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Direct Effect of Interactive Mobile Learning Approach towards Renewable Energy on Children in Malaysia

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ABSTRACT

Renewable energy (RE) is getting more attention in solving the escalating global warming issue. However, the community has not been sufficiently educated about this fact. Exposure to renewable energy technology in Malaysia, especially for children, is still lacking, leading to a lack of awareness on the importance of renewable energy. Besides, children's lack of knowledge about renewable energy and lack of interest in the field of science became problems in this study. Therefore, this study on effect of usefulness, user friendly, quality and user acceptance toward mobile application approach in introducing knowledge of renewable energy. The main software in developing the RE application consist of five components, i.e. introduction, video, game, quiz and news. Testing was carried out on selected children to evaluate children's satisfaction in terms of using the application in learning RE. A pilot study was conducted on 30 children and the application model was validated by three experts and evaluated for its effectiveness through quantitative studies. Then, the mobile apps were tested on 77 9-year-old children with a quantitative research method to assess the level of knowledge acceptance and awareness of renewable energy. Results indicate that the children's knowledge of RE increased with the use of this RE mobile application because RE information is delivered in the form of images, audios, and videos. More than 98% of the respondents agree that the application helps in understanding RE. The mobile application also successfully attracted the children's interest in RE innovation and increased their awareness on the importance of RE.

Keywords: Android application; mobile apps; renewable energy; awareness

ABSTRAK

Tenaga keterbaharuan (RE) semakin mendapat perhatian dalam menyelesaikan isu pemanasan global yang semakin meruncing. Namun, masyarakat belum cukup dididik tentang hakikat ini. Pendedahan kepada teknologi RE di Malaysia khususnya untuk kanak-kanak masih kurang, menyebabkan kurangnya kesedaran tentang kepentingan RE. Selain itu, kekurangan pengetahuan kanak-kanak tentang RE dan kurang minat dalam bidang Sains menjadi masalah dalam kajian ini. Oleh itu, kajian ini mengenai kesan kepenggunaan, mesra pengguna, kualiti dan penerimaan pengguna terhadap pendekatan aplikasi mudah alih dalam memperkenalkan pengetahuan RE. Perisian utama dalam membangunkan aplikasi RE terdiri daripada lima komponen iaitu pengenalan, video, permainan, kuiz dan berita. Ujian telah dijalankan ke atas kanak-kanak terpilih untuk menilai kepuasan kanak-kanak dari segi penggunaan aplikasi dalam pembelajaran RE. Kajian rintis telah dijalankan ke atas 30 kanak-kanak dan model aplikasi telah disahkan oleh tiga pakar dan dinilai keberkesanannya melalui kajian kuantitatif. Kemudian, aplikasi mudah alih itu diuji ke atas 77 kanak-kanak berumur 9 tahun dengan kaedah penyelidikan kuantitatif untuk menilai tahap penerimaan pengetahuan dan kesedaran mengenai tenaga boleh diperbaharui. Keputusan menunjukkan bahawa pengetahuan kanak-kanak tentang RE meningkat dengan penggunaan aplikasi mudah alih RE ini kerana maklumat RE disampaikan dalam bentuk

imej, audio dan video. Lebih daripada 98% responden bersetuju bahawa aplikasi itu membantu dalam memahami RE. Aplikasi mudah alih itu juga berjaya menarik minat kanak-kanak dalam inovasi RE dan meningkatkan kesedaran mereka tentang kepentingan RE.

Kata kunci: Aplikasi android; aplikasi mudah alih; tenaga keterbaharuan; kesedaran

INTRODUCTION

Non-renewable energy, such as fossil fuels, has been used to generate energy in the world for many years. Traditional methods of generating energy have a negative impact on the environment. The use of fossil fuels used increases the level of carbon dioxide (CO_2 in the atmosphere and causes environmental pollution (Soeder 2021. As the world economy is now booming (Begum et al. 2015, Wang & Azam et al. states that climate change caused by global warming is a major concern in the 21st century because greenhouse gases are produced from the burning of fossil fuels, which increase the overall temperature of the earth (Wang and Azam, 2024. This phenomenon also reduces the atmospheric layer and causes negative effects on society. As fossil fuels are declining and will dwindle soon, renewable energy (RE has been introduced to replace fossil fuels (Aminudin et al. 2023 to reduce environmental pollution (Owusu and Asumadu-Sarkodie 2016; Hemer et al. 2018, to ensure adequate energy supply and achieve sustainability (Gunnarsdottir et al. 2021.

Renewable energy is produced through natural processes, continuously filled and in unlimited quantity. Panwar et al. (2011 say that RE is derived from natural sources, such as hydropower, solar, biomass and wind (Panwar et al. 2011. Bhowmilk et al. (2017 considers RE as clean energy that reduces the impact on the environment and plays an important role in saving the environment (Bhowmik et al. 2017. Tsantopoulos et al. (2014 supports the statement of Bhowmilk et al. (2017 that the reform is known and recognized is also often used as an alternative energy for fossil fuels (Tsantopoulos et al. 2014.

