The Use Of Mobile Learning In Teaching And Learning Session During The Covid-19 Pandemic In Malaysia

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Abstract

Mobile learning (m-learning) is a teaching and learning method during home learning during the covid-19 pandemic that hit the world. This situation demands teachers and students to conduct online learning sessions. Accordingly, teachers also need to be creative in finding alternative methods and strive to develop educational innovations to ensure that the teaching and learning process at home can be carried out effectively. The purpose of writing this concept paper is to discuss the twelve elements of m-learning to provide information to teachers to consider and apply it in teaching and learning sessions at home. The twelve elements are the definition and theory of m-learning, the development of m-learning in Malaysia, the difference between e-learning and m-learning, the characteristics of m-learning, basic features in m-learning, m-learning activities, the advantages of m-learning in teaching and learning, selection criteria for the use of the mobile application in m-learning, factors affecting m-leaning in education, the quality of mobile application features, the importance of the use m-learning in education and the issues and challenges of m-learning based on past studies. In addition, further research is also discussed in this concept paper. Based on past studies, m-learning is an appropriate alternative method used during this covid-19 pandemic for teachers and students to carry out the teaching and learning process at home.

Keywords: Mobile Application, Mobile Device, Mobile Learning, Covid-19 Pandemic, Teaching, and Learning.

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Introduction

Today, the education sector is the primary key in forming a nation and country in the development of social and economic sectors even though our country is still in the wave of the covid-19 pandemic, which is at a deep level. The Ministry of Education Malaysia (MOE) to take immediate initiatives to teach and learn at home. It requires teachers and students to use mobile devices in teaching and learning sessions at home. The advancement of modern and advanced technology in the digital age can be used as a catalyst in developing the world of education by using Information and Communication Technology (ICT) in education. Teaching and learning can be delivered effectively and efficiently using mobile device applications as educational technology tools.

The COVID-19 pandemic, also known as the 2019–2020 coronavirus pandemic is a globally ongoing 2019 coronavirus disease outbreak caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The outbreak was initially detected in mid -December 2019 in the city of Wuhan, Hubei China, and was declared a pandemic by the World Health Organization (WHO) on March 11, 2020 (WHO, 2020a). As of

December 10, 2020, more than 70 million cases of COVID-19 have been reported in at least 180 countries (preceded by the United States with over 15 million cases), resulting in more than 1.5 million deaths (worldometers.info/coronavirus, 2020). On 13 March 2020, the WHO announced that Europe had become a new center of the pandemic (WHO, 2020b). This situation caused panic almost all over the world where many countries including Malaysia took drastic measures to introduce the Movement Control Order (PKP) nationwide starting March 18, 2020, to curb the spread of Covid-19 from being infected to all Malaysians.

In Malaysia since the PKP which began on 18 March 2020 in line with the government's directive to close all schools and educational institutions, the Ministry of Education Malaysia has issued a directive for the implementation of Teaching and Learning at Home (PdPR) to be carried out at home (MOE, 2020). All educators, from kindergarten to tertiary education, use PdPR based e-learning methods such as WhatsApp, Telegram, Google Classroom, Zoom meeting, Google Meet, and many other applications to ensure that students do not drop out of learning. The MOE itself has reintroduced an educational TV program that is broadcast daily for 2 hours to ensure that all students have access to learning. In fact, on 22 April 2020, the trend showed that Malaysians were the 3rd most used country in the world to use the Google Classroom application in PdPR during the period when PKP was implemented and the 5th place for the past 12 months (Kim & Bog, 2021).

Mobile learning (m-learning) emphasizes the ability to manage to convert traditional learning to the teaching and learning process without recognizing the geographical factors in which the learning process takes place (Sharples, Taylor, & Vavoula, 2005). In the developed countries, m-learning has shown its effects on cognitive change, attitude change, and student motivation. The advent of mobile applications on smartphones has made exchanging study notes between students easier (Nagata & Abad, 2017). Students are no longer asked to sit in front of a computer to do learning activities such as searching for information. Learning activities can be conducted using wireless internet networks (wifi) or broadband services by the subscribed telecommunications company. Even the process of downloading notes and learning materials can be done at any time without limitation (Yadegaridehkordi & Alaa, 2017). Therefore, teachers should wisely take the opportunity to master the skills in using mobile applications such as android to apply m-learning Science, master the skills in ICT and wisely find additional sources of information for learning so that the effect can have a positive impact on students.

Definition and theory of mobile learning

M-learning is a learning method that uses mobile technology applied in teacher teaching and learning. The flexible mobile nature allows this learning to be easily carried out regardless of time, place, and distance boundaries (Taylor & Sharples, 2006). According to Sharples et al. (2005), m-learning should be unrestricted, and students can get input on a learning topic. He has concluded about the design of m-learning that teachers need to consider if they want to apply this theory in their teaching and learning sessions that teachers need to provide support and encouragement to students to gain knowledge through discussion and exploration sessions through group activities and collaborative learning is highly encouraged.

