovate audit teaching method initiated by our undergraduate student's grievance on the hurdles they have to face in memorising and understanding the audit theories and laws. Hence a survey was conducted looking into students' problems and preference in capturing their interest in learning audit subjects. Responses from 76 respondents showed that 88.2% facing difficulty in memorising and understanding MIA By-Laws, 98.7% agreed that no working experience makes this course even tougher and 69.7% prefers to have pictographic (ie:comics) to help them in the audit course (refer fig. 1)

PictoEZodit was created using web application "Pixton for Schools" that can be used to show characters that have different facial expressions and body positions which express emotions and make the subject look real and, therefore, the comic more realistic. A study evidenced that 'Pixton for Schools' appears to be the most complete web tool that can be used to create comic strips as it is richer in features, having extensive support in characters, emotions, postures and interface language selection [6]. Furthermore, this application supports collaborative work and offers many features in designing attractive e-comic strips.

Figure 1: Pie chart result on audit learning method effectiveness.

IV. RESULT AND FINDINGS

The educational scenarios of ***PictoEZodit*** e-comics had been done efficiently by using the features available in the application. The comic strips developed show rich graphic design which helps enhance the original idea in delivering the story and thus, the results are more appealing. The comic strips then are exported as a set of images and further merged to build an

e-comic. This study merely focuses on the feasibility of developing an attractive and usable design of e-comic, and not on the actual impact on the learning process.

Figure 2 shows an example of educational scenarios developed using comic strips for the code of ethics of Gift and Hospitality for auditors in public practice. By observing different characters' facial expressions, and postures, the auditing subject looks appealing and realistic.

Figure 2 : Example of comic strips for ***PictoEZodit***

1.

V. POTENTIAL COMMERCIALISATION

PictoEZodit has a good potential for commercialisation since none of the audit comics is available in the market today. The e-Comic Audit can become one of the references in audit subjects rather than solely using the audit textbooks. ***PictoEZodit*** is a new innovation of learning materials and can be accessed either through offline or online form. Since the market today towards digitalisation, the usage of e-book has been widely popular among younger generations including university students. Thus, ***PictoEZodit*** is expected to be available via online shopping platforms such as "Shopee" and "Lazada" applications as it could make an easy way for accessibility to own this e-book by everyone interested in seeking the audit knowledge.

VI. CONCLUSION

In conclusion, the call for changes in accounting education required students to acquire the complete set of soft skills to become marketable among the industry players and employers. Using ***PictoEZodit*** as one of the learning materials offers accounting students an interactive experiential learning tool to complement the lecture-based lesson in facilitating them to understand better in audit theory and its application. The concept of experiential learning is proven to have positive impact in self efficacy, social support and motivation among students in tertiary level [7] and students are expected to feel these positive outcomes when learning is made through ***PictoEZodit***. Additionally, some of the misconceptions on certain issues can be corrected using the concept of cartoons as it is a visual aid making the discussion of ideas related to daily life events with the cartoon style characters possible [3]. Hence, ***PictoEZodit*** is considered as an effective learning tool that can be practiced to relate with the real audit working environment and the audit theories and knowledge as presented in the textbook. However, there are some limitations in this innovation since not all parts of audit theories are able to demonstrate real audit working experience. Some of the audit theories require the understanding from textbooks as it is hardly to be presented in the comic form. Further research also can be done in order to test the effectiveness of using the e-comic in students' learning process.

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i-CHEMTORIALS
(Interactive Chemistry Tutorials)

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Abstract **- For decades, the traditional teaching and learning using textbooks and PowerPoint point slides is very popular in universities and colleges. However, this approach is not the best teaching method, especially for subjects that require critical concepts thinking. Due to the outbreak of the COVID-19 pandemic, many schools, colleges, and other educational institutions have embraced online education platforms for lecture but the students' lacking in performing the tutorials after the online class due to not enough time and not effectively to guide the students during online lecture. So that, the introduction of game-based and gamification of learning is an innovative move to enhance students' experience during immersive learning. Therefore, i-CHEMTORIALS is an educational approach to motivate students to learn by using video tutorial design and game elements in learning environments. The goal is to maximize enjoyment and engagement through capturing the interest of learners and inspiring them to continue learning. In this project, the development of gamification-incorporated learning is introduced in the General Chemistry course. It allows students to perform interactive activities like attending a test, answering the tutorials, submitting a response, working on a chemistry calculation, and more in a virtually connected classroom. A treasure hunt game was implemented using Kahoot, Prezi and Quizizz application. This approach is capable of involving students directly in immersive learning experience such as group discussion. Perceptions and feedback from the students were obtained through questionnaires and reflective assessment. It can be concluded that at the end of the project, the content development in i-CHEMTORIALS has been successfully developed to increase the students' participation and engagement in this limitless and dimensionless new norm era. However, it can be further improved by adding more features for more enjoyable game and learning experience for students.**

Keywords—i-Chemtorials, gamification-incorporated learning, Kahoot, Prezi

I. INTRODUCTION

The Covid-19 pandemic has taken many educators and students off guard. Within a very short time, teaching and learning process was moved online and this has changed the education landscape drastically. The year of 2020 has been extraordinary thus far. The Covid-19 pandemic has brought about significant changes to every domain of our lives. University around the world was quick to adapt to the changes brought about by this pandemic. The greatest implication Covid-19 pandemic has on education is that all lessons in universities all over the world were moved fully online within a very short period of time [1]. Ever since the invention of various new technologies and Information and Communication Technologies (ICTs), methods for teaching and learning have changed into another dimension. This dimension is technically referred to as 'Online Environment' which basically means the use of gadgets of ICTs for teaching and learning. The online teaching and learning is unlimited by

time and space; thus, it increases the accessibility to education created by a physical learning environment such as age limit, time constraint, unavoidable absence of instructor, and distance in space and time [2].

This study focused on students' learning experience while using interactive multimedia content in terms of its interactivity and accessibility. The use of interactive multimedia content might improve students' learning process especially engaging them into instructional content [3]. In this advanced era of communication and media, the process of teaching and learning has become more creative and innovative with the existence of Kahoot, Prezi and Quizizz gamification applications in chemistry tutorials. The 'Open Distance Learning' or so called as ODL has been introduced in UiTM for continuous academic activities even with the current global health issues. The academic activities can be conducted in a blend of asynchronous (without real-time interaction) and synchronous (real-time interaction) online learning [4]. There are many e-learning platforms available to be used depending on the favorability of the lecturers and students to make the tutorial more efficient and attractive for the students.

In education, gamification is used under the assumption that the type of engagement experienced by gamers can be translated to support students' learning. After considering the contexts, learning objectives and distinctive needs of their students, educators in a gamified classroom setting may integrate such game-related elements as progress indicators, fun, narrative, immediate feedback, mastery, player control, social connection and scaffolded learning to impact students' attitudes, behaviors and actions and enhance their motivation, engagement, creativity, retention and overall learning outcomes. By using this gamification in tutorial might be able to trigger intrinsic motivation, yet it relies on multiple internal and external factors that must be aligned. That is, the identification with learning tasks, creating an environment where multiple participants can receive comparable scores or badges, and having the opportunity for authentic gamification; built on and integrating the objectives of tasks and strategic aims of the organisation; and creating energising and engaging experiences. The aim of this study is to merge the gamification elements with the authentic learning tasks in the same time to implement the General Chemistry tutorials using many types application in U-Future so that the students' perception is not biased towards achieving badges but working towards overall objectives.

II. MATERIALS

A. Production of i-Chemtorials

The i-Chemtorials was produced from one of the topics of General Chemistry subject namely Gas Law. i-Chemtorials is a web-based education platform that was supplemented with interactive multimedia elements (images and infographics) using Kahoots, Prezi and Quizziz.

III. METHODS

A. Data Collections and Analysis

The present study used a survey tool to see the students' initial understanding of tutorial questions in their study. A survey was conducted to 125 students from the Faculty of Applied Sciences and the Faculty of Education, Universiti Teknologi MARA (UiTM) that composed of diploma and degree students from July-February 2021. The survey was conducted using a Google Form that was easy to access and reach the respondents through a virtual method. The purpose of the survey was to identify the students' problems with the topic of the targeted subject. This product has been developed to enhance student performance and solve the issues that have been raised. The data were analyzed using Microsoft Excel software as a basic analyzing method.

B. Design of Study

At the beginning of the first class after the completion of the tutorial using Kahoots, Prezi and Quizziz, the instructor asked students to voluntarily complete a short survey (5 min) about tutorial through those medium use in this and other classes. The 10-question survey asked multiple-choice and open-ended questions about General Chemistry tutorials using U-Future. U-Future is a platform developed by UiTM for delivering learning content online to any person who wants to take a course. Figure 1 illustrates the steps or phases involved to design this i-Chemtorials.

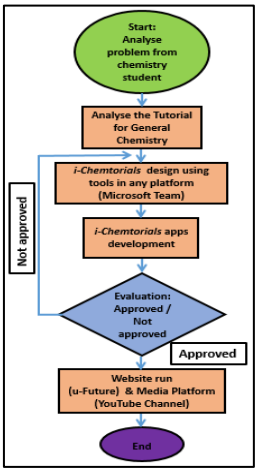

Fig. 1. Process of i-Chemtorials flow chart used in this study

IV. RESULTS AND FINDINGS

The online questionnaire was conducted anonymously by a group of students from the Faculty of Applied Sciences and the Faculty of Education, Universiti Teknologi MARA (UiTM). The number of male and female respondents were 36 and 89, respectively. Respondents were from the chemistry department. Overall, 125 students responded to the survey. The demographic profile of the respondents is present in Table 1.

Table 1: Demographic profile of respondents.

Demographic Characteristics		**Respondents (125 students)**
Age	18-20	31
	21-25	83
	26-30	11
Gender	Male	36
	Female	89
Programme	Degree	80
	Diploma	45

The questions in the survey dealt with the student and faculty populations' awareness of i-Chemtorials existence where the results were encouraging. 35.8% of all respondents were aware of i-Chemtorials. As detailed in the chart (Figure 2), students had a slightly higher awareness of the existence of an i-Chemtorials compared to 64.2 % of students who were not aware of it. The respondents were asked whether they had ever used the i-Chemtorials technique during their classes.

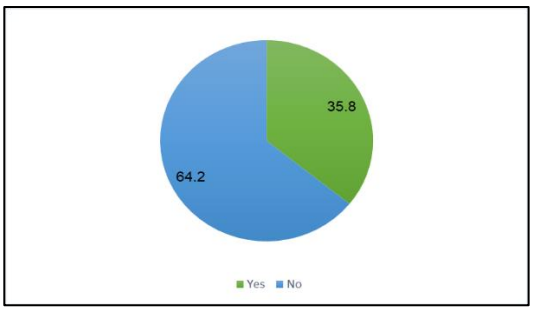

Fig. 2. Have you heard about i-Chemtorials?