Solar energy is one of the clean energy sources that has no negative impact on the earth and the environment. Sunlight is generated in one second on a large scale and is a frequently used source. Moreover, Ludin et al. (2018 and Asim et al. (2018 stated that solar energy is generated using photovoltaic devices by converting the heat of sunlight into electrical energy. Solar energy is also known as an alternative to fossil fuels. Solar energy is readily available at low prices and large quantities. Solar energy also has less impact on the environment and is often the community's choice in using renewable resources as claimed by (Fudholi and Sopian 2019

Communication 20 years back dominantly utilised landlines, fax machines and physical email. The world has grown rapidly in technology into digital technology. Digital technology has been advancing since 1980 with the advent of cell phones and computers. There are several advantages of technology advancement, such as easing daily routines and works in industries (Baines et al. 2020) . The revolution had four phases, i.e. the first, second, third and current (fourth) revolutions (Schwab 2021) . The fourth revolution has made a huge impact in all areas, including industry, manufacturing, technology and education.

The education system mostly focuses on class-based learning. The exposure of students to outdoors activities is low, limiting their knowledge and mind development. The usage of advance technologies has to be maximised in every sector, especially in the education sector. According to Skiada et al. (Skiada et al. 2014), the benefits of using mobile learning include building communication opportunities and interesting learning surroundings that can inspire and support children's learning (Kirkley and Kirkley 2007).

Modern technologies have become necessary in teaching and learning (T&L) have become a necessity for students. The learning method can be improved in various ways as the current learning materials based on static materials which are less attractive in terms of presenting information are only provided in class using textbooks and whiteboards (Raghuvanshi et al. 2008). With the advancement of technology in the past few years, technologies have been integrated with and influenced education through mobile learning (M-Learning) which could support the P&P sessions in class (Taketa et al. 2007; Nincarean et al. 2013).

M-Learning is a concept that implements the learning process with emphasis on the ability to facilitate learning without being bound to a physical location (Pu et al. 2011; Sarrab 2015). Garcia et al. defines M-Learning as learning through mobile devices due to the growth of mobile phone technology (Garcia-Cabot et al. 2015). The usage of android applications is currently increasing in popularity among smartphone users. Various applications have been uploaded to users' smartphones for recreation, learning and work requirements. By simply installing an Android-based learning application software on smartphones, all learning activities can be easily performed by students wherever they are and whenever necessary (Althunibat, 2015; Taleb et al. 2015). Majority of university students show a strong interest in the use of smartphones for learning purposes and consider it a necessity in keeping with the current era

of technological development (Althunibat 2015; Cavus 2016). M-Learning has also been accepted in terms of theoretical framework as a technology acceptance model (TAM) which can be observed by conducting research on students' acceptance of M-Learning (Chavoshi and Hamidi 2019). TAM is a relevant information system and design for forecasting acceptance and technology usage. In line with the development of technology, augmented reality (AR) was developed in the advance technology age.

AR is the latest technology that enables users to see the real world through virtual objects superimposed on actual objects (Azuma 1997; Azuma et al. 2001). AR technology uses standard components, like sensors and processors, which are frequently used in smartphones that can serve as a prospective AR platform. Most AR applications use recognised cameras to detect markers and images (Dekker et al. 2013).

Despite the rapid growth of mobile technology, limited CPU and memory capacities remain a challenge. Thus, the implementation of built-in sensors is beneficial for mobile devices. Recently, several studies have been conducted on developing AR applications for and the potential technology usage in education (Dunleavy et al. 2009). From this AR technology, renewable energy (RE) applications have been successfully developed to attract student's interest in the RE topic which is quite famous in build-up technology for replacing fossil fuel usage.

Some research on mobile learning for the mathematics and science subjects has been conducted (Bano et al. 2018) without focusing on a specific topic. Given the critical environment issue, this project was carried out to develop RE mobile apps for school students to provide innovative solution for optimising learning effectiveness, expose RE education by developing mixed reality simulators that can be easily used and integrated into existing curriculum and provide experiential learning opportunities for students in the field of modelling, simulation, and visualisation.

Meanwhile, RE education is a globally recognised need and important at all levels (Skamp et al. 2019; Buldur et al. 2020). RE education projects have been implemented around the globe over the last three decades (Kandpal and Broman 2014), demanding full dedication from all sectors, especially from governments, researchers, industries, and policy-makers. to enhance the education system, especially on RE (Othman and Sopian 1999). Many of these projects entail floating independent teaching/training programmes or elective classes in the traditional engineering/applied science curricula. Many attempts have also been made to incorporate energy-related issues in the school curricula (Rizaki and Kokkotas 2013). RE educational systems are expected to grow more rapidly than academic programmes in developed disciplines over time. RE training systems also need a significant period to attain a relatively satisfactory stage by continuously developing the learning framework, incorporating and reviewing technology advances, modifying energy policy usage reviews, and other options open to the expected recipients (Kandpal and Broman, 2014.

Education is easiest approach to introducing RE, especially to grade-schoolers in Malaysia. At this point, they can prepare to face the obstacles of their lives. This sense of personal control evolves from activities that harness problem-solving abilities, imagination and performance (Berkovski and Gottschalk 1997; Kandpal and Broman 2014. The kindergarten and primary school levels are the best stage to foster awareness of and explore alternative energy through an interactive approach, such as M-Learning. Therefore, this work developed a smartphone app for kids and examined the level of usefulness, usability and quality of the applications developed through children's responses. Various learning methods were used, such as presentation through interactive videos, quizzes, current issues and games, to increase RE awareness.