Teachers encourage collaborative learning and support students to interact to form their understanding. Formation of group activities with the help of mobile equipment, communication between teachers and students can be improved, and even student motivation also increased (DeWitt & Siraj, 2010). Communication is essential in teaching and learning to interact in active communication situations (Rafidatul Suib & Johari Surif, 2013). According to Vavoula et al. (2005), teachers must emphasize that the teaching and learning process should use technological tools to strengthen and build students' knowledge in collaboration between peers and teachers. Increasingly modern technological tools now need to be fully utilized by teachers to enable technological elements to be absorbed into education.

In addition, teachers should encourage students not to be tied to a single content, broaden the context of learning, and not be limited to a single piece of information alone. The information obtained is obtained from various sources as long as it is relevant and appropriate in the learning context. Furthermore, students need to be given the freedom to find and manage to learn information in today's increasingly advanced digital age. The information is easily accessible and can be obtained at our fingertips. This indirectly self-access learning can be applied simultaneously (Noor Haniza & Effandi Zakaria, 2017).

Development of m-learning in Malaysia

The development of education in Malaysia is proliferating. The Ministry of Education Malaysia (MOE) mobilizes various efforts to improve the quality of education in the country, including formulating curriculum syllabus from the Integrated Secondary School Curriculum (KBSM) to the Secondary School Standard Curriculum (KSSM) for secondary schools and primary schools. Curriculum reform from the Integrated Primary School Curriculum (KBSR) to the Standard Primary School Curriculum (KSSR). In this regard, KPM collaborated with Frog Asia in 2014 and Google Classroom in 2019 in the DELIMA application to introduce a learning environment in virtual classrooms to all schools in Malaysia to implement virtual and blended learning.

The application of ICT elements plays an essential role in the education system of a country. Through KPM and the Ministry of Higher Education Malaysia (KPTM), the Malaysian Government has mobilized efforts to plan various efforts and programs to help schools integrate m-learning culture. One of the efforts is the introduction of Frog VLE (Hasliza, Siti Munira & Zarina, 2016). In addition, the Smart Schools Program, Cluster Schools of Excellence (SKK), High-Performance Schools (SBT), and the Teaching of Mathematics and Science in English (PPSMI) are based on the application of ICT culture in teaching and learning (Abdullah, Ziden, Aman, & Mustafa, 2015).

Hussain and Shiratuddin (2017) argue that the injection of multimedia elements in teaching English using Digital Storytelling (PD) supports innovation in learning English. Mobile devices that use tablets have touch screen features, making it easier to use for user interaction such as text and images to make the PD more meaningful. Therefore, learning to use the mobile application is not just focused on Science, Mathematics, and Engineering, even in other subjects such as Bahasa Melayu (Jamaludin & Mohamed Amin, 2013). It makes mobile devices versatile for use in any field of learning. Furthermore, the findings obtained by Nuryanto (2013) said that ICT is a combination of complex hardware (hardware) and soft hardware (software) that can form high capacity at a relatively low price. Accordingly, the dumping of various brands of mobile devices in the domestic market provides an opportunity for consumers to choose the best mobile devices with their level of consumption and finance.

In the latest scenario of Malaysian education in the era of the covid-19 pandemic, teachers, parents, and students are required to connect and learn virtually with the help of mobile technology and internet connection regardless of the area, whether urban or rural. Home learning is applied virtually using the Google Classroom platform, Google Meet, Zoom App, Youtube, Quizizz, WhatsApp, Telegram, and Kahoot. These platforms allow teachers to provide exercises, notes, learning videos, chat, discuss virtually and give instructions from time to time. Although limited, teachers, parents, and students need to be prepared financially, mentally, and physically to face the challenges of this new norm. With the applications available in mobile devices, it is conducive for them to continue learning at home effectively despite certain constraints.

Differences between e-learning and m-learning

According to Sharples et al. (2005), m-learning is part of e-learning. Nevertheless, there are seven differences between m-learning and e-learning. According to Saedah (2004), there are seven aspects in distinguishing e-learning and m-learning. Table 1 below shows a comparison between aspects of e-learning and m-learning.

Table 1: The Differences Between E-Learning and M-Learning

Aspect	E-Learning	M-Learning
Ownership	Owned by an institution or privately	Owned private property
Devices used	Desktop computers in schools or institutions, or offices and personal computers at home	Personal mobile devices such as laptops, netbooks, tablet computers, and smartphones equipped with an internet network
Forms of learning	Learning is behaviourism, cognitivism for the majority of students. Students access courseware and materials online for learning	Personalized learning, situational learning, and authentic learning, discovery, access, and knowledge creation

Mobility for students	Students can access learning materials using a Local Area Network (LAN) or a compact disc.	Students access learning materials without time and place from the internet.
Learning Context	Formal learning in the classroom and at home	Formal and informal learning in the office, school, while traveling. In developing countries.
Ingredients organization	Learning materials in the form of courseware are delivered via LAN or CD ROMs or other storage devices, and learning materials in the form of objects via a Learning Management System (LMS) on the internet.	Learning materials in the large capacity form are sent via LMS via the internet or short message service (SMS). Students also generate content through discussion and interaction.
Knowledge	Knowledge is gained through cognitive processes and inquiry.	Knowledge is constructed through peer interaction and learning content materials.