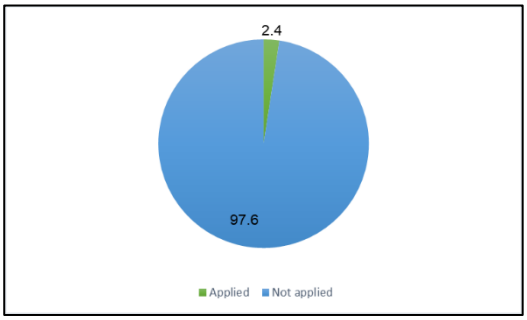

Fig. 3. The technique of Interactive Chemistry Tutorials was applied during the lectures?

Results show 97.6 % of students claimed that the technique was not applied during their classes as shown in Figure 3. The awareness of i-Chemtorials among the students become a significant benchmark for the rest of this survey. It is important to align with the main objective of the study which to break the concepts into their most conventional memorizing methods that can be systematically repeated in customized intervals of time [5].

Results show 80.6 % of respondents agreed that applying the technique of i-Chemtorials as their learning platform, more efficient compared to traditional learning method. This developed study might be more effective due to additional features such

as audio, immediate feedback, a seamless and user-friendly interface, and their high accessibility through a range of platforms [6]. By using this i-Chemtorials's medium, the students are capable of processing larger amounts of information, resulting in increased retention [7]. Only 19.4% of respondents did not agree and they preferred textbook-based learning because of perception that this format enabled an authentic, 'real' and enjoyable reading experience.

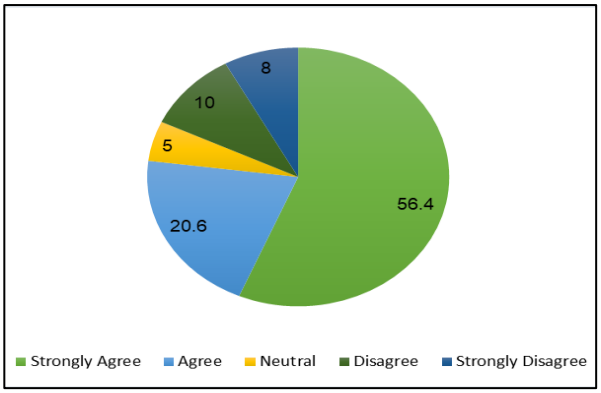

Fig. 4. Due to the outbreak of the COVID-19 pandemic, many schools, colleges, and other educational institutions have embraced online education platforms for lecture but the students' lacking in performing the tutorials after the online class due to not enough time and not effectively to guide the students during online lecture.

As can be seen in Figure 4, most of the respondents strongly agreed that due to the outbreak of the COVID-19 pandemic, many schools, colleges, and other educational institutions have embraced online education platforms for lecture but the students' lacking in performing the tutorials after the online class due to not enough time and not effectively to guide the students during online lecture. As introducing a new tool such as i-Chemtorials will provided an interactive digital tutorial platform such as a greater variety of activities, high level of immediate feedback, increased sense of control and learner autonomy, and the non-linearity of the application and it make i-Chemtorials was better than classical tutorial method.

V. CONCLUSIONS

From this gamification learning factors will motivate the students to engage with teaching and learning processes by implementing interactive multimedia content in instructional content. The findings showed that interactive multimedia content may influence students to stay motivated and interested with the learning process that directed to both intrinsic and extrinsic motivation. Furthermore, by incorporating interactive multimedia content in chemistry tutorials, students can be more fun, proactive and at the same time learning effectiveness can be achieved. Lastly, further research of this application i-Chemtorials should be done in the future for potential commercialization to get expand this area of study.

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Chemical Composition and Biological Activity of *Momordica charantia* (Bitter Melon)

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***Abstract*— Phytochemical analysis and biological activities of *Momordica charantia* have been studied. Two parts of plant were used in this study such as fruit and seed. Plant sample has been extracted by using three different polarity of solvents such as *n*-hexane, chloroform and methanol through the cool extraction method. The result has shown that the highest percentage yield was methanol fruit extract with 15.29%. The phytochemical analysis has revealed there are many secondary metabolites in *M. charantia* fruit and seed such as alkaloid, flavonoid, saponin, phenol, tannin, terpenoid, steroid and glycoside while for seed part saponin was absence. Antibacterial study has been conducted by using disc diffusion method on *Bacillus subtilis, Staphylococcus aureus, Salmonella typhimurium* and *Escherichia coli.* In addition, the result has shown that the highest inhibition zone for fruit and seed was on *Staphylococcus aureus* in the range of 16 to 17 mm. Meanwhile, the antioxidant study revealed that the fruit and seed of *M. charantia* do not have antioxidant activity with percentage inhibition less than 50%. The results of this study conclude that *M. charantia* extract contains medicinally important bioactive compounds with efficient biological activities.**

Keywords— Momordica charantia, Chemical composition, Antibacterial, Antioxidant

I. INTRODUCTION

Natural product is substances that origin from animals, plants and microorganism. New therapeutic compounds have been comes from nature due to the tremendous chemical diversity found in various species of plants. Since the beginning of the 20th century, extraction or powder of medicinal plant has been used as the main active ingredient in medicinal products because they are considered as a powerful source of drugs that has no side effects when applied to patients [1]. *Momordica charantia* which belongs to Cucurbitaceae family is known as bitter melon, balsam pear or karela is commonly used in Indian subcontinent [2]. *Momordica* is the Latin names which means "to-bite" (referring to the jagged edges of the leaf that has been appeared as if they have been bitten). The taste of fruit very bitter because it contains a bitter compound called momordicin which has believed to have a stomachic effect [3]. These species are widely used as medicinal remedy for many disease, specifically for diabetes [4]. *M. charantia* has known as 'peria katak' in Malaysia is an excellent source of vitamins and minerals that made it extensively good and nutritious [5]. In this study, the phytochemical screening was done on *M. charantia* extracts in order to detect the presence of secondary metabolites such alkaloids, saponins, flavonoids, terpenoids, phenols and steroids. The screening of antibacterial and antioxidant activity of *M. charantia* extracts were also done.

II. MATERIALS

A. Raw Materials

The fruits of *Momordica charantia* were purchased at a local market located in Tampin, Negeri Sembilan.

B. Chemical and Instruments

Methanol, ethyl acetate, *n*-hexane, dimethyl sulfoxide (DMSO), chloroform, acetone, ammonia, vanillin, nutrient agar (NA), nutrient broth (NB), sulphuric acid (H_2SO_4), acetic anhydride, sodium hydroxide (NaOH), hydrochloric acid (HCl), ferric chloride ($FeCl_3$), Wagner's reagent (iodine in potassium iodide). Ultraviolet visible (UV-Vis) spectrophotometer, ultraviolet (UV) lamp, digital rotary evaporator, autoclave, incubator, hot plate and oven

III. METHODS

A. Plant Extraction

The seeds were separated from the fresh fruits and cleaned. The fruits then were cut into small pieces. Both fruits and seeds were dried and grinded into finely powder. The powder of the fruits and seeds have been weighed accurately and were extracted sequentially with *n*-hexane, chloroform and methanol. The extracts were filtered through a filter paper and concentrated using rotary evaporator to obtained the crude extract.

B. Phytochemical Screening

Chemical tests for the screening and identification of bioactive chemical constituent such as alkaloids, flavonoids, phenols, saponins, terpenoids, glycosides, steroids and tannins on M.charantia extracts were carried out by using standard procedure in [6].

C. Antibacteria Assay

The antibacterial activity of the crude extracts of M.charantia was determined using disc diffusion method with slightly modification [6]. The activity was tested against two Gram-positive bacteria, B. subtilis and S. aureus as well as two Gram-negative bacteria, E. coli and S. typhimurium.

D. Antioxidant Assay

DPPH radical scavenging assay was utilized to determined the antioxidant activity of of M.charantia with some modifications [7]. Each sample (1.0 mg) was dissolved in methanol (1 mL) to obtain a stock solution with concentration of 1000 µg/mL. A series of diluted solution were prepared from the stock solution with methanol starting from 1000, 500, 250, 125, 62.5, 31.3,15.63 and 7.81 µg/mL. The sample solutions with various concentration (0.2 mL) was mixed with 3.8 mL of methanolic DPPH solution (50 µM). The mixture was incubated for 30 minutes at room temperature in the dark. After 30 minutes, the absorbance of reaction mixture was recorded at 517 nm.

IV. RESULTS AND FINDINGS

A. Phytochemical Screening of M.charantia Extracts

M.charantia contains many active compounds such as alkaloids, flavonoids, steroids, phenols, saponins, tannins, glycoside and terpenoids. In this study, phytochemical screening was carried out to detect the presence of secondary metabolites in n-hexane, chloroform and methanol. Table 1 shows the result of the phytochemical analysis of those extracts.

Table 1. Phytochemical screening of *M. charantia*

Test	***n*-Hexane**		**Chloroform**		**Methanol**		**Observation color**
	fruit	***seed***	***fruit***	***seed***	***fruit***	***seed***	
Saponin	-	-	+	-	+	-	Frothing
Alkaloid	+	+	+	+	+	+	Reddish brown
Flavonoid	+	-	+	-	+	+	Light yellow
Phenol	-	-	+	-	+	+	Dark green
Tannin	-	-	-	-	+	+	Dark green
Terpenoid	+	+	+	+	+	+	Brown
Steroid	+	-	+	-	+	+	Green
Glycoside	+	+	+	-	+	+	Greenish yellow

Key: presence (+), absence (-)

According to the result, alkaloids and terpenoids can be found in all of the three extracts. Almost of all tests gave positive results in methanol fruit and seed extracts. However, only saponin was gave negative result in methanol seed extract.

B. Antibacterial Activity

The diameter of inhibition zone for each extract were measured. Table 2 showed the highest bacteria activity of fruit and seed extract against *S. aureus* with diameter inhibition in the range of 16.0 to 17.0 mm compared to other extracts. In contrast, there was no inhibition zone observed for n-hexane and chloroform extracts against *B. subtilis*.

Table 2. Antibacterial activity of difference *M. charantia* extracts

Extract	Diameter of Inhibition Zone (mm)			
	B. subtilis	***S. aureus***	***E. coli***	***S. typhimurium***
n-Hexane fruit	6.0	15.0	8.0	13.0
n-Hexane seed	6.0	17.0	7.0	12.0
Chloroform fruit	7.0	11.0	7.0	12.0
Chloroform seed	6.0	17.0	10.0	14.0
Methanol fruit	10.0	16.0	8.0	6.0
Methanol seed	6.0	9.0	6.0	14.0
Streptomycin[a]	23.0	27.0	23.0	22.0

Inhibition zone diameter (mm) including diameter of disc 6 mm; [a]Positive control

C. Antioxidant Activity

Based on the Table 3, all of the fruit and seed extracts have percentage inhibition less than 50% at concentration 1000 µg/mL which were showed inactive DPPH radical scavenging activity. Meanwhile, the result has shown that methanol fruit and seed extracts have the highest percentage inhibition among the other extracts.