METHODOLOGY

PRELIMINARY STUDY

Before this study started, a pre-study was conducted first as in the previous study(Zakaria et al. 2019 [47]. From the findings of this study, smartphone applications are very popular and provide ease in understanding about RE for children in the learning process. Thus, the RE mobile application was designed to facilitate RE education and promote the importance of RE to the primary school students.

UNITY 3D

The RE application for green technology was developed using the Unity3D software. This software can be developed in the industrial world and applied in two-dimensional (2D, three-dimensional (3D and increased reality.

After completing the application development, the application was tested on children (Figure 1. The platform for RE developed on the smartphone application contains some parts that can be referenced in Figure 2 which including 1. Introduction, 2. Video, 3. Game, 4. Quiz and 5. News. M. Figueiredo and J. Bidarra reported that this mobile device encourages and facilitates the delivery of information and has an easy-to-use and easy-to-manage content that is appropriate for the topic to be addressed

(text, image, audio, video, animation, etc.)(Figueiredo and Bidarra 2015). The integration of portable devices in the instructional model is assumed, in the opinion of this author, as a possible way of increasing the efficiency of learning. Figure 1 showed the summary of the method flow in this research.

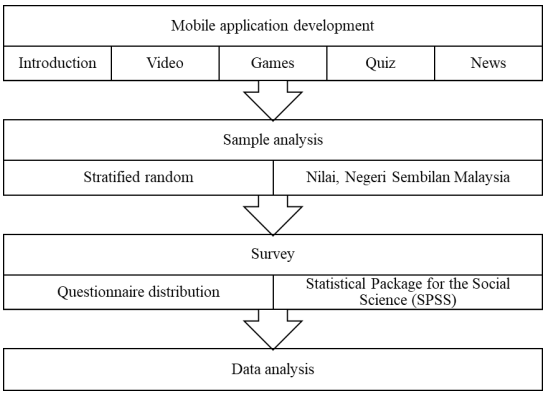


FIGURE 1. Summary of method flow

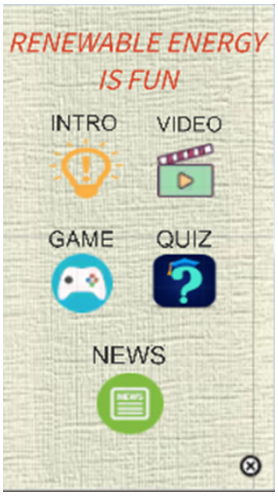


FIGURE 2. Application's front interface

The features of this smartphone application include elements that students must apply to increase their awareness of RE. Any of these elements can be used with the programmed method. For the introduction button, the program is shown in Table 1.

TABLE 1. Instruction program

```
public class StrButtonIntro : MonoBehaviour {

    // Use this for initialization

    void Start () {

    {

    // Update is called once per frame

    public void StrScene (string Intro1)

    {

    Application.LoadLevel (Intro1);

    }

}
```

Application Load Level (Intro1) calls the next interface to continue using this application. Intro1 is an interface set up to provide users the option to choose the next step. The programming is similar to that of other buttons that distinguish only the interface called.

INTRODUCTION

The introductory section on RE is divided into two parts, namely, the definition and advantage of RE as illustrated in Figure 3. The first section describes RE in detail, i.e. its characteristics, the reasons for its use and the types of RE.

The second part presents the advantages of RE and the importance of using RE technology as shown in Figure 4.

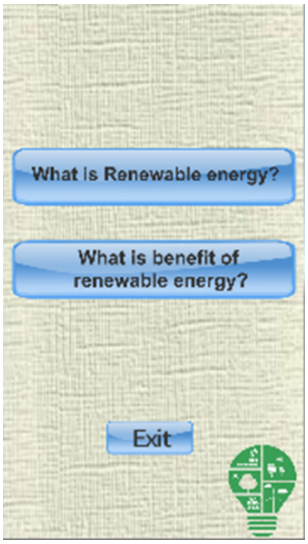
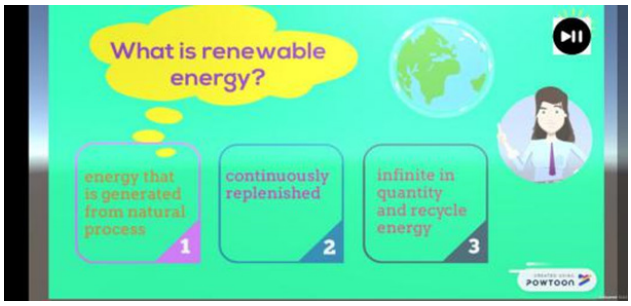
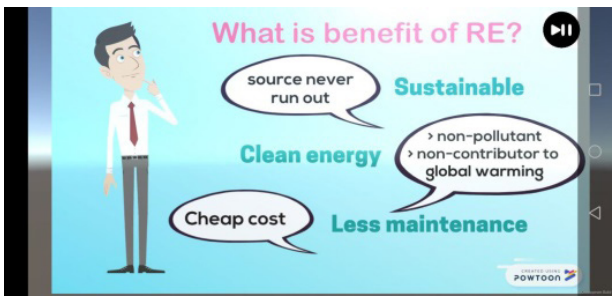


FIGURE 3. Introduction interface

Both sections of the video explain the power of innovation using animated videos through the Powtoon platform. This animated video is user-friendly to create more engaging presentations and videos by using voice descriptors. This animated video is described in English and using info graphics to help students understand the power of innovation delivered.