The characteristics of m-learning

The characteristics of m-learning need to be systematically arranged. It includes applied learning activities (Mikhailova, Post, Schlautman, Xu, & Younts, 2021). Moreover, the length of time that m-learning takes place should also be considered (Rohayati, Ahmad Fauzi & Othman, 2012). In the daily teaching plan, teachers plan the learning that will be implemented before the teaching and learning session begins. The suitability of the mobile devices used and the learning content should also be emphasized to achieve the targeted learning outcomes in teaching and learning (Rohayati et al., 2012). Ozdamli & Cavus (2011) suggest that there are several features in the m-learning element. These features are in terms of:

Students: Students play an active role from goal setting to the assessment stage of learning. The role of students is to access information when needed, take responsibility for their learning, learn by following their learning style, know their learning style, share information or produce new products, do research with their peers jointly, conduct self-assessment and other group assessments.

Teacher: Books and other media elements store information. In addition, teachers present it to students in an m-learning environment. Teachers need to use technology to store information and provide more information that students can access. The role of teachers in m-learning is to be qualified and know how to use the tools. Mobile devices used, determine the strengths and weaknesses of the methods and studies used and wisely find solutions to overcome those weaknesses by using different methods, be a facilitator, acting as an advisor, gives trust to his students, learns with their students, motivates his students, organizes activities to support interactive interaction between collaborative groups and conducts m-learning assessment activities.

Content: M-learning content can be learned by students. Content should be agreed upon in consultation with stakeholders such as students, teachers, parents, and others. Otherwise, the teacher may not get the desired result. Learning content must enable users to obtain the information they need at a rapid rate. In addition, content can be presented with interactive games or quizzes. The m-learning content should also be incorporated with graphic video elements and other multimedia elements.

Environment: The environment must be well designed to get a positive learning experience. The teaching and learning in the m-learning environment must be conducive. Students also learn online as a whole. Students must have access to all unit content, including learning outcomes, assignment requirements, and related resources. Students can also receive in-class content and additional content online with mobile technology. The learning environment should be able to enhance the interaction between students and student-teachers. Wikis, social media, or blog sites can be used to enhance social interaction. This environment must use smartphones, laptops, and other mobile devices.

Assessment: Assessment is a critical component in complete m-learning. Mobile technology can evaluate student performance records and reports to teachers. Therefore, student assessments should be done through database logs, software packages, online exams, chat rooms, discussion boards, online quizzes, or project assessments. Students should also evaluate themselves and others. It provides the information needed to assess knowledge, skills, creativity accurately, and so on. Sharples et al. (2005) described the assessment as matched to the student's ability, offering diagnostic tests and formative tests to assess its effectiveness. The assessment will help students remove all doubts at the same time. A well-designed course should provide immediate feedback so that students can determine the extent to which they understand the course content. Feedback should not make students feel like they do not know anything. This assessment factor is significant for students after following m-learning.

Basic features in m-learning

M-learning has some basic features contained in it. Learning needs to be carried out at the right time and strategy. The planning, implementation and evaluation phases need to be done systematically to impact the students (Maulidizen, 2016) positively. According to Ozdamli and Cavus (2011), there are seven features mentioned in m-learning.

Mobility and spontaneity: m-learning is spontaneous and occurs immediately compared to other learning styles (Praxis, 2015). Therefore, the speed of m-learning is said to be fast and immediate. Wireless technologies such as laptops, palm talk, and mobile phones are revolutionary education from traditional learning to flexible learning (Ozdamli & Cavus, 2011).

Mobile devices: Mobile devices are mobility, easy to operate, and store (Abachi & Muhammad, 2014). Therefore, teachers and students can operate the mobile device conveniently despite its small size, but various functions can be used.

Blended learning: Cross-curricular learning can be integrated into m-learning (Al-Hunaiyyan, Alhajri & Al-Sharhan, 2016). For example, m-learning for Science subjects can apply entrepreneurship and moral values in experimental activities, while Physical Education can be applied to environmental education (Alabdulkareem, 2015). Teachers can also use mobile devices to do homework, create projects and activities of associations and uniformed units in the cocurricular (Soykan & Uzunboylu, 2015). Therefore, the implementation of blended learning can be combined with m-learning, making learning implemented online and digitally.

Personal: This means that only one student can access the mobile device when it involves downloading and uploading learning materials and interacting with teachers when online, face-to-face learning sessions occur (Taleb, Ahmadi & Musavi, 2015).

Interactive: M-learning needs to occur in an environment equipped with communication technology equipment infrastructure and mobile devices to bring an interactive culture into teaching and learning activities (Norliza, 2013). Students involved in m-learning are always active and can operate mobile devices prudently (Rohayati et al., 2012). Therefore, an interactive environment needs to be implemented by teachers. in addition, teachers should be prepared with teaching skills and ready-to-use devices. School facilities that use complete mobile technology equipment can create a harmonious and conducive learning environment.