Table 3. Percentage inhibition of fruit and seed extracts of *M.charantia*

Samples	Percentage inhibition at 1000 µg/mL (%)
Ascorbic acid	95.80 ± 0.36
Methanol fruit extracts	20.97 ± 0.58
Chloroform fruit extracts	12.53 ± 0.93
n-Hexane fruit extracts	14.33 ± 0.46
Methanol seed extracts	20.48 ± 0.15
Chloroform seed extracts	9.38 ± 0.53
n-Hexane seed extracts	5.23 ± 0.48

V. CONCLUSIONS

The phytochemical screening has revealed there are many secondary metabolites in *M. charantia* fruit and seed such as alkaloid, flavonoid, saponin, phenol, tannin, terpenoid, steroid and glycoside while for seed part saponin was absence. Antibacterial study has been conducted by using disc diffusion method against *B. subtilis*, *S. aureus*, *S. typhimurium* and *E. coli*. In addition, the result has shown that the highest inhibition zone for fruit and seed was on *S. aureus* in the range of 16.0 to 17.0 mm. Meanwhile, the antioxidant study revealed that the fruit and seed of *M. charantia* do not have antioxidant activity with percentage inhibition less than 50%. The results showed that the extract of *M.charantia* have a potential as antibacterial agents for pharmaceutical purpose.

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Lima Sekawan: An Entrepreneurial App Based Introductory Tools for Kids

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***Abstract*— Entrepreneurship is an essential element in the modern economy. It has become a buzzword, especially in education development at the elementary level. Understanding the needs to equip children with the basic knowledge on the concept of risk, economy and entrepreneurship, we developed an application-based tool to enhance children's' perspective of entrepreneurship as a whole. Some of the skill that needs to be emphasised is problem-solving, desire to make money, customer service, tenacity, creativity, leadership, and networking. Teachers and parents should play an important role in children's development. Based on interviews with kindergarten teachers, they acknowledged that the lack of teaching aid and resources was why kids could not explore the art of entrepreneurship. This project aims to create and introduce entrepreneurship skills to the children in kindergarten and instil interest. This applications-based method will enhance the children understand entrepreneurship's essential skill, such as the value of money and the concept of economy and risk. Children can also explore the idea in their own time by watching videos in the applications. The applications will also be used to attract children's attention and provide parents with alternative learning content.**

Keywords - Application, Entrepreneurship, Children, Risk, Economy

I. INTRODUCTION

Traditionally, most of teaching and learning activities were conducted in the classroom. The educators have used the whiteboards extensively in delivering the knowledge in the class. But nowadays, due to technological advancement, the use of computers, smart television, gadgets, and other technological tools have been widely used in the classroom. Nevertheless, the results shown in the research conducted by [1] stated that the actual use of technology remains infrequent in the class setting. This scenario can be seen especially in early childhood education [2]. According to [3] also highlighted that even though technology is used, it is often not used in meaningful, student-centred ways but is integrated in more traditional, didactic practices. The purpose of this project is to address issues pertaining to limited number of materials in teaching young children among elementary school regarding on entrepreneurship development based on Malaysian scene. Besides, this project also aims to expose the young children on the basic concepts of entrepreneurial knowledge with the use of digital story telling technique. Upon completion of the animated video, students' understanding will be assessed using interactive games and quizzes. Therefore, it would help the educators to analyse the performance of students based on the topic of discussion.

II. METHODOLOGY

This project aims to expose the young children about entrepreneurial knowledge. Thus, Lima Sekawan: An Entrepreneurial App Based Introductory Tools for Kids is created after undergone five important stages. It started with discussion on topics to be covered in the app, the durations of each video, interactive videos and etc. Upon discussion, five characters was built and agreed to be used in the stories. Storyboard were designed using characters that portray Malaysian multi-ethnic background. Then, it will be transformed in the video animation. The compilation of the videos and interactive games were arranged and categorized in a more systematic way in the apps. In order to look into the children's perspectives regarding on the use of

mobile applications in the classroom, semi-structured phone interviews were conducted involving ten number of interviewees. This method is similar to structured interviews, in which the researcher prepared an outline of topics and questions [4]. Based on [5], some of the advantages of the phone interview are wide geographical coverage and it is convenience to contact inaccessible individuals. Considering the Covid-19 issues recently, conducting phone interview seems to be the best methods to be implemented. Each interview session took about 30 minutes to 45 minutes. The range of age of interviewee are between six to eight years old and the interview were conducted from February 2021 until April 2021.

III. RESULTS AND FINDINGS

Table 1 shows the response rate based on the interview session with ten interviewees. Based on the following table, it indicates that of 10 interviewees, 96% from them responded that they will be more focused in the classroom with the use of digitalized tools. It is supported by 94% from the entire respondents stated that they will be happier if it is used extensively in the classroom. The use of animations and videos also seems to be widely accepted by them with the percentage of 92%. This results also showed that 58% from the entire respondents disagreed on the sole dependency on the traditional teaching methods using whiteboard and books in the teaching and learning session. Nevertheless, 88% of the respondents believed that the interactive, colourful animated videos in the moderate range of duration will kept their attention during the class session. This result is supported by [6] in their research that quality educational media can enhance young children's learning. Similarly, based on the results shown in [7] research, it indicates that children who received the media supplement made greater gains on letter recognition, phonics, and print and story concepts.

Table 1. Response rate based on interview session

No.	Elements/ Aspects	Results
1.	Do you like to learn through whiteboard and books?	58%
2.	Do you like to do a lot of activities such as singing, role play, and physical activities in the classroom?	86%
3.	What would you feel when your teacher uses more animations and short videos in the classroom?	92%
4.	Do you like to watch videos that have cartoon backgrounds and children’s voice over?	84%
5.	Do you like to have online quiz such as quizizz, quiz marker etc. upon completion of any topic?	86%
6.	Do you think it is easier for you to understand if the teacher shows an interesting video?	88%
7.	Would you participate if the teacher asks you some questions while playing games?	84%
8.	Would you be more focused if teaching activities are conducted using digital methods?	96%
9.	Would you answer the teacher's question if it is in the form of games?	86%
10.	Would you get bored and tired if the video duration is too long?	88%
11.	Do you like to watch colorful animated video?	88%
12.	Would you be happier if the teachers use more digitalized items in teaching and learning session?	94%
13.	Would you be more participative in the classroom if it is conducted in an interactive way?	88%
14.	Do you like to respond to your teacher’s questions during class session?	52%

IV. CONCLUSIONS

Based on the responses received from the respondents, this project has a bright potential to be commercialized. Most of the questions scored over 80% agreements for the subject matters pertaining to the use of digital tools in the classrooms. Based on [8], also supported those children at a younger age have shown positive response and confidence in using computer software. They can understand and follow pictorial directions and use situational and visual cues to perform their learning activities. In conclusion, this project will contribute towards instilling entrepreneurial interest amongst the young children.

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A Study on Factors Toward Household Willingness on E-Waste Recycling in Seremban

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***Abstract*—E-waste recycling is a method of recycling electrical and electronic equipment as e-waste may harm the environment and human health if it is not discarded properly. The amount of e-waste generated in Malaysia has increased over the years due to rapid increases in technology and economic development. Many households have an irresponsible attitude and are not committed to e-waste recycling even though they have knowledge and awareness of e-waste. This study focuses on psychological models, econometric models and demographic variables to measure e-waste recycling behaviour based on the Theory of Planned Behaviour (TPB) theoretical framework of previous studies to explore factors related to the household willingness on e-waste recycling through an online questionnaire survey distributed to Seremban households. Based on the empirical analysis of 226 valid online survey responses from Seremban households, the results show there is a significant positive correlation of attitude, subject norms and perceived behavioural control over the willingness of Seremban households to participate in e-waste recycling. Moreover, researchers further analyses the moderating effect of income on economic motivation and also moderating effect of education level on subject norms. The findings of this study indicate that only attitudes have an impact on households' willingness to recycle e-waste and, in contrast, the moderating effect of income on economic motivation and education levels on subject norms is not significant, indicating that they have no impact on households' willingness to participate in e-waste recycling. Finally, it is recommended to promote and enhance e-waste recycling to support households in the recycling of e-waste.**

Keywords—e-waste, household, recycling behaviour, recycling willingness

I. INTRODUCTION

The market of electrical and electronic equipment (EEE) continues to grow rapidly and bring many benefits to today's lifestyle, however, they are contributing to the growing pile of waste of EEE or e-waste. Nowadays, due to the fashionable trend, an advanced function of the system has increased consumption and the short lifespan of electrical and electronic equipment generates large amounts of e-waste.

The Malaysian government had regulated the Environmental Quality (Scheduled Wastes) since 2005 that aimed to enforce the public not to dispose of e-waste in landfills. The proper disposal practice of e-waste had been widely practiced by industrial sectors, but in households, small-sized electronics can end up in normal waste bins and disposed of with municipal solid waste [4]. Material Recovery Facilities revealed that at a household level only 5 percent of the e-waste was recycled because no obligation for householders to dispose of their electronic products to the right platform [1]. E-waste management in Malaysia had not been efficiently employed because of poor household willingness in recycling e-waste [3].

The Malaysian government had regulated the Environmental Quality (Scheduled Wastes) since 2005 that aimed to enforce the public not to dispose of e-waste in landfills. The proper disposal practice of e-waste had been widely practiced by industrial sectors, but in households, small-sized electronics can end up in normal waste bins and disposed of with municipal solid waste [4]. Material Recovery Facilities revealed that at a household level only 5 percent of the e-waste was recycled because no obligation for householders to dispose of their electronic products to the right platform [1]. E-waste management in Malaysia had not been efficiently employed because of poor household willingness in recycling e-waste [3].

The Department of Environment Malaysia stated that the overall household e-waste management system was lacking at the moment and also facing many challenges in developing proper systems for household e-waste management. Furthermore, some household e-waste had a low value of recyclable materials and recyclers or collectors were interested in more valuable materials.

The previous study suggested that socioeconomic variables such as education and income were the crucial factors in recycling behaviour [7]. Likewise, attitudinal also affects household willingness to recycle e-waste, specifically attitude, subjective norm, perceived behavioural control, and economic motivation. Thus, the household willingness in recycling e-waste was significant to address the factors that influencing willingness in terms of attitude, subjective norm, perceived behavioural control, economic motivation, income and education in this study.

II. METHODS

A. Descriptive Data

The targeted population and sample of this research was the household in Seremban, Negeri Sembilan. This research used the Creative Research System (2012) to determine the sample size and the adequate sample size. The study distributed 230 questionnaires to Seremban's household. A total of 226 samples were received and used for the analysis after data cleaning. The sampling method that was used in this study was snowball sampling. The data collection method was an online questionnaire through a google form that was distributed to the respondents using social media platforms. Each household is limited to the completion of one questionnaire filled by the housing representative.