(a)



(b)

FIGURE 4. Introduction's (a) first and (b) second section interface

VIDEO

The RE video section has three subsections corresponding to the types of RE, namely solar, wind and fuel cells (Figure 5. These videos explain the application of RE technology in everyday life in homes and industries. This video explains only the basic ways of using RE technology through the use of the kits provided. Through this video, students will understand how to generate electricity better using RE kits. In line with the development of the 'artificial reality' technology, users are required to have images that must be scanned using a smartphone application. The images must be the same as the one set in the application to play the video (Kim et al. 2014.

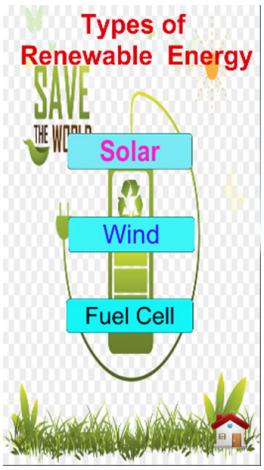


FIGURE 5. Video Interface

GAME

The game was developed based on RE and can provide consumers with information on RE technology in three levels. These stages are different in terms of area as shown in Figure 6. The first stage is in an open field, the second stage is in a hilly area and the third stage is in a waterfall as shown in figure 6. Through this game, users can find the right place to place the RE equipment such as solar panel, wind turbine and hydro turbine to fit the area to obtain the most out of the battery provided. Before starting the game, a command will appear to tell the user how to play the game. The game has three levels. Figure 7 shows the Level 1 game interface. Players are required to drag and drop technological innovations on the blue site. Each image placed on a blue base will affect the percentage of battery power. Players must reach 100% battery level to earn three stars in each level. According to Vieira et al. and Huizenga et al. mobile games have a positive effect on learning and allow children to think out of the box in solving problems(Vieira and Coutinho 2016; Huizenga et al. 2019.

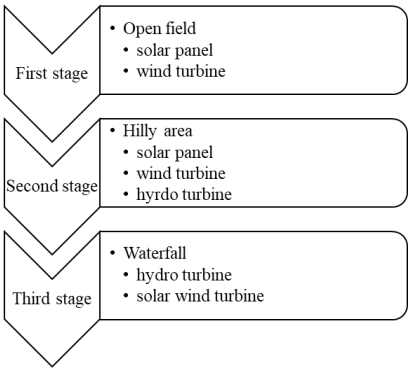


FIGURE 6. Stages of Area

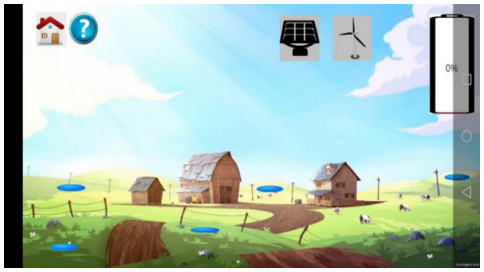


FIGURE 7. Game Interface for open field (Level 1)

QUIZ

The quiz section has several questions to test the knowledge obtained by the students after the introductory sections, the videos and the games that include the definitions and types of and benefits of using RE. Ten questions are highlighted in this application. These questions cover the basic knowledge in the field of RE. Figure 8 shows one of the questions that must be answered. The scope of the questions is simple and aims to introduce and provide basic knowledge on RE.

FIGURE 8. Interface for quiz section

NEWS

The news section shown in Figure 9 aims to facilitate web browsing to obtain latest updates. The web site provided in this application was selected because of up-to-date news. Thus, the application users need not worry about the latest news on RE. Furthermore, if users want to browse other websites for more information and knowledge, they can simply click on the Google Chrome picture and type anything they want without leaving the application.

FIGURE 9. News Interface

TABLE 2. Details of the mobile apps section

Section	Details
Introduction	Describes RE in detail, i.e., its characteristics, the reasons for its use and the types of RE
Video	Explain the application of RE technology in everyday life in homes and industries
Game	Provide consumers with information on RE technology in three levels
Quiz	Design questions to test the knowledge obtained by the students after go through all the information section
News	Facilitate web browsing to obtain latest updates

SAMPLE

This research study used the stratified random sampling technique. This technique was chosen because it is more practical and economical than other sampling methods. This smartphone application has been tested on children in Nilai, Negeri Sembilan. This area was chosen because it is located on the outskirts of the city and has very limited green energy technology due to its poor use in residential and industrial areas. A total of 77 students (i.e. 53.25% male and 46.75% female students were selected as participants, ranging from 7 years to 14 years old from five school. Children were selected to participate in this study because they will eventually manage the government and determine the direction of the country in preserving the environment. With early exposure to the RE technology, they could come up with good solutions to the current environmental issues in the future.