Collaborative: Ronizam, Shahrul Niza, Norzaimah, and Dina Syafini (2016) argue that m-learning implements collaborative learning in the classroom. In comparison, Asrizal (2021) argues that interaction takes place bilaterally (teacher-student) or three-way (teacher-student-learning materials). Mobile technology supports communication between teachers, students, and the learning materials used (Vavoula et al., 2005). Therefore, collaborative learning strategies are suitable for use in m-learning because students are always active in teaching and learning sessions. Comprehensive learning makes students always able to be competitive with their peers, making the learning more meaningful.

Instant information: Learning using mobile devices can help students and teachers get information quickly (M.-H. Lin, Chen & Liu, 2017). Just one click of information is available at our fingertips. The high rate of urgency can be aided by high-speed communication technologies that use optical fibers widely applied in

developed countries today (Pei, 2021). According to Norazah and Helmi (2018), students can answer specific questions at a rapid rate. Learning content must be reflective so that learning does not become sluggish and dull. Thus, the provision of learning materials provided by innovative and creative teachers enables students to explore new opportunities in the context of existing learning outcomes.

M-learning activities
Every teacher who wants to apply their teaching and learning using the m-learning method needs to consider the following aspects through activities. Fernando (2020) pointed out that sixteen activities can be applied in m-learning, namely accessing information, uploading files and learning outcomes, finding information, learning materials, and resources, answering quizzes and exercises, giving tests and assessments, discuss information findings using social media platforms, continue discussions on issues and problems online, identify learning outcomes either individually or in groups virtually, evaluate learning outcomes using mobile devices, discuss assignments in small groups through media social, forums or blogs, presenting assignments using social media, uploading teaching materials constructed individually or in groups, creating assignments, online tutoring programs, uploading new findings and learning outcomes and building links related to subjects studied using the Quick Respond or Hyperlink method.

Advantages of m-learning in teaching and learning
Mobile technology plays an essential role in the field of education. Mobile technology can offer new opportunities for learning that go beyond traditional teacher-guided classroom scenarios. Advances in mobile and wireless technology have had an impact on educational settings. It has led to a new approach. The learning technology known as mobile learning or m-learning has been enhanced. During this time, many researchers from all fields, primarily academic and industrial fields, began to explore the potential of mobile technologies and devices to support learning (Sharples, Taylor, & Vavoula, 2010; Golenhofen, Heindl, Grab-kroll, Messerer, & Böckers, 2019). Developments in the field of mobile technology prompted the design of M-Learning projects. In addition, efforts and studies were also taken to design courses and build materials suitable for mobile devices (Hanbidge & Tin, 2020; Utesch, 2020)

M-learning has become an essential component of educational technology in higher education institutions. Most universities around the world have implemented m-learning to deliver learning anytime and anywhere in different ways. This M-learning is very important nowadays, especially in the field of education. Much evidence and support of research highlights that state m-learning can enhance learning (Henryk Hodam, 2020). Mobile technology assists students in raising awareness of technology, make conversations, participate in social media, find answers to their questions, facilitate collaboration in teams, enable knowledge sharing, and leverage their learning outcomes (Mostafa, Hatem & Khaled Shaalan, 2016).

Moreover, this m-learning can enhance collaboration among students and stimulate interaction between them and their educators (Keskisaari, Butylina & Kärki, 2016). It also allows students to learn, collaborate and share ideas with the help of the internet and technology (Mostafa, Hatem & Khaled Shaalan, 2016). SMS in learning can provide support, motivation, and continuity; warnings and reminders; summarize the content; introduction, tips, and reviews; study structure guide (Alijah, 2016). Students with disabilities can also benefit from this m-learning. This M-learning helps these disabled students and helps them to attend distance classes with the help of their mobile devices (Lindner, Rienow & Jürgens, 2019). According to Sharples (2005), m-learning allows students to develop their knowledge in different contexts and build their understanding. Cornetta, Touhafi, and Togou (2019) state that mobile technology has become an essential part of the educational process in higher education institutions as it brings many opportunities and challenges to students and academics.

M-learning can support social knowledge construction by enhancing critical thinking power, creativity, collaboration, and communication within sites and contributing to the construction of learning networks. It also encourages students to participate in all activities (Shi, 2021) actively. The teaching and learning materials delivered through these m-learning media have graphics, animations, text, audio, and video to attract students to interact with them (Naveed, Aseere, Muhammad & Islam, 2021). The mobile also provides the facility of discussion with groups and professional assistance of online content. Such information technology has enhanced the interaction between lecturers and students (Kim, Kwak & Bog, 2021) and facilitated class

discussions while changing the way lecturers interact with students (Sprenger & Schwaninger, 2021). M-learning allows students to have online discussions with lecturers and their peers at any time. In addition, two-way information sharing can also be done quickly, and students can acquire more learning materials.