B. Theoretical Framework

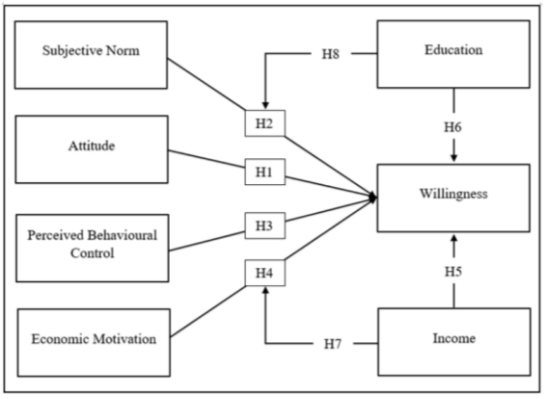

Fig. 1.Theory of Planned Behavior, TPB

The theory of planned behaviour suggested three pillars that affect behavioral intention, which is attitude, subjective norm, and perceived behavioral control. A survey of citizens in Wuhan proposed that consumers with higher incomes, social status, and levels of education are more likely to participate in recycling activities [6]. Household educational level and income may play a moderating role in behaviour intentions. The moderating variable can influence the strength of the correlation in the relationship [2]. Thus, this research proposes a theoretical model of the factors that influence the household willingness on recycling e-waste which shown in Fig. 1.

C. Multiple Linear Regression and Hierarchical Regression

In this study, multiple linear regression analysis was used to identify which variables have an impact on household willingness in participating in e-waste recycling. There are a few assumptions to build a multiple linear regression model in which the relationship between dependent and independent variables must be linear, the error term must be normally distributed, the error variance must be constant, the error terms are independent and there are no outliers [5]. The transformation of variables is done to make the model adequate for making inferences if any assumptions are not fulfilled. Researchers run a hierarchical regression to check if the interaction items are significant. The significant result indicates that there is a moderating effect.

III. RESULTS AND FINDINGS

A. Demographic Profile

This research illustrates the respondent's gender, household gross monthly income and education level using a demographic profile. In the distribution of gender, 68.1 percent of the respondents were female and only 31.9 percent were male. More than half of the respondents, 54 percent, have income less than RM2500, followed by income from RM2500 to RM6999 with 31 percent while the rest of 15 percent are from respondents that have an income of RM7000 and above. As for educational level,

respondents with Degree level of education conquered the educational level with slightly more than half of the respondents with 50.4 percent and 27.4 percent belongs to the respondent with STPM/Diploma/A Level. Only 15.5 percent of the respondents had SPM/SPMV/MCE/O Level while the respondents with Master were only 6.6 percent.

B. Awareness and Knowledge of Electronic Waste

This study also tested Seremban households' awareness and knowledge of e-waste. The result from the analysis showed that 65 percent of respondents were aware of e-waste and 58.8 percent of respondents have the knowledge that e-waste needed special treatment before it was disposed of. In addition, most respondents, 83.2 percent, know that e-waste is harmful to the environment if it is not disposed of properly and 80.6 percent of respondents are aware that e-waste contains harmful substances. About 69 percent of respondents reported that they were aware of the health risks associated with e-waste and, shockingly, only 23.5 percent of respondents from Seremban households received e-waste education. This study also found that 89.4 percent of respondents expressed the opinion that e-waste sorting is important.

C. Multiple Regression Analysis and Hierarchical Regression

Multiple linear regression analysis was used to test H1 to H8 in this study. Throughout all of the assumptions that were built for multiple regression analysis, the variables used in this research fulfilled all of the assumptions. The hierarchical regression and moderation analysis result was reported in Table 3.1 and attitude was the only significant variable that will give an impact on the household willingness to participate in e-waste recycling as the p-value was less than 0.05. Therefore, only hypothesis H1 has been supported. Next, results discovered that the variance in the willingness of the household to participate in e-waste recycling shown in R^2 value for model 1, accounts for 31 percent, then increased to 31.3 percent in model 2 and accounted for additional 31.5 percent in model 3. Moreover, the proportion of incremental variance in Model 1 is statistically significant because of the other model statistical significance value greater than 0.05. Therefore, this research can conclude that income does not moderate the relationship between economic motivation and the willingness of the households in Seremban to participate in e-waste recycling. In addition, the relationship between subject norms and the willingness of households in Seremban to participate in e-waste recycling is not moderated by education.

Table 1. Hierarchical Regression and Moderating Effect Analysis

Model	Variable	B	Standard Coefficient	t	Sig.	Co-linear Statistics		R^2	Statistics Change		Sig. F Change
						Tolerance	VIF		R^2 Change	F Change	
1	(Constant)	2.704		1.657	.099			.310	.310	16.395	.000
	Attitude	.313	.485	7.643	.000	.782	1.279				
	Subject Norm	.033	.071	1.001	.318	.623	1.604				
	Perceived Behaviour	.050	.089	1.222	.223	.596	1.679				
	Economic Motivation	-.087	-.076	-1.198	.232	.791	1.264				
	Income	.098	.025	.425	.672	.931	1.074				
	Education	.270	.078	1.318	.189	.910	1.099				
2	(Constant)	2.837		1.731	.085			.313	.003	.825	.365
	Attitude	.309	.479	7.508	.000	.774	1.292				
	Subject Norm	.036	.077	1.075	.283	.619	1.616				
	Perceived Behaviour	.046	.081	1.108	.269	.588	1.702				
	Economic Motivation	-.082	-.072	-1.131	.259	.787	1.270				
	Income	.091	.023	.396	.693	.930	1.075				
	Education	.276	.079	1.346	.180	.909	1.101				
	Economic Motivation*Inc	-.029	-.052	-.908	.365	.971	1.029				
3	(Constant)	2.964		1.801	.073			.315	.003	.891	.346
	Attitude	.305	.473	7.360	.000	.765	1.308				
	Subject Norm	.040	.086	1.196	.233	.607	1.648				
	Perceived Behaviour	.042	.074	.997	.320	.581	1.722				
	Economic Motivation	-.078	-.068	-1.069	.286	.784	1.275				
	Income	.065	.016	.0279	.781	.917	1.091				
	Education	.282	.081	1.371	.172	.908	1.036				
	Economic Motivation*Inc	-.027	-.047	-.827	.409	.965	1.036				
	Subject Norm*Edu	-.077	-.055	-.944	.346	.941	1.062				

IV. CONCLUSIONS

The main aim of this research is to study the factor towards households' willingness to participate in e-waste recycling which is based on the theory of planned behaviour methods. Following the analysis, this research discovered that attitude positively manipulates the households' willingness to participate in e-waste recycling. This research also found out that the moderating effect of education and income is not significant which indicates that the household with different income and education levels did not have an impact on their willingness to participate in recycling e-waste. Thus, this research needs to add more samples to obtain a better result regarding this topic in the future.

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PEFE (Plant Eco-Friendly Energizer)

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***Abstract*— PEFE also known as Plant Eco-Friendly Energizer is an innovation that combines both a bryophyte microbial fuel cell and an electricity generating system from salt. This is a bio-electrochemical system that mimics our natural surroundings to generate electricity naturally.**

Keywords—Plant, Eco-friendly energizer, Electricity, bryophyte microbial fuel cell

I. INTRODUCTION

PEFE also known as Plant Eco-Friendly Energizer is an innovation that combines a bryophyte microbial fuel cell and an electricity generating system from salt. The problem we face today is the rising temperature of our planet. Evidence show that the extreme climate change is connected to the rising in carbon dioxide and greenhouse gases in our atmosphere which in most cases are caused by human activities. Over the last century the burning of fossil fuels like coal and oil has increased the concentration of atmospheric carbon dioxide (CO_2).

A big portion of electricity around the world uses fossil fuels and nuclear energy. These resources are unrenewable and will run out or not be replenished. We need to develop many new sources of clean, low carbon energy that is cheap and practical. That includes low carbon energy to fight global warming, clean air to stop pollution, cheap and practical energy to replace fossil fuels. We need many options for low carbon energy. Global energy demand is quickly increasing due to global growth in population, economics, wealth, industries, transport, and trade. It is possible that renewable energy will not meet the demand that is needed.

Many scientists and researches around the world are trying to solve this by using biofuel as an alternative to generate energy(electricity). PEFE is a biofuel that harnesses solar energy that can replace fossil fuels to generate electricity. The difference between PEFE and other biofuels is that it combines both a bryophyte microbial fuel cell and an electricity generating system from salt to achieve a more efficient system.

II. MATERIALS

A. Microbial Fuel Cell

In this study, the model moss species *Polytrichum strictum* was used to develop a non-vascular bryophyte microbial fuel cell. This fuel cell consists of a few layers to form a bio-electrochemical system to mimic the natural system found in our surroundings to generate electricity. The first layer is the aluminum foil(cathode) and is followed by zeolite powder(dielectric). Next, a carbon felt(anode) was placed. Then, the moist soil and moss was placed on the topmost layer. Additional materials that were used are copper tape, wire, LED lights and a voltmeter to complete the circuit.

B. Electricity Generating System from Salt

For this system, the materials used are table salt, NaCl, iron nails, A.C power supply, crocodile clips and a light bulb. We found that any soluble salt is good enough to be used in this system. It is essential that the salt used is concentrated in the solution and excess salt is required until the salt can no longer dissolve in water.

III. METHODS

In order to create the microbial fuel cell, a box was made for storing all the components. Small holes were made at the bottom. The height of the box had to be at least 2cm. Next, aluminum foil(cathode) was placed on the bottom of the box as the first layer. The aluminum foil was creeped up the wall of the box using tape so that it would not touch the anode in the future. A wire was taped on the aluminum foil using copper tape to make sure the top side would be conductive. For the second layer, zeolite powder was placed on top of the aluminum foil. 500 grams were used to cover up the 25cm×16cm box. The height if the zeolite volume was about 1cm. For the third layer, a carbon felt(anode) was placed on top of the zeolite powder and ensured that it does not come in contact with the aluminum foil. A wire was placed on top of the carbon felt. Moist soil was gathered and placed on the carbon felt about 0.5cm. Lastly, moss was placed gently on the moisturized soil with some pressure. Both wires from the cathode and the anode are the kept aside to be connected to the salt system.