STUDY INSTRUMENT

The findings from this survey include quantitative data obtained from the multiple-choice and Likert scale responses to the questionnaire items. This dataset was analysed using the Statistical Package for the Social Science (SPSS statistical software for descriptions in terms of frequency, percentages and significant values. According to Mohd Majid (Mohd Majid 1990, descriptive statistics are the organisation and summary of data obtained from data processing. The statistics can be in the form of tables, illustrations in diagrams, or graphs of data or information. The items using multiple response options gathered the respondent's background information, while the Likert scale response items were used to summarise the effectiveness of RE applications on students' knowledge and awareness of four elements, namely usefulness, usability, quality and user acceptance as shown in the Table 3-6. The questionnaire used a five-point Likert-type scale format, and all the items in the second part were graded as 1: strongly disagree, 2: disagree, 3: undecided, 4: agree, or 5: strongly agree to evaluate the students' responses by considering previous studies in similar areas. The collected data were tabulated, checked and evaluated.

TABLE 3. Questions given to respondents

Code	Question
Q1	The renewable energy application helps me get information easily
Q2	This app helps me understand RE more effectively
Q3	This application tests thinking about the importance of RE
Q4	Using this application gives new knowledge about RE
Q5	Overall, this app is useful in my learning

TABLE 4. User friendly's question

Code	Question
Q6	The interface of this application is very attractive
Q7	The video in this application is very interesting
Q8	I find it easy to access the latest news about RE through this app
Q9	Overall, I believe this app is easy to use

TABLE 5. Quality's question

Code	Question
Q10	I found this app very user friendly
Q11	The quiz questions encouraged me to think about RE
Q12	This application has interesting visuals and graphics
Q13	This application provides the right solution to increase awareness of the importance of RE technology
Q14	Overall, this application is important for me to increase my knowledge in the Science subject

TABLE 6. User acceptance's question

Code	Question
Q15	I am happy using this apps as a good and useful application
Q16	I love using this app
Q17	I love the RE videos that are featured
Q18	I love the games in this app
Q19	I am satisfied in using this application
Q20	I will continue to use this application to find information about RE

RESULTS AND DISCUSSION

This study determined whether students could learn about RE through smartphones. In addition, this study was conducted to find out the relationship between approaches to using smartphones through games, videos and augmented reality related to learning outcomes. At first, the students did not know about RE. When the students were provided with smartphones to use the RE applications, they appeared very excited. The results are divided into four sections, namely usefulness, usability, quality and user acceptance. Each section has 4 to 6 questions related to the application. Table 7 shows the results for each question that answer by the student.

USEFULNESS

The usefulness section has five questions, including knowledge on obtaining the RE information. From the 77 participants, 61% totally agree and 31.16% agree that the application helps find information on RE easily, whilst only 7.8% disagree. This result proves that most students agree that the application is easy to use to find information because nearly all students have at least one mobile phone and can open the application anytime to gain knowledge on RE. Furthermore, 57.14% totally agree and 41.16% agree that the application helps in understanding RE effectively, and only 1.3% disagree. Although the students are too young to understand RE, they could gain basic knowledge on RE through the application.

TABLE 7. Results on the questionnaire

Details	Frequency				
	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Usefulness question					
Q1			6	23	48
Q2			1	32	44
Q3			4	33	40
Q4			4	22	51
Q5			2	26	49
User friendly's question					
Q6			3	22	52
Q7			6	20	51
Q8			3	26	48
Q9			2	26	49
Quality's question					
Q10			4	23	50
Q11			4	20	53
Q12			2	24	51
Q13			4	26	45
Q14				26	51

continue ...

... *cont.*

User acceptance's question			
Q15	2	21	54
Q16	3	23	51
Q17	2	25	50
Q18	3	19	55
Q19	2	24	51
Q20	3	27	47

In addition, 94.71% students agree that the application tests the critical thinking of students on the importance of RE, triggering their concern for our environment's condition. The application also provides students with new knowledge as the topic is rarely discussed (i.e., 66.23% of the students totally agree and 28.57% agree). Most of the students (63.64%) agree that the application is useful for learning on RE.

Figure 10 shows the average Min number of students who responded after on the passing questionnaire in Table 3. Research questions 1 to 5 obtained mean values of 4.47 and above, showing that students agree that this RE application is useful for easy access to information, understanding RE, testing thinking, providing new and useful knowledge and enhancing knowledge to use technology better in the future. These results are supported by Tan et al. who mentioned that M-Learning's perceived usefulness and usability are highly satisfactory (Hassanein et al. 2010; Tan et al. 2012).