Selection criteria for the use of mobile applications in m-learning

The selection factor of mobile applications is significant to ensure that learning sessions can be applied effectively. Teachers should ensure proper selection and in line with the facilities provided. In addition, this is to ensure that the teaching and learning session can positively impact the students and make it more fun and comprehensive. Seven criteria need to be emphasized by teachers who use mobile applications for the application of m-learning. Among them are:

Resources and literacy: Teachers need to identify the party that published the mobile application (Perez-navarro & Garcia, 2021), the date the software was built (Langford, Uehara & Scherer, 2021), and ensure that the software was published by a charismatic and trusted party (Hanbidge & Tin, 2020). Mobile applications also need to apply pedagogical and andragogy aspects well (Henryk Hodam, 2020). So that teachers can consider teaching strategies when using a mobile application.

Teaching and learning strategies using mobile applications: According to Shaaban and Chatila (2020), teachers can apply seven teaching and learning strategies during teaching and learning in m-learning. The teaching and learning strategies are drills, tests, problem-solving, exploration, games, simulations, and tutorials.

User-friendly: This third criterion is essential for a mobile application to be used effectively in m-learning. There are fourteen main elements in determining whether a mobile application is categorized as user-friendly. The content of mobile applications should be easy to understand (Renouard, 2018), mobile applications should be interactive (Rohaan, Taconis, & Jochems, 2010) and in line with the needs of the target group (Noor Dayana & Nurfatin Atikah, 2002). In addition, the language element (Oz, 2014) should also be emphasized. The language used should be easily understood by the user (Wasserman, 2010). Apps should also be fun (Darrow, 2009). Next, screen design elements need to be attractive and easy to use (Bidin & Ziden, 2013). The motivational aspect also needs to be emphasized so that consumers are always motivated and always want to use it regardless of time and place (Taylor & Sharples, 2006). The next aspect is that mobile applications need to have a branch of learning (subtopics) related to the main topic being studied (Hanbidge & Tin, 2020). Aspects of icons found in a mobile application need to be considered. The icons used should be easily identifiable by the user (Trinder, 2012). The icons used look organized and neat (Dold, 2016), easy to understand (Taylor & Sharples 2006). The mobile applications used need to have interactive elements to attract the interest and attention of users while using them (Taleb et al., 2015). A mobile application should allow the user to exit the application at the desired time without limit (Abd Majid & Husain, 2014). In addition, a mobile application needs to have learning activities that attract the interest and attention of users (Dold, 2016). So that users always have fun while using it. According to Leslie, Low, Jin, and Sweller (2012), mobile applications also need to be flexible in their use. Flexible means mobile applications can be used on any mobile device such as laptops, smartphones, tablets, and Chromebooks (Cheung, 2015). In addition, the mobile application used should have clearly understood instructions (Chachil, Engkamat, Sarkawi, & Shuib, 2015), presentation in the mobile application does not require facilitator instructions (Yunita, Nursechafia, Setiawan, Nugroho, & Ramadhan, 2018), good mobile application menu (Analisa, Rosseni, & Siti Zuraida, 2013) and simple applications the move is easy to operate even if the user is using it for the first time (Badusah & Amin, 2013).

Content: The content of a mobile application is also an essential aspect for teachers to consider whether a mobile application can be used. Almaiah, Jalil, and Man (2016) stressed that the content of mobile applications should be accurate according to the syllabus drafted by the Ministry of Education Malaysia (MOE). In addition, the arrangement of information in the application should be organized and orderly (Nawi & Hamzah, 2013), and the time of use of mobile applications allocated sufficient (Trinder, 2012). Further, Providing examples in the content of mobile applications should also be emphasized. Therefore, the examples given in the content of a mobile application should be adequate (Taleb et al., 2015), realistic (Taylor & Sharples 2006), accurate (Abd Majid & Husain 2014), and appropriate (Mohd Paris, 2016) for users to understand a learning content. Another aspect that teachers need to consider is that the content is concise,

easy for users to understand (Balacheff, Ludvigsen, De Jong, Lazonder, & Barnes, 2009), and users are easier to understand the learning content after using the mobile application (Camilleri & Camilleri, 2017).

Media: Media is also the backbone of a mobile application. An excellent mobile application has video clips (Hanaa Youssef Shaarawy, 2014) that help users understand the learning content. In addition, the use of text in applications is easy to read and clear (Olasina, 2012). The use of colour should also be appropriate to attract consumers' attention (Azizah Jaafar & Siew Lee, 2018). The use of colour for children needs to be bright (Soykan & Uzunboylu, 2015) to stimulate the interest of children's consumers (Jeng, Wu, Huang, Tan & Yang, 2010) so that they do not get bored and have fun while using it. In addition to visual elements, the use of audio elements is also essential. Non -excessive use of audio is necessary so that the attention of other users is not disturbed (Irwan Mahazir, 2015) and helps the teaching and learning process (Thaden, 2014). In addition, interesting graphic aspects also need to be applied. Attractive graphics will make a quality mobile application (Y.-C. Lin, Liu, & Sweller, 2015). Animation elements should also look attractive to users, especially children (Cheong, Bruno & Cheong, 2012). The included animations should help the user to understand the content of a learning topic (Renouard, 2018) and not distract the user's focus while using it (Wasserman, 2010).