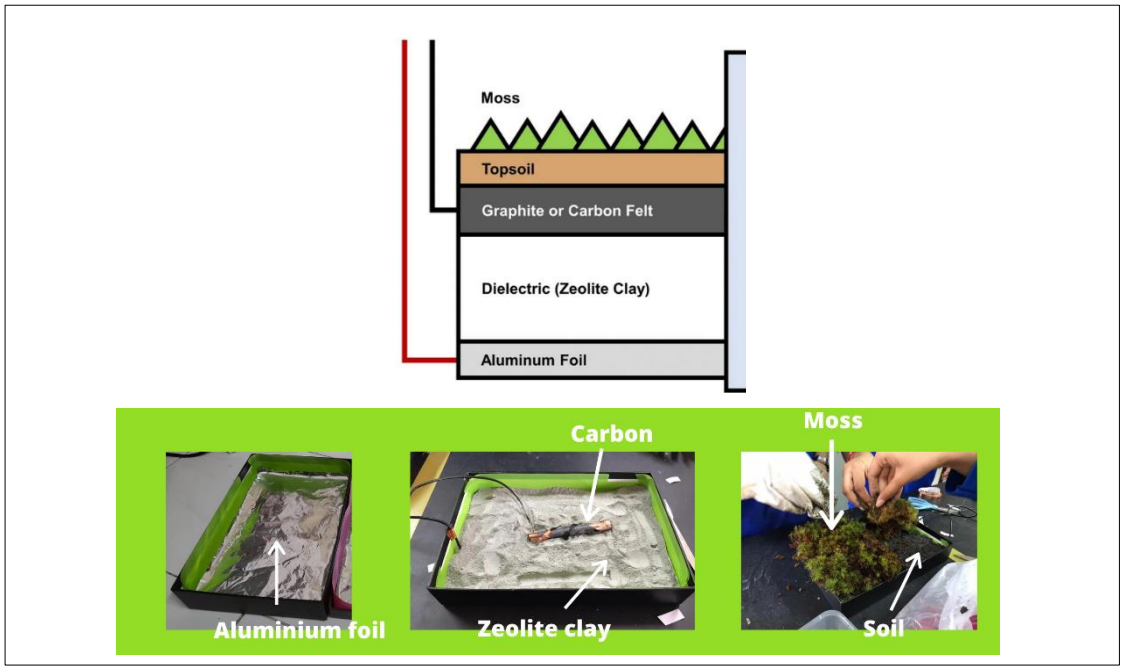

Fig. 1. Plant Eco-Friendly Energizer Setup

As for the electricity generating from salt system, a transparent plastic container was used. The container was filled with ¾ distilled water. Copper tape was used to coil the wire and the iron nail together and placed on one end of the container. This was repeated with another iron nail and it was placed at the opposite end of the container. One wire was connected to the A.C supply and the other wire was connected to the microbial fuel cell.

The other wire form microbial fuel cell is connected to a light bulb and the light bulb is connected to the A.C supply to complete the circuit. In simple words, the microbial fuel cell and the electricity generating from salt system were combined to complete the circuit. Fig. 1 shows the full setup for this project.

A. Process of generating electricity from microbial fuel cell

In this microbial fuel cell, a bryophyte was used. Bryophytes are poikilohydric plants with a greater tolerance to dehydration than vascular plants. Bryophytes have a unique physiology enabling them to accumulate water and nutrients, and survive in a wide range of temperatures and habitats. They have root hair-like rhizoids that bind the surface on which they grow, stabilizing the soil and preventing loss of nutrients by erosion.

In the microbial fuel cell, the moss carries out photosynthesis. In the photosynthesis reaction, electrons are released. This can be proven in the following processes:

Photosynthesis occurs in 2 stages which are the light-dependent reaction (happens in thylakoids) and light-independent reaction (happens in stroma). In light-dependent reaction, the photosynthetic pigment on the surface of thylakoid absorbs light energy. The light energy excites the electrons in chlorophyll pigment to a higher level. The excited electron from chlorophyll goes through a series of electron carriers until it reaches and is accepted by NADP+. Next, photolysis of water happens and H_2O molecule is broken down in the presence of light energy and chlorophyll to form hydroxide ion (OH^-) and hydrogen ion (H^+). The OH^- ion loses electron to form O_2 and H_2O.

$$4OH^- \longrightarrow O_2 + 2H_2O + 4e^-$$

The electron released in this reaction is one of the many reactions in photosynthesis that releases electrons. These electrons can be used to generate electricity. The electrons will move to the carbon felt (anode) and flow thro

B. Process of generating electricity from electricity generating salt system

Water is a polar solvent containing partial negative charge at the oxygen atom and partial positive charge at the hydrogen atom. When salt is added into the water, the positive ion, Na^+ will be attracted to the oxygen atom of water which is negatively-charged while the negative ion, Cl^- will be attracted to hydrogen atom of water which is positively-charged. Attraction force between atom of water molecules with the ions of ionic compound are strong enough to overcome electrostatic attraction force between ions themselves. Thus, it breaks down the lattice structure of the solid compound. As a result, the ions can move freely in water. This enables the salt to conduct electricity and eventually lights up the bulb.

C. Combination of both systems

The microbial fuel cell and the electricity generating from salt system are combined though a complete circuit to form a more efficient energy producing system.

IV. RESULTS AND FINDINGS

A. Microbial fuel cell

Before combining the microbial fuel cell with the salt system, it is found that the microbial fuel cell alone produces 0.6V and is able to light up 2 LED lights. A mentol was managed to be brightly lit.

B. Electricity generating from salt system

Before combining the salt system with the microbial fuel cell, it is found that the salt system alone was able to brightly light up a mentol of 2 volts. The more the salt is added into water, the brighter the bulb lights up. Bare in mind that the electricity can't be generated without the supply of Alternating Current.

C. Combination of both systems

With both the microbial fuel cell and the salt system combined, the brightness of the mentol was higher. This proves that with both systems, a sufficient amount of electricity can be produced.

V. CONCLUSIONS

PEFE which is a combination of microbial fuel cell and electricity generating salt system is a developed technology that can help solve many pressing environmental issues such as climate change by replacing fossil fuels with biofuels instead. In a larger scale, PEFE can aid the country's economy and provide a more sustainable environment. The goal of PEFE is to stop the usage of fossil fuels as they release greenhouse gases and replace it with a more environmentally friendly system. PEFE can generate electricity naturally and can make a huge impact if it is used in a larger scale. This technology can be further improved into a smaller device which can then be used to generate electricity on-the-go without ever harming the environment.

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An Intelligent of ANN Towards Agarwood Oil Compounds Pre-processing Based on Stepwise Regression Method to Improve the Oil Quality

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***Abstract*— This paper presents the performance of Artificial Neural Network (ANN) application towards the agarwood oil quality classification. The works involved the selected of agarwood oil compounds based on a feature selection technique. The compounds are selected based on using Stepwise Regression technique. The compounds identified by stepwise regression are β-agarofuran, ϒ-Eudesmol, Longifolol, and Eudesmol. These compounds are fed into ANN as input feature and the output is the quality of the oil either high and low. Three classifier algorithms; Scaled Conjugate Gradient (SCG), Levenberg Marquardt (LM) and Resilient Backpropagation (RBP) and ten hidden neurons in the hidden layer are implemented. The performance of ANN is measured using confusion matrix, mean square error (mse) value and number of epoch. The finding showed that the ANN using four compounds of agarwood oil as input features obtained good performance with a good accuracy, lower mse value and lower number of epoch in one hidden neuron.**

***Keywords*— Stepwise Regression, ANN, SCG, LM, RBP, mse, epochs**

I. INTRODUCTION

Agarwood oil is known as the most precious essential oil in the world. It comes from the plant family Thymelaeaceae [1]. Agarwood produce an aromatic resin which formed based on the immune response to fungal infection [2], [3]. Every part of the agarwood trees have its own uses especially the agarwood stem can produce essential oil [4]. Other application of agarwood oil is to be use in perfume, medication purposes and ceremonies [5].

Agarwood oil is grading according to its quality either high and low. The high quality agarwood oil has a long lasting odor as well as pricey while the low quality has a cheap price [1]. Manually, the grading of agarwood oil based on human's sensory panel but this technique is inefficient and time consuming [6]. Recent years, the grading is invented using modern techniques using chemical properties of agarwood oil. The techniques such as Multilayer Perceptron, Support Vector Machine, k Nearest Neighbor (k-NN) and others have been implemented [4], [7], [8]. These techniques can enhance the accuracy of the grading which has been proven by the previous researcher [9].

This research proposed two techniques which are Stepwise Regression and Artificial Neural Network (ANN) for grading agarwood oil. The part A is stepwise regression technique is used as feature selection to select significant compounds of agarwood oil before fed into the ANN for future classification. The three training algorithms; SCG, LM and RBP is used as classifier to classify the significant compounds selected by stepwise regression into high and low quality. Finally, the model need to go through process of performance checked to be accepted.

II. OBJECTIVES

This work is carried out according to the following objectives:

- To employ Stepwise Regression technique in investigating the relationship between input and output of agarwood essential oil compounds.
- To develop ANN models for agarwood essential oil quality grades classification and investigate the comparative performances of three selected training algorithms; Resilient Backpropagation (RBP), Scaled Conjugate Gradient (SCG), and Levenberg Marquardt (LM) for agarwood essential oil quality classification.
- To evaluate the overall performance of the proposed techniques in (i) and (ii) as a viable and new technique for agarwood essential oil quality grading

III. METHODS

The methodology of the proposed project is including two continuous methods. For part A as in Fig. 1, the experiment starts with the selection process of agarwood oil compounds by stepwise regression technique. It consists forward selection and backward elimination process. The selection process follows the analysis of p-value. In order to accept the significant compounds, it must have p-value less than 0.05 as recommended by [10]. After the significant compounds have been selected to the model, the experimental continued by ANN technique for the part B.

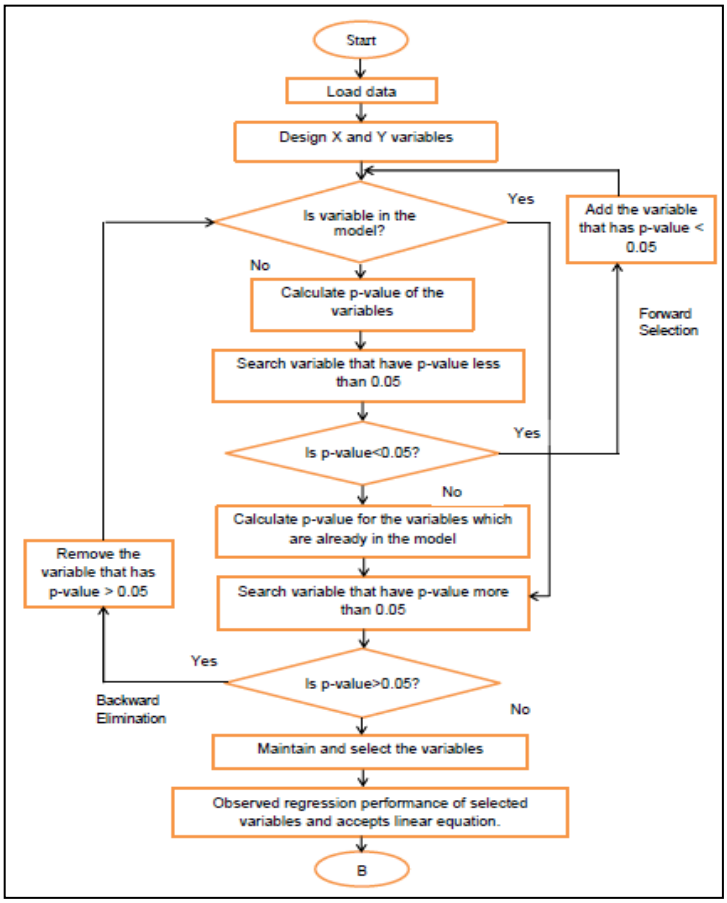

Fig. 1. Detail experiment for Stepwise Regression method

The Fig. 2 showed the part B methodology, which is the classification of agarwood oil compounds from the stepwise regression into high and low quality. The data is normalized, randomized and divided into training (70%), validation (15%) and testing (15%) dataset. The hidden nodes and training algorithms are varied; 10 hidden neurons and three training algorithms which are Scaled Conjugate Gradient (SCG), Levenberg Marquardt (LM) and Resilient Backpropagation (RBP), respectively.