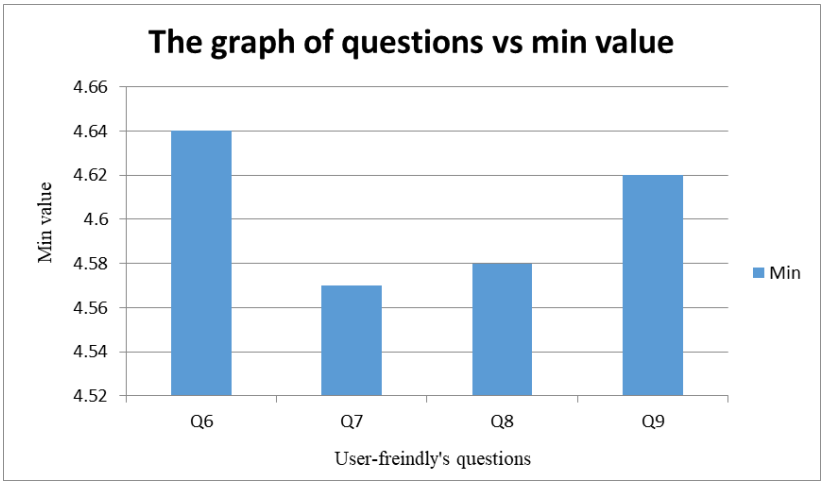


FIGURE 10. Respondents' feedback on user-friendly

QUALITY

The quality of the application was measured by the users in all aspects, including usability, i.e., the quiz for testing critical thinking and the visual or graphic information for increasing the knowledge and awareness of students about RE. Most of the students found the application to be user-friendly, and only 5.19% found the application difficult to use. Furthermore, the application has a quiz to test the knowledge of the students about RE. Students will also know their level of understanding of the topic from the quiz which requires critical thinking to obtain the right answer. This claim is proven as 68.83% students totally agree and 24.69% agree that the quiz encouraged them to think about RE.

The application also has interesting visual or graphic materials that attract students and lead to continuous use. This claim is proven as 93.51% of the students totally agree to this survey question because visuals or graphics are very important in

learning visuals and the brain have a relationship which impacts the focus towards the topic [57]. With the new knowledge gained from this RE application, 67.53% students totally agree and 24.68% agree that their awareness on the importance of RE increased. From this quality section, 100% students agree that the application

is important for increasing the knowledge on RE, indicating that the application has good quality contents. Demir and Akpinar reported that M-Learning provides a positive feedback on students' achievement and increases their interaction (Demir and Akpınar, 2018).

Figure 12 shows the average Min number of students who responded after on the passing questionnaire in Table 5. Research questions 10 to 14 obtained mean values of 4.53 and above, showing that the students agree that this RE application is user-friendly, the quiz encourages critical thinking and the exciting visuals or graphics increase the awareness towards RE

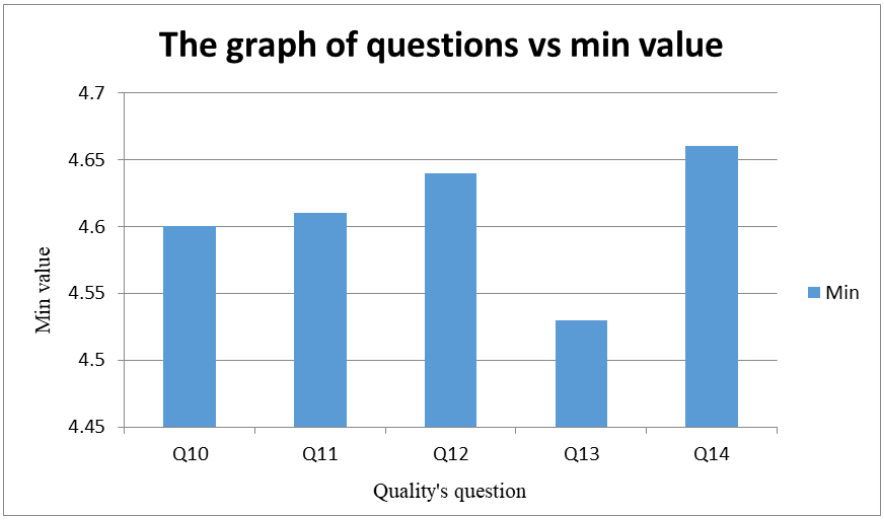


FIGURE 11. Respondents' feedback on quality

USER'S ACCEPTANCE

This section is crucial to ensuring students' acceptance of the application and their enjoyment in learning about RE. Majority of the students (70.13% totally agree and 27.27% agree are happy with the application because it is good and useful for them, whilst 2.6% dislike the apps and think that the application unnecessary. After using the application, 96.1% of the students like to continue using the application and are eager to learn RE using the application during class.

In addition, the video part is the most interesting as it uses AR technology which excited the students. The students brought the phone camera on top of an image and the video will play automatically which increase the curiosity towards the technology and focus on the video. Consequently, most of the students (66.23% totally agree and 29.87% agree like the video about the RE. The students also interest in RE games with the highest voted totally agree, 70.13% because they will use critical thinking to ensure that the renewable technology icon is placed correctly to obtain maximum electricity capacity.

Furthermore, 96.11% of the students are satisfied with the application, whilst the remaining 3.89% are unsatisfied, probably because they are not interested on the topic itself. Thus, 61.04% of the participants totally agree and 35.06% agree to continue using the RE application to gain more knowledge and information on RE.

Figure 13 presents the average Min number of students who responded to the questionnaire in Table 6. Research questions 15 to 20 obtained mean values of 4.57 and above, showing that the children agree with happy feedback that this RE application is good and advantageous, love the apps, love the videos, are satisfied with the contents and are willing to use the application to enhance their knowledge on RE. The feedback indicates that this mobile application could stimulate interest, enhance the learning method and strengthen the learning development process in various fields and is supported by A. Chavoshi and H. Hamidi (Chavoshi and Hamidi 2019).