Teaching and Facilitation Process: This aspect is related to the usability of mobile applications used in teaching and learning. The usability aspect is a practical session on whether a mobile application is suitable or not for use (H.-C. Huang, Wang, & Hsieh, 2012). A mobile application produced should be relevant to the actual and existing knowledge of the students (Cheng & Su, 2012). Mobile learning objectives need to be clearly and explicitly stated (Chen, Liu & Hwang, 2016). Therefore, the stated learning objectives can be easily achieved. Mobile applications should also be given the freedom to select and browse any of the titles and subtopics found in the mobile application without being bound to specific instructions (Wu, 2019). This provides space for users to explore information (Nurahimah & Muhammad Nidzam, 2016) and form self-directed learning (Mohamad Siri, Norazah & Pajuzi, 2016). Mobile applications should also have references (Bidin & Ziden, 2013) and links to specific websites and act as additional references to users (Nilgun Ozdamar Keskin & David Metcalf, 2011). In addition, exercises, quizzes, or tests can be placed in the app to test user comprehension (Taleb et al., 2015) . Presentation screens in mobile applications also need to attract and inform users (Zanaton & Saufian, 2012). Elements of teaching and learning delivery in applications are also emphasized. The teaching and learning presentation in the application must be appropriate to the user's learning style with exciting and structured skills (Mayer, 2001). To support constructivism theory, cognitivism, and the 21st-century learning model, mobile applications can stimulate users to think (Renouard, 2018), multilateral communication (Jeng et al., 2010), implement group activities (Y. M. Huang, Lin & Cheng, 2010), stimulate active learning (Sutikno, Handayani, Stiawan, Riyadi & Subroto, 2016), provide space for users to reflect at the end of the lesson (Lindner et al., 2019), has an effective cover (M.-H. Lin et al., 2017) and can enhance the user experience (Lin Karmila Yusri, 2014).

Factors affecting m-learning in education
Educational applications are used to increase the motivation level of students and teachers to make learning easy and fun. Domingues (2009) stated that mobile applications facilitate teachers to convey information and stimulate students' interest in teaching and learning. Mobile applications are also a catalyst for teachers to deliver learning content using sensory stimuli such as sight, hearing, and touch. This increases the interest and attention of students. The factors affecting m-learning in education are:

The device features: Mobile devices need to have features such as ease of use, lightweight, portability, and flexibility to use. In addition, mobile devices need various features and functions (Krish, Hussin, Manap & Amir, 2012). Mobile devices can be categorized into three aspects: usability, functionality, and technical nature ((Kelly Walsh, 2010).

Usability: In terms of usability, mobile devices are lightweight, small portable devices (Stefanovic & Klochkova, 2021; Aeni Zuhana & Khairun Salwa, 2015; Kurniawati & Ermawati, 2020). With this function, students do not need to carry a heavy bag full of books. Students will feel free because of its flexible nature and can be carried in any situation, time, and place. This will make it easier for students not to be tied to books anymore.

Functionality: Mobile devices provide an opportunity for teachers and students (Ozdamli & Cavus, 2011b) to gain information spontaneously (Sharples et al. 2005). Sofia Sakinah (2013) stressed that mobile devices provide time for teachers and students to get fast, authentic information, such as getting mathematical formulas, information about assignments, and knowing the definition. Thus, mobile devices provide meaningful instant information to enrich information. The mobile device also strengthens the relationship between the teacher and his students, making the goodwill between the teacher and his students always in good shape.

Technical In nature: By using a mobile device, all the technical aspects are in it. The relevance of information between one application to another application is always closely related, e.g., using the Facebook application, users can link it with Instagram (Salomon, 2013). For example, photos and videos uploaded into the Facebook application can be uploaded into Instagram as well. Moreover, Ramamuruthy and Rao (2015) argue that m-learning allows students to obtain as much learning material in no time and with geographical limitations. Robledo (2015) pointed out that m-learning is also not influenced by time constraints and students' geographical factors. Therefore, the flexible factor found in it can make students motivated to follow the learning. Students can access information and learning materials non -stop due to the location because it takes place in various places and situations. Another technical factor is that teachers and students need to be skilled in using mobile applications and know-how to operate mobile devices in teaching and learning sessions (Frydrychova, 2015). What a loss for teachers when there are technology facilities in schools, but teachers do not have the solid skills to manipulate them. The willingness of teachers is also essential to implement car learning in their teaching and learning. Frydrychova (2015) added that the level of readiness of teachers needs to be high so that the application of car learning can be carried out effectively when the readiness of teachers at a high level of communication between teachers and students can be carried out smoothly with the help of mobile applications as a catalyst.

The quality mobile application features
According to Norhasyimah, Siti Nadiah, and Siti Nur Kamariah (2017), there are seven features of quality mobile applications that need to be emphasized by teachers.

Accessibility: The essential feature that must be considered is an application's ability to be used anywhere and regardless of time.

Functionality: Each of these mobile applications can work well and smoothly. In addition, the mobile application can meet the characteristics of the needs of its users.

Reliability: An application's ability to maintain good performance without interruptions can reduce the user's confidence to use it in a certain period.