The model is passed based on their performance on the confusion matrix, accuracy, sensitivity, specificity, precision, epochs and mse value.

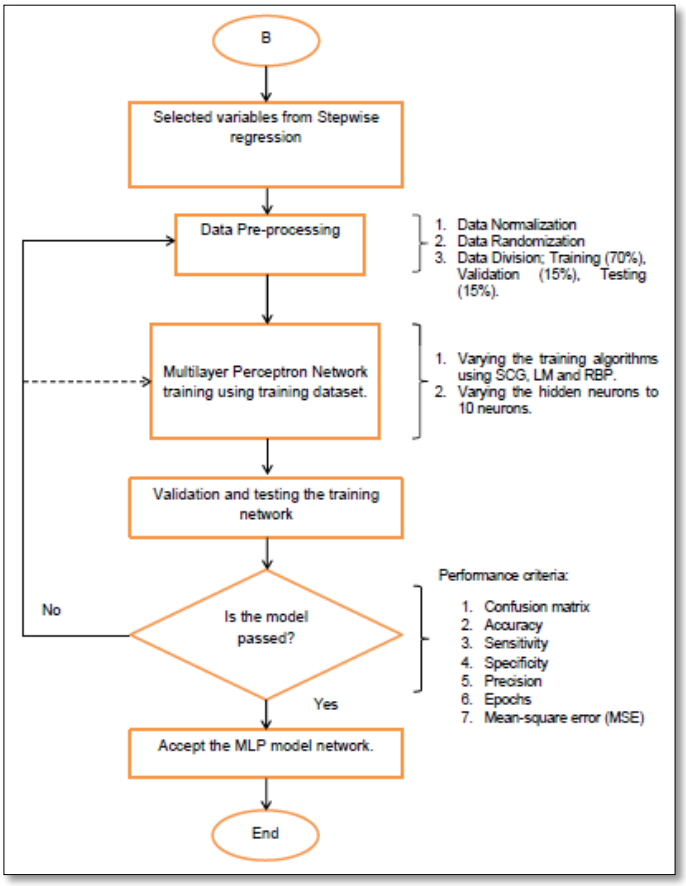

Fig. 2. Detail experiment for ANN method

IV. RESULTS AND FINDINGS

Table 1 show the results finding for output of stepwise regression and Table 2 show the results of Final Design Parameter of ANN. The final linear equation of stepwise regression:

$$Y \sim 1 + X_1 + X_4 + X_5 + X_7$$

$$Y = 1.7337 + 0.031742X_1 + 0.021556X_4 + 0.10766X_5 - 0.25592X_7$$

Table 1. Output of stepwise regression

Independent Variables	Compounds	Estimate Value	Standard Error	t-statistics	P-value
Intercept		1.7337	0.048005	36.115	9.7577×10^{-56}
X1	β-agarofuran,	0.031742	0.012569	2.5255	0.013285
X4	ϒ-Eudesmol	0.021556	0.0049152	4.3857	3.1006×10^{-5}
X5	Longifolol,	0.10766	0.020186	5.3331	6.9926×10^{-7}
X7	Eudesmol	-0.25592	0.032819	-7.7981	1.0008×10^{-11}

Table 2. Output of stepwise regression

Training algorithms	Hidden Neurons	Training	Validation	Testing	MSE	Epoch
Scale Conjugate Gradient (SCG)	1	92.6	100.0	100.0	0.0446	32
*Levenberg Marquardt (LM)	1	92.6	100.0	100.0	0.0384	12
Resilient Back-propagation (RBP)	1	86.8	100.0	100.0	0.0468	36

V. CONCLUSIONS

From the research study, the project is able to differentiate between high and low quality of agarwood essential oil based on the pre-processing of the stepwise regression technique. In this project, stepwise regression used to identify the significant compounds that give the major contribution to agarwood essential oil quality. The compounds identified by the stepwise regression are C1=β-agarofuran, C4=ϒ-Eudesmol, C5=Longifolol and C7=Eudesmol. Then, the modelling is continued using three ANN algorithms which are Resilient Back-Propagation (RBP), Levenberg Marquardt (LM) and Scaled Conjugate Gradient (SCG). Among them, LM algorithm is chosen as the best algorithm as the result of classifying the quality of agarwood essential oil obtained best accuracy, the fastest time during training the model by the epoch result and lowest mse value among others.

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Paddyville: Learning Paddy Cultivation through Role-Playing Game

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***Abstract*— Paddy cultivation process is a step-by-step routine that should be followed when planting the paddy plants. Paddy is important in Malaysia as it is the staple food for most Malaysia. To cultivate this important grain of rice, it needs a lot of passion and care. There are a lot of preparations and maintenance in the cultivation process. However, as important as it is, people are prompted to forget about farming when the country is developing so much every year. Buildings are built and houses occupied most of the lands. Younger people nowadays have become ignorant to the cultivation process of the rice they eat every day. Therefore, the objectives of this project are to design an informative game on the agriculture sector, that focuses on the process of paddy cultivation called PADDYVILLE, to develop a role-playing two-dimensional (2D) game application as a learning method on paddy cultivation process and to evaluate the user acceptance of this game. The game used Extreme Programming (XP) for its methodology because of how flexible it is towards changes. It also used Attention, Relevance, Confidence and Satisfaction (ARCS) Motivational model to evaluate the user acceptance while playing the game. The overall findings showed that the game manages to accomplish all the objectives. However, the prototype showed that there are plenty of rooms for improvement. Recommendations can be referred to improve the game, such as by adding a money system to expand the game that allows user to buy and sell items.**

Keywords—learning, paddy, cultivation process, role-playing game, 2D-game

I. INTRODUCTION

Nowadays, people are no longer interested to know the hard work behind the cultivation process and not inclined to know about it. Younger generations are more ignorant to the cultivation process of the rice that their ancestors once make their living of [1]. Because of how convenient the world has become, the process of cultivating the paddy is no longer a part of their life and some may not even have the chance to see the paddy with their eyes and hold them in their hands. This project is intended to pass down the knowledge of paddy cultivation to the younger generations using the most popular icon among them, games.

According to [2], role playing games (RPG) create interesting characters that allow players to experience and connect with varying points of view and personalities. So, by using RPG, this project allows the player to act as a farmer and go through a process to cultivate paddy fields for grains of rice. It is an interesting and engaging method that helps younger generation to learn about the paddy cultivation process. Additionally, youngsters are more likely to learn when games are involved in the learning process, because of how they love to play games more than reading books. By incorporating learning process into gameplay, youngsters will be more interested and gain enjoyment from it. This is due to the ability that promotes fun and motivating learning environment while allowing more flexible ways of communicating than in normal settings. This may lead to keeping the attention and focus of the players on the knowledge in the game [3]. Role-playing is fitting to be used for the experience that will be gained when playing it. As the name implies, role-playing allows the player to play as the character of the game by controlling the actions of the character. The player will act according to the set of rules that are already

predetermined such as walking and holding within a certain scenario [4]. As a result, the player can gain the experience as a farmer who tends to his rice field from ploughing the field to harvesting.

There are also no competitions in the game because the goal for role-playing games is to have a rewarding experience for the player as in this case will be the experiences or knowledge gained as a paddy farmer [5]. Therefore, by applying the RPG concept in the learning process of rice cultivation, the player will be able to absorb the knowledge much better and understand much easier. The engaging element can help the player focus while still gain enjoyment and accomplishment. This project is designed for the PC platform where users can play it on their computer without having to buy additional game consoles.

II. MATERIALS

A. Paddy Cultivation Process

Information on paddy cultivation process were carried out using interviews and studies from valid resources. Paddy cultivation is usually done in warm places, because paddy prefers to grow in a not too cold and not too hot environment. Malaysia's weather is very suitable for paddy cultivation, as it is warm all year round and the rain distribution are perfect for cultivating paddy. Paddy cultivation process is quite complex and distinctive. Fig. 1 shows the processes that involves in the paddy cultivation. Basically, the process of cultivating paddy plant consists of seeding, land preparation, plant establishment, water management, nutrient management, and pest management.

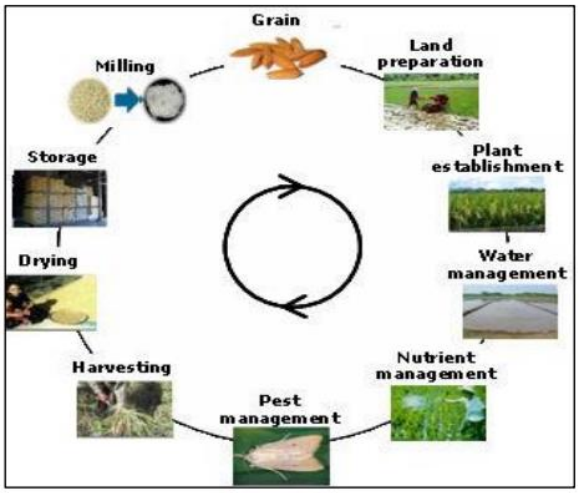

Fig. 1. Paddy cultivation process

B. Two-Dimensional Role-Playing Game

The game is designed in a 2D environment suitable for desktop platform. The pixelate graphic that portrays the Malaysia atmosphere is the unique characteristic of the game. PADDYVILLE is an offline role-playing simulation game that focuses on the paddy cultivation process. The game can be played on the computer without the internet connection. All multimedia elements are included, and English is used as its main language.

III. METHODS

The development of PADDYVILLE is based on the flow of Extreme Programming methodology, which consists of five stages such as planning, designing, coding, testing, and listening stages. XP is very suitable for developing game because it enables developer or programmer to inflict changes at any moment, and helps developer manages task and time better. As it is an educational game, ARCS model is used in making sure that the educational contents of the game are useful and effective to the players that play the game. By following all four components of ARCS model, the developer are able to develop a proper video games with an educational content. Fig. 2 shows example of interfaces of the game.

a. “Planting Guide” Book Panel

b. Fill Water Action in Nursery and Paddy Field

c. Planting Seeds and Seedling

d. Harvesting Process

Fig. 2. User Interfaces of the Game

IV. RESULTS AND FINDINGS

The testing stage happens as the progress of project development is on-going. To render the testing procedure more precise and efficient, a test case is used to run the functionality analysis. Based on the testing, it was showed that all the functions are run correctly and passed. Then, the prototype was tested for user acceptance, based on components of ARCS Motivation Model.