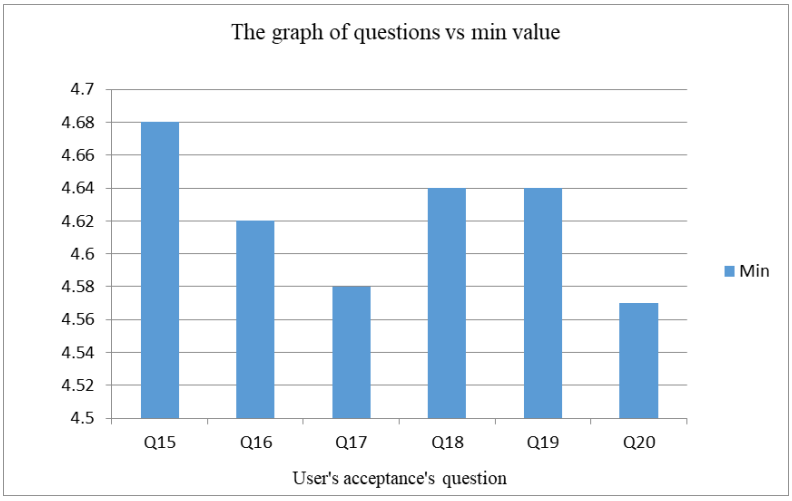


FIGURE 12. Respondents' feedback on user's acceptance

CORRELATION ANALYSIS

RELATIONSHIP BETWEEN USEFULNESS AND USER-FRIENDLY

To find out if there is a relationship between the usefulness of an application to an easy-to-use application, Pearson Correlation statistics are used. In this study, the usefulness adopted is the result of a combination of mean values of Usefulness to User-friendly after using computer variables in SPSS. Statistical inferential analysis of the relationship of Usefulness and User-friendly found that there is a significant relationship between Usefulness and User-friendly. Table 7 below shows the results of correlation analysis in the relationship of Usefulness and Easy to Use.

TABLE 8. Correlation Analysis between Usefulness and User-friendly

Factor	Correlation value, r	Significant value, p
Usefulness	0.801	0.000

*significant value, p= 0.05

This indicates that if the usefulness of the application affects the ease of application. With the existence of applications that are easy to use by children will give them an understanding in knowing about renewable energy. The significant value is 0.000 which is less than the alpha value = 0.05, so has very strong evidence to support that Usefulness has a relationship with User-friendly. Thus, Hypothesis Ho1: There is no significant relationship between Usefulness and User-friendly n can be rejected.

RELATIONSHIP BETWEEN USER-FRIENDLY AND USER ACCEPTANCE

To find out if there is a relationship between Easy-to-Use applications to User Acceptance, Pearson Correlation statistics are used. In this study, the application that is easy to use is the result of a combination of mean items User-friendly on UserAcceptance after using computer variables in SPSS. Statistical analysis of User-friendly relationship and User Acceptance found that there was a significant relationship between User-friendly and User Acceptance. Table 8 below shows the results of the correlation analysis in the relationship between User-friendly and User Acceptance.

TABLE 9. Correlation Analysis Between User-friendly and User Acceptance

Factor	Correlation value, r	Significant value, p
Usefulness	0.564	0.000

*significant value, p= 0.05

This indicates that the ease of use of the application affects user acceptance. With User-friendly applications it is easy for users to use to learn about renewable energy. The significant value is 0.000 which is less than the alpha value = 0.05, so it has very strong evidence to support that User-friendly has a relationship with User Acceptance. Thus, Hypothesis Ho2: There is no significant relationship between User-friendly and User Acceptable.

RELATIONSHIP BETWEEN QUALITY AND USER ACCEPTANCE

To determine whether there is a relationship between Application Quality to Consumer Acceptance, Pearson

Correlation statistics were used. In this study, the application that is easy to use is the result of a combination of mean Quality items on User Acceptance after using computer variables in SPSS. Statistical analysis of the relationship of Quality and User Acceptance found that there is a significant relationship between Application Quality and User Acceptance. Table 9 below shows the results of the correlation analysis between the Quality and Consumer Acceptance relationship.

TABLE 10. Correlation Analysis between Quality and User Acceptance

Factor	Correlation value, r	Correlation, p
Usefulness	0.074	0.525

*significant value, p= 0.05

This indicates that the quality of the application affects the acceptance of the user. With the existence of quality applications that increase children's knowledge of renewable energy learning. The significant value is 0.525 which is greater than the alpha value = 0.05, so has very strong evidence to support that Quality has nothing to do with Consumer Acceptance. Thus, the Ho3 Hypothesis: There is significant relationship between Quality and User Acceptance.

IMPLEMENTATION OF DIGITAL EDUCATION

RE education should be introduced from a young age during formal or non-formal education in line with the progress of digital technology. This is because mobile technology has upgraded the method makes the learning environment more interesting, eases the teacher to teach during the class, and enhanced the school and colleges throughout the world so that student can educate about the advantages of renewable energy and its efficient use.

There is a strong need to promote RE resources and encourage the use of the clean energy from renewable sources to reduce our dependence on fossil fuel like coal and oil which are harmful to the environment. Thus can be achieved by introducing the concept of RE to student at a young age through their formal education or after school programmes. Thus, mobile apps are a tool that aid in increasing the awareness of RE amongst student. Besides, it also able to motivate them to use RE sources for their immediate benefits and the future generation as well. Study shows that digital literacy is positively correlated with the education outcomes, especially with regard to language and mathematical skill. Additionally, evidence suggest that use of tablets may help to improve academic achievements of student in low-income countries, such as Nigeria and India though effective usage as an educational tool.