Usability: The mobile application can be used smoothly, and there is an evaluation element for users to assess the level of achievement individually, either explicitly or implicitly.

Efficiency: The ability of a mobile application to bear the relationship between the level of performance and the number of resources used under predetermined conditions.

Maintenance: The designed mobile application must be maintainable so that the application's performance is at an optimal level. Efforts to make changes need to be continued for modifications to remain relevant.

Mobile: The ability of a mobile application to be used and transferred from one environment to another.

The importance of the use of m-learning in education
Abachi and Muhammad (2014) stated that the latest communication technology not only simplifies daily human affairs but is a valuable tool to improve teachers' teaching methods. M-learning provides opportunities for students to complete skills and utilize the best technological facilities to achieve learning outcomes. Moreover, Heflin, Shewmaker, and Nguyen (2017) argued in their study that m-learning can be associated with positive perceptions about collaborative learning but contributes to procrastination among students. Furthermore, the data indicate that students 'level of critical thinking is highly related to the technical

instruments used to produce written responses compared to group learning techniques. Students exposed to mobile devices had better levels of critical thinking than students who used computer keyboards or students who wrote responses by handwriting.

Therefore, As noted by previous researchers, it is essential when developing instructional programming. The central aspect that needs to be emphasized is to consider a design to ensure that mobile devices and educational applications create opportunities to enhance student learning rather than complicate or disrupt teaching and learning sessions. . This can provide a space for students to show initiative to learn in their peer group as they are responsible for discussing and making product innovations in the final assessment.

According to Palmatier, Houston, and Hulland (2017), small groups can build teachers 'teaching effectiveness in collaborative activities using mobile devices. Teachers play a role as facilitators in m-learning by providing stimuli to students in instruction and supporting m-learning meaningful learning in addition to m-learning using mobile devices such as smartphones. M-learning can also use tablet computers because of their portable nature and having almost the same features as smartphones, although different in size (Palmatier et al., 2017). They pointed out that tablets can support them-learning of school children of all ages learn in various situations. The tablet features integration with various features in one device, including various sensors found in it and a high-quality touch interface display to allow students to manipulate objects. In addition, tablets can be thought of as alternative mobile devices used in the classroom. If used appropriately, this benefits students. Tablets may be better used in conjunction with other resources such as personal digital assistants and laptops. In other words, tablets can be used digitally or non -digitally.

According to Martin and Ertzberger (2013), students who use mobile devices, namely iPad and iPod, have significant differences in the mobile learning-based treatment group regarding their academic achievement and attitudes. The study's findings showed that students who used iPad and iPods in teaching got higher scores in the test compared to the group that followed the conventional teaching method. Regarding student attitudes, the treatment group that used the iPad had the highest attitudes in the attitude survey. In addition, students who use iPads feel excited and motivated by new technologies compared to the group of students who use computers in teaching and do not have access to mobile devices.

Teaching and learning that uses animation elements will help students build scientific concepts and skills that are schematic, essential processes. They can help transfer learning from the text (Aeni Zuhana & Khairun Salwa, 2015). The use of animation in the stages of teaching and learning can improve students' academic performance in a subject (Fazzlijan, 2015). Application designers sometimes have trouble determining various variations for effectiveness in achieving objectives to improve student achievement (Cheng & Su, 2012). In addition, the use of animated elements in interactive multimedia mobile applications is considered to facilitate students to understand an abstract concept. Although teachers are the primary source of reference for students, the mobile application developed can be a teaching aid to facilitate the teaching and learning process in the classroom to be effective (Taufiq, Amalia & Parmin, 2017). Therefore, effective strategies must be considered to ensure that effective learning can be applied to master the facts and concepts in terms of selection and processing of information in the appropriate context.

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Herrington and Mantei (2009) argue that animation through multimedia learning has a significant effect on verbal learning (audio). The integrated use of visuals and spaces such as animated elements, images, graphics, photographs, video, and text is critical in developing mobile interactive multimedia applications to help the teaching and learning process become more dynamic (Paul, 2014). Learning that incorporates animation elements can take students' focus and attention to a topic and has great potential to facilitate the understanding of an abstract and complex concept of Science (Mahat, Fauzi, Ayub & Luan, 2012). A study conducted by

K. Al-Balushi & S. Al-Balushi (2018) found that the use of animated text in stages will make student achievement more improved than using static graphic text. Therefore, Taufiq et al. (2017) believed that graphic animation developed for education should have specific strategies integrated to ensure that learning can be carried out effectively. As such, students will be able to process an abstract fact in an appropriate context.

This indicates that the application of the them-learning method shows a better effect in terms of academic achievement and attitude change in learning compared to learning using the computer. Therefore, teachers need to take the initiative to switch to using mobile devices in their teaching. Since the new generation has now been exposed to advanced mobile technology since they were little, they are more interested in m-learning than the old method, which only helps with textbooks.