The total mean depicts the level of agreement of respondents to the factors imposed. After all data of all components have been analysed, all four total means are summed and calculated again to provide the value of overall total means. Table 1 below shows the list of all total means and overall total means. the game projects managed to grab the attention of the players when playing the game. With a total mean of 4.49, the respondents agreed with the Paddyville to be entertaining and engaging. The total mean of relevance is 4.26, shows that respondents agreed with knowledge gained by playing Paddyville, is relevant to the real-world knowledge. With a total mean of 4.41, Table 1 also shows that the respondents agreed with Paddyville in introducing confidence to the players. The game gives clear and easy to follow instructions, and they feel a sense of success and accomplishment when completing the in-game tasks. With the total mean of 4.24, the respondents agreed that the game gives a sense of realness as compared to real experience. The game managed to give players an experience as a paddy farmer in real life, and to feel contented with the outcome of playing this game. Based on the total average means, which is 4.35, the value shows the level of agreement of the respondents. Overall percentage shows that the respondents experience about 87% of acceptance value towards this game. It can be said that Paddyville manages to accomplish all the objectives by evaluating the user acceptance.

Table 1. Total average of mean value

Components	Total Mean Average
Attention	4.49
Relevance	4.26
Confidence	4.41
Satisfaction	4.24
Total Average Mean	4.35
Overall Percentage	87%

V. CONCLUSIONS

An innovation of this project is originally developed as an informative game, to provide the knowledge of agriculture that shows the process to cultivate paddy, which in turn can attract interest of the players (especially youngsters) towards cultivation. It is agreeable to say that developing a paddy cultivation game can help educating young people about the cultivation process of paddy plants. With this game, the players can learn while playing. According to [6], many researchers agree that educational video games can offer motivational values and increase players' concentration on learning and promote their thought of higher order. By playing this game, the players can gain enjoyment during the learning time which helps them to focus much better. Apart from that, the game also promotes the local culture of Malaysia. This helps to expose the local culture in agriculture to the players. The uniqueness setting of the game is based on Malaysian living culture, such as wooden high beam house and fashion of the Malaysian farmers. With improvements, this prototype can turn into a better educational material for school and

community. The prototype is in a process to get an intellectual property (IP) right, in order to turn this idea into profit-making assets.

ACKNOWLEDGMENT

Thank you to our university academic committee, colleagues, friends, and family members. We received a great deal of support and assistance. Thank you also to project's participants who has been involved and helped in our project work.

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Agarwood Oil Quality Classification Using One Versus All Strategies in Multiclass on SVM Model

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***Abstract*— Agarwood oil is one of the most beneficial oil to the world community with a high demand. However, there has been a lack of research on the development of agarwood oil because there is no any standard grading model of agarwood oil was implemented. With that, it is very important to come out with a standard of quality classification model for agarwood oil grading's. By continuing developing this standard, specific algorithm function has been used to make sure the ability of this model is totally not in doubt. Support vector machine (SVM) has been chosen as a main model and for the specific function algorithm was multiclass function. Then, in the function, the one versus all (OVA) strategies has been used. The analysis work has involving the data taken from the previous researcher that consists of four classes of agarwood oil quality's samples which are low, medium low, medium high and high quality. So, the output was the classification of quality between low, medium low, medium high or high quality while the input was the abundances (%) of compounds. The desk research has been conducted by using MATLAB software version r2020a for the simulation platform. The result showed that the model has pass the performance criteria standard. Based on that, the intelligent model has shown excellent performance with 100% of accuracy by producing 0.00 of error rate. The verdict in this research for sure will be valuable for the future research works of agarwood oil areas, especially quality classification part.**

Keywords—Agarwood oil, multiclass, one versus all, support vector machine.

I. INTRODUCTION

Agarwood or known as chenxiang in Chinese and call edagalloch, aloeswood, eaglewood, kanankoh, jinkoh, kalambak or gaharu in different regions, is a non-timber forest product with very highly prized for its values as herbal medicine, aromatic material, ceremonies and many more, depend on the different cultures and religious [2 – 5]. Agarwood oil, the fragrant resinous heartwood is a well-known essential oil originating from Aqualaria and several other plant species of the Thymelaeaaceae family [1]. Some countries like Malaysia, Japan and India graded agarwood using two types of grading techniques. Malaysian researchers classify agarwood by naming them as kalambak and gaharu as well as in japan grade agarwood by use kanankoh and jinkoh for high and low quality. However, India, they are using the alphabet from A to D or numbering from 1 to 4 according to color and infection level for the agarwood grading process [6]. The price, usability and others are fully depending on the quality of the agarwood oil either the quality is low, medium low, medium high or high [5]. In other word, the higher the quality of agarwood oil, the higher the price of the agarwood oil. A review from other researchers' study [2,5], it was found that grading agarwood oil process has been conducted by only using human sensory panels. But this method can spark doubt because it is

very incompetent, caused tiredness, and take time as well. With the availability of data analysis technology nowadays, there is a platform where agarwood oil quality classification can be conduct only use their chemical profiles so that essential oil can be classified according to their respective classes (low, medium low, medium high or high quality) and the accurate result can be measured. In this paper has focus on the Support Vector Machine (SVM) as the main model to classification the grading of agarwood oil into low, medium low, medium high and high quality as recommended by [7].

II. MATERIALS

A. Sample of data used.

There are 660 of sample of data were used throughout the research [1]. These data samples have four different classes which include 210 samples of data for low quality, 90 samples of data for medium low quality, 30 samples of medium high quality and 330 samples of high quality.

III. METHODS

A. Flowchart of Experimental Set – Up.

All the samples of data have been through data pre-processing stage which are normalizing data, randomizing the arrangement of data, and lastly separating into training data and testing data using 80%:20% ratio as recommended by previous researchers [1] as mentioned in Fig. 1. The simulation has used Holdout partition to separated data as recommended. After that, SVM model have been developed by using standard template that have been designed for nonlinear data. The standard template using SVM as method, classification as the type of analysis, and 'gaussian' as kernel function parameter by having the ability to analyze nonlinear data. Then, to make sure the classification successful, Multiclass classification method based on binary classifiers have been used. In the multiclass classification, OVA strategies have been chosen as multiclass method of machine learning. With that,each of the quality will be classify by comparing the quality and other qualities as Low vs All (LvsA), Medium Low vs All (MLvsA), Medium High vs All (MHvsA) and High vs All (HvsA).

Next, all 528 of training data have been involve during develop the SVM model above. But 132 of testing data have been hold first for testing the model and analyze the model by following the performance criteria as standard pass evaluation for SVM model. The result of testing has been put in result and discussion part.

The simulation of intelligent model has been conducted by using Matlab software version r2020a to classify four different quality of agarwood oil.

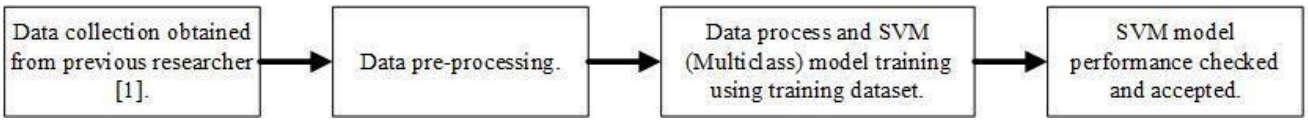

Fig. 1. Block diagram of experimental work.

IV. RESULTS AND FINDINGS

As mentioned in material part, there were 660 samples of agarwood oil compound data used in the analysis work. The data samples then were analyzed and constructed into SVM model. Next, OVA of multiclass classification function have been applied on the SVM model to classify the quality of data. As result, the outcome from the applying the OVA have formed different value of support vectors for all the different quality. For low quality was 46 values, medium low was 40 values, medium high was 22 value and high quality was 36 values. Next, the confusion matrix of SVM model between actual quality and predicted quality for four different qualities of agarwood oil by using testing data has been conducted. It shows that, there is no any misleading during predicted and actual quality. With that, error rate for confusion is 0.00 and for sure Mean – square error also has 0.00 values. Next, Table 1 shows that each of the classes have 100% of accuracy, 100% of sensitivity, 100% of specificity and 100% for precious. This performance criteria have been measure based on the testing data which is 20% (132 samples) from the total of sample data used. As researcher mention before, each of performance criteria can achieve 100% when there is no any error or misleading during confusion matrix between predicted quality and actual quality comparison.

Table 1. Performance criteria

	LvsA	MLvsA	MHvsA	HvsA	Avg Acc	Avg Sen	Avg Spec	Avg Pre
Accuracy	100%	100%	100%	100%	100%			
Sensitivity	100%	100%	100%	100%		100%		
Specificity	100%	100%	100%	100%			100%	
Precious	100%	100%	100%	100%				100%

V. CONCLUSIONS

Various studies have made an effort to show that the insufficiency of classification of quality using traditional method can affect human health. By developing of the modelling of agarwood oil classification using SVM model has successfully presented

on this paper. During SVM process by support with Multiclass classification method, the classification has been run using hyperplane separating in SVM for the result. From the data, accuracy yielded to 100% which are very significant and also reach 100% of sensitivity. With that, 0.00 of error rate the model result has been achieved. On the other hand, the SVM model in this study keep strongly proven the ability on handling the variation of input data created from the abundances of eleven significant chemical compounds and separate the nonlinearly data into training and testing data. then, measure the output of data by classify the data into four classes of quality, low, medium low, medium high, and high quality. The outcome of this study benefits other analysts on evaluating the oil quality especially agarwood oil. By developing this intelligent model, SVM and implementing OVA of multiclass function will be significant for future study especially in agarwood oil classification. In future work, it is prescribed to design the agarwood oil model to classify more than two classes of agarwood oil quality. Their result afterward canbe compared and assessed.