In the other sector, mobile applications have been created to reduce energy consumption. Energy efficiency and green living are money-saving strategies that are also environmentally benign, especially when applied to one's own home. Certain activities, such as turning down the lights and conserving water, are required. This is where an assortment of new smartphone applications come into play. These mobile applications are designed to aid homeowners in conserving energy by reducing their resource usage (Bekele, 2010. In addition to identifying infrastructure prospects, the app includes GPS technology, Bing satellite map views, and information regarding the viability of various areas to generate RE. The new technology also aids in lowering our everyday energy consumption. Locating local fuel pump stations is a simple method for owners of electric cars and other alternative-fuel vehicles to recharge/refuel their vehicles. The National Renewable Energy Laboratory developed a free mobile app for the U.S. Department of Energy's Clean Cities programme that provides information on more than 15,000 public and private alternative fuel stations in the United States that will promote a healthy environment by avoiding the use of fossil fuels as primary sources. The use of mobile applications has been effective in reducing energy use. Therefore, it is time for us to alter our teaching techniques for science courses in schools, beginning with renewable energy in every school. This study has also demonstrated that the use of mobile applications has a significant impact on the development of students' RE knowledge.

CHALLENGE ON DIGITAL EDUCATION

Although digital education is able to attract students' interest to participate in learning sessions, there is no doubt that there are some challenges that will be overcome to realize this goal. These challenges not only need to be handled well, but are likely to have adverse effects if not handled effectively. Therefore, cooperation between schools, parents, the community and even the government is necessary to ensure that this challenge of digital education can be overcome and have a positive impact.

There have been both beneficial and negative effects on children's education after a pandemic. They are totally immersed in the environment of the online classroom, both in terms of learning and discussion. More than two years into their children's exposure to online education, many

Malaysian parents are concerned about their children's growing dependence on electronic devices. Future generations and the wellbeing of children could be negatively impacted if this is not stopped. Among the challenges that will be faced in this digital learning are i) giving the effect of gadget addiction to children, ii) children potentially doing other activities during learning, and iii) limited fasilties. But, to educate and expose youngsters at the appropriate ages, M-learning's is undeniably crucial. Therefore, plans must be made to protect kids from the harmful consequences of technology while also ensuring they are not left behind in the digital age.

It's important to put restrictions on students' access to electronic devices. Based on the findings of this research, students are overjoyed and rapidly expand their knowledge, especially in areas that are challenging for them. Teachers need to employ engaging tools, such as tablets or real materials, to capture students' attention when teaching new concepts.

When students are using tables or other devices for M-learning, it is imperative that the teacher maintain complete control over the learning session. This is done to ensure that students continue to learn alongside the teacher and do not engage in any other activity during the time that the teacher is delivering instruction. Teachers frequently confront this obstacle in the midst of learning sessions, which results in students being unable to concentrate on the material at hand and preventing the teachers from accomplishing their goals for the day. As a direct consequence of this, kids will not be able to comprehend the following lesson because they will have missed the previous one.

Because of this issue, the number of students in the class needs to be decreased so that the teacher can concentrate on and maintain control over the activities that are taking place throughout the learning session. Students have the opportunity to not only obtain knowledge but also to simply ask inquiries whenever they require assistance. This study is also carried out with a limited number of students at any given time since it is essential to make certain that each student is able to concentrate and learn the information that is intended to be communicated to them.

A third obstacle that may also be faced in many developing countries is a lack of budget to offer the essential facilities. This challenge may also be confronted by the government. In order for this strategy to be effective, the school must provide M-leading facilities, such as tables, smartphones, or computers, as well as an adequate internet network. Nevertheless, in comparison to the more conventional instructional approach that is utilised in the present day, the cost of providing these prerequisites is relatively expensive. As a result, taking this into consideration, the government had to allot a specific amount of cash to pay the expense of supplying the essential gadgets and services.

CONCLUSION

In the research, the development of renewable energy apps looks positive which could attract children towards the apps. The increasing usage of mobile phones had increased the acceptance towards mobile learning. The result from this research shown majority respondents provide the positive feedback from the students on the renewable energy application. Majority students voted on totally agree and agree for all questions show the better impact to the knowledge on renewable energy. This renewable energy application provides the children with opportunity to access on various materials to gain information in renewable energy. The apps that include introduction, video, games, quiz and news encourage and motivating children to enjoy and eager to learn more on renewable energy topic.

The 4 subtopics of from the results (Likert scale presented min value are more than 4.5 which obviously showed the children are very happy and having fun with application that could benefits them from now with new knowledge of renewable energy.

In addition, learning renewable energy through mobile phone creates different learning surrounding. Interesting contents and enjoyable learning surrounding will attract children's interest to be more focus that will affect their acceptance and interest. From the feedback on this renewable energy application, the knowledge has been exposed to the children despite there is challenges in developing the apps. However, the study could be repeated with a larger sample size in order to generalize the results., most respondents had high satisfaction and positive attitude towards students from pre-school until secondary school for them to think wider on environment issue and importance of renewable energy technology in future. Renewable energy apps also could enhance learning in urban area because students can also access the same content to educate children about renewable energy from early age.

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DECLARATION OF COMPETING INTEREST

None.

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