Issues and challenges of m-learning

Education has changed from formal education to e-learning and m-learning and overgrew globally during the covid-19 pandemic. Various types of advanced equipment have been introduced in the world of education, which has brought us to a level that has challenges in its implementation. This positive development has changed the traditional way of teaching and learning to computer-based virtual learning. Now it has also been replaced and enhanced with the use of sophisticated gadgets. Thus, this development has changed the form and atmosphere of learning that goes beyond the classroom space (Norazah, Mohamed Amin & Melor, 2010) is global (Cornetta et al., 2019) and promotes lifelong learning (Mullen & Milechin, 2019). Although m-learning promises many advantages, like the implementation of other technologies, m-learning has many issues and challenges that need to be addressed.

Attitudes towards m-learning technology are essential factors that help determine whether students and teachers are willing to use this m-learning. Such attitudes will identify strengths and weaknesses and facilitate the development of technological infrastructure (Faham & Asghari, 2019). Before implementing m-learning, the excess focus should be given to the learning process, such as specific learning needs and pedagogy-related matters rather than the equipment used. The implementation of m-learning requires the cooperation of all parties in the schools to develop appropriate theories, strategies, and techniques, considering all aspects (Chachil et al., 2015). Among the aspects that need to be given attention are the management system, preparation and evaluation of learning materials, the preparation of teachers to use the technology, and how teachers will assess students (Mingsiritham, 2016). For example, how can a teacher who is not familiar with technology record the learning material to be taught without attending the real classroom before sending the recording to students via the 4G or 5G system?

Some of these problems and constraints have existed in most educational institutions since implementing home teaching and learning. The main problem is the lack of skilled teachers in the development of m-learning content in the form of multimedia and interactive (Farooq, 2019). The next issue is, in terms of technical aspects. The use of mobile devices in the teaching process in learning is less effective because the screen size of mobile phones is small and will limit the ability to display information clearly and cause the information presented to be concise. Suppose the information provided is long and many. In that case, it will be difficult for students to see or read the information because the display will be small, and students will be unclear and lack understanding of the information (Hanbidge & Tin, 2020). Students also have difficulty navigating the necessary additional information via buttons. It is because the button is too small and difficult to press (Utesch, 2020). Also, some mobile devices have only a minimal amount of storage, making it difficult for students to store downloaded learning materials (Fazzlijan, 2015).

Networks that provide m-learning may also experience difficulties as users and materials increase. Plus, internet access in rural areas is poor (Jamalludin & Nurul Syazwani, 2016). This mobile device also needs to be changed frequently so as not to interfere with the learning process. Extended network usage will cause the phone battery to deplete quickly (Almaiah et al., 2016) easily. To date, it is impossible to use applications developed for desktops or laptops in mobile devices. Prices for wireless mobile devices are still high (Yuni Sartika, 2016). Not all students can own a mobile device that can support m-learning. It is because everything is expensive for needy students. In addition, teachers are also unable to convey all learning information to students through m-learning.

The MOE has provided various types of infrastructure for the convenience of students and teachers to support the implementation of e-learning. ICT facilities such as LCD projector, Wifi connection, and even Chromebook. However, some of this equipment needs to be repaired. These types of equipment require regular maintenance to ensure that the teaching and learning process is not disrupted (Azmiza Saemah & Ruslin, 2014). Teachers also need to work harder in improving the skills of using m-learning that involves technological knowledge and need to know how its use can make the teaching and learning process more effective (Christensen & Knezek, 2017). The future of mobile learning depends on the level of social acceptance it receives. From a social point of view, m-learning is seen as contrary to teaching methods in Malaysia. It is because the learning system in Malaysia emphasizes good relations between students and teachers.

Meanwhile, m-learning has no face-to-face communication and good relationship between students and teachers. With this, teachers are not able to identify the strengths and weaknesses of students. This results in the teacher not being able to shape the personality of the student. It can be said that the use of m-learning seems to limit the relationship between students and teachers. In addition, the dependence on m-learning will limit students' ability and eventually become weak and affected by technology such as experiencing a "telephone addict" where life is too dependent on mobile phones.

Proposed future studies

In Malaysia, the study on mobile applications in m-learning is still at an early stage compared to other countries. Nevertheless, local researchers are increasingly interested in exploring the potential of these applications towards improving the quality of teaching and learning. To further enhance m-learning among students and teachers, and m-learning learning modules in primary and secondary schools should be developed to facilitate the learning process. They can be a guide and reference to be applied in the future.

Skills in using the latest applications and e-pedagogy knowledge need to be applied to all teachers so that PdPR session either face to face or online is always relevant with the changing times. This study is an introduction to more meaningful studies after this. Therefore, the current perceptual study only focuses on the implementers, ie teachers cannot give an overall picture of the implementation of PdPR in primary and secondary schools throughout Malaysia. It is proposed for future studies, the design and development of a mobile application specifically for PdPR that is suitable to be conducted on urban and rural students to view and compare the findings from both teachers and students. It is hoped that this study can provide input on the implementation of PdPR during the post-covid-19 pandemic and open a new leaf towards 21st-century education where the digitization of education is an inevitable thing.

Conclusion

From the explanation of the findings of previous studies, it can be concluded that the implementation of m-learning is an additional requirement in the education of the new millennium