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The Development of E-Content 'Sci-Anime2021' for PDPR during Covid-19 Era

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***Abstract*—E-Content is any form of learning material available digitally which a learner (students) access or interacts with teachers or among themselves to achieve related learning outcomes. E-Content is becomes popular because it allows flexibility in terms of time, place and pace of learning. However, in Malaysian education especially at primary school level, the development of E-Content is not widely developed due to the limitless of internet coverage, knowledge gap among teachers and awareness about E-Content. Therefore, the development of Sci-Anime2021 was introduced in order to help students specifically *Tahap 2 Kurikulum Standard Sekolah Rendah (KSSR)* students to increase their understanding towards certain topics in Science subject. Sci-Anime2021 separated to three major components, which are the development process of Sci-Anime2021, final product E-Content Sci-Anime2021 and assessment in Sci-Anime2021. This E-Content developed by using combination of smart phone applications (FlipaClip & CapCut). Animations in Sci-Anime2021 were created by using FlipaClip whereas video editing process was conducted using CapCut. Finally, the assessment was prepared using EdPuzzle. Then, the link of assessment will be posted in Google Classroom. Google Classroom will be a platform to discuss and interact with teacher and other students regarding the assessment and E-Content. Therefore, the development of Sci-Anime2021 will be able to help students during current *Pengajaran dan Pembelajaran di Rumah* (PdPR) in Covid-19 era. The learning process will be more fun and interactive through animation, which includes text, video, images and sounds.**

***Keywords*—E-Content, PdPR, assessment, video editing, Covid-19**

I. INTRODUCTION

Education provides the pathway to reach their destiny. Education helps in inculcating social responsibilities as well as to developed people manner and behaviour. The main core of education is to learn. Learning is a process of acquiring knowledge or skills through study, experience, or being taught [1]. However, during pandemic Covid-19 outbreak, mostly schools were shut down including primary schools, secondary schools, college and university [2]. Our education system in Malaysia are toward e-learning process including the usage of e-content during *Pengajaran dan Pembelajaran di Rumah* (PdPR). PdPR was introduced by Ministry of Education, Malaysia during Movement Control Order (MCO) 1.0 in year 2020 and it was continue until today [3, 4]. In PdPR, the information regarding syllabus and subject matters were send through Gamification (Quizziz, Kahoot), videos, audio clip, ebooks, Google Meet and Microsoft Teams (live streaming) [3]. Knowledge from teacher to students was delivered through various platform that normally used by other teacher or academician. The intention to attract students especially primary school students to stay focus during PdPR is become the main issues during learning process as primary school students tend to loss their focus during teaching and learning. Until nowadays, there is less tool or e-content that was developed by specific person in order to increase the interest of the primary school students during PdPR process. Therefore, the innovation of e-content especially for science subject for *Tahap 2 Kurikulum Standard Sekolah Rendah (KSSR)* students was developed in order to

increase their interest towards science subject. E-content was innovated and developed by primary school students of Sekolah Kebangsaan Kubang Gajah, Arau, Perlis (Year 2, 4 and 6) and it was named Sci-Anime2021. This E-content is in the form of animation and it was developed by using smart phone application (FlipaClip and CapCut). Then, the assessment was developed by using EdPuzzle and the discussion among teachers and their peers will be conducted through Google Classroom.

II. MATERIALS

A. Smart Phone Applications Preparedness

FlipaClip free version was downloaded in Google Play Store (**Fig. 1.**) through Samsung Tab S6 Lite. The functions of FlipaClip application are to provide children digital tools to draw and create the frames of a storyboard and transform them into animated videos, cartoons, and GIFs. It includes digital drawing tools like brushes with different tips and colours and the option to insert text [5]. Apart from that, CapCut application was downloaded in Google Play Store (**Fig. 2.**). CapCut application is a free all-in-one video editing application that helps people to create incredible videos. CapCut was launched in the Chinese market as *Jianying*. The application has been in the Top 10 Worldwide (Non-Game) Most Downloaded Apps in 2019.

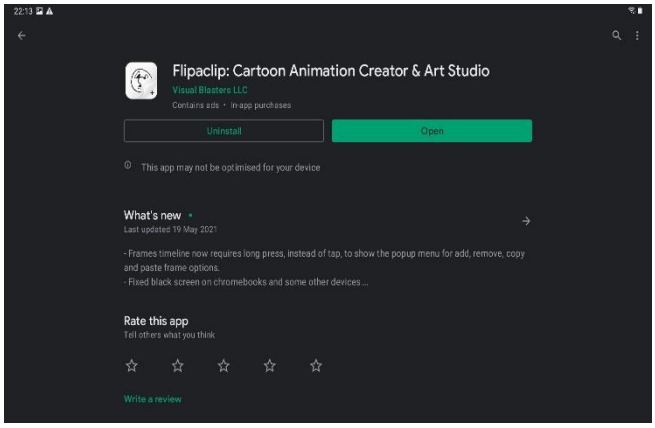

Fig. 1. Download Flipaclip application in Google Play Store

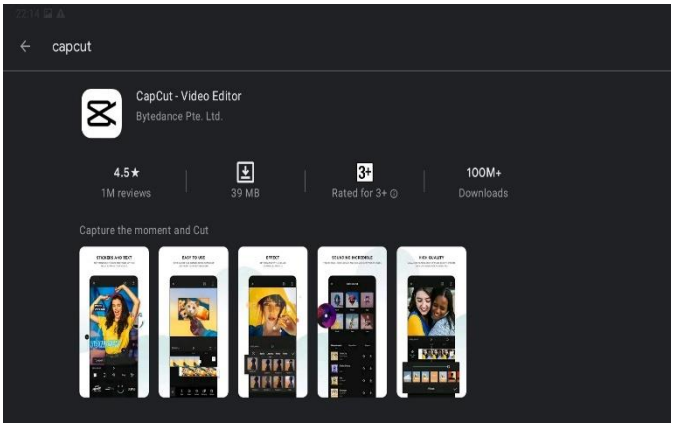

Fig. 2. Download Capcut application in Google Play Store

B. EdPuzzle for Assessment Purpose

EdPuzzle is a free assessment-centered tool that allows teachers and students to create interactive online videos by embedding either open-ended or multiple-choice questions, audio notes, audio tracks, or comments on a video. The overall purpose of *Edpuzzle* is to facilitate increased student engagement with video content. EdPuzzle tool was search via Google search engine (**Fig. 3.**) and the sign up for the EdPuzzle account has been done completely via EdPuzzle website (**Fig. 4.**).

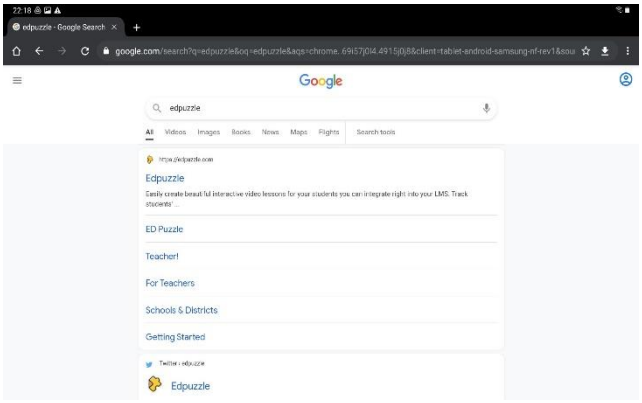

Fig. 3. Searching EdPuzzle tool via Google search engine.

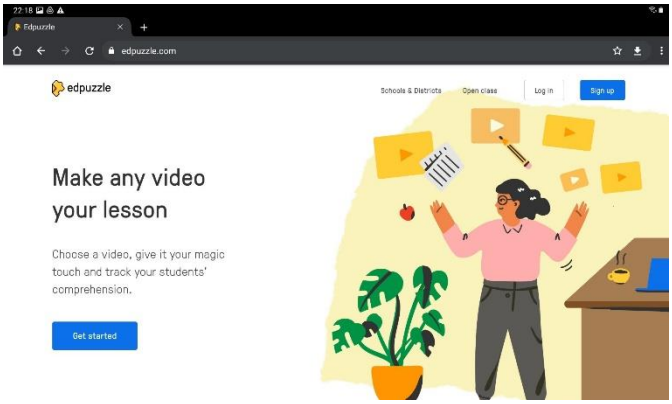

Fig. 4. Sign up for EdPuzzle Account

III. METHODS

A. *Development of Sci-Anime2021 E-Content for Science Subject*

Fig. 5. below shows the process of Sci-Anime2021 development for 'Daya' topic in Science subject of Year 6. *FlipaClip* and *CapCut* applications were downloaded in *Google Play Store*. Apart from that, *EdPuzzle* tool has been searched via Google search engine. Then, the sign up process for *EdPuzzle* account has been done through *EdPuzzle* website. The animation process has been done by using *FlipaClip* application. Then, the video editing process was proceed by using *CapCut* application. During video editing process, students can insert their voice and give explanation about the topics. The length of the video can also be controlled by using this application. At the same time, some of the parts can be removed by using this application. Finally, *EdPuzzle* tool is used to create an assessment consisted of multiple-choice questions (MCQ).

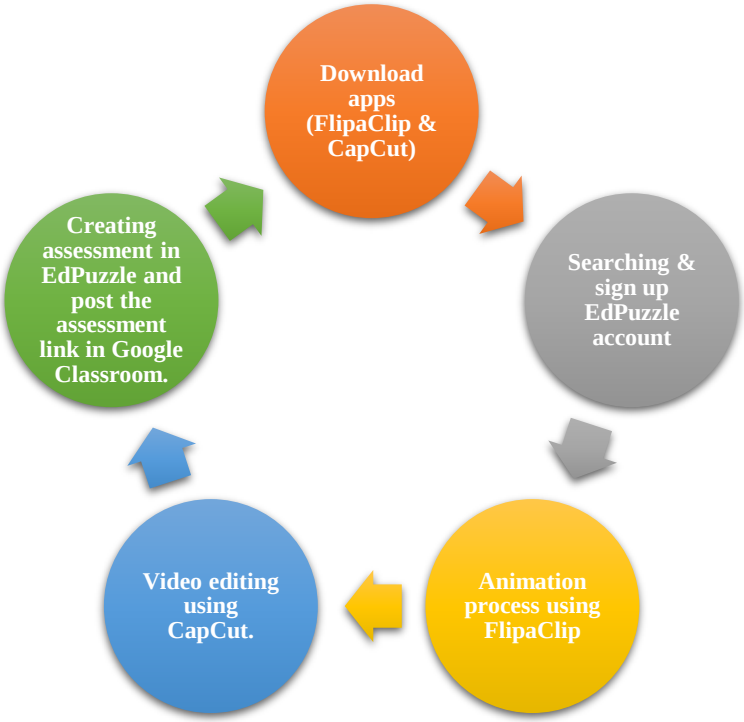

Fig. 5. Flow chart of e-content *Daya* topic for science *Tahap 2*, KSSR.

IV. RESULTS AND FINDINGS

Topic *Daya* for Science subject Year 6 KSSR was chosen for Sci-Anime2021 e-content development. Previously, this topic is too 'dry' and full of scientific facts. Students tend to loss their focus when learning this topic. By introducing the animation elements, teachers should be able to attract the student's attention during PdPR process. The learning process will be more fun and interactive as it involves animation and online assessment via EdPuzzle website. The engagement of the students with their teachers also improved compared before the development of Sci-Anime2021 module.

V. CONCLUSIONS

Sci-Anime2021 for 'Daya' topic in Science subject of Year 6 KSSR has been successfully developed by using the combinations of smart phone applications (FlipaClip and CapCut). The assessment in Sci-Anime2021 has been fully developed by using EdPuzzle tool. In future, hopefully Sci-Anime2021 e-Content innovation will be able to used and applied to all primary school students in Malaysia during PdPR process.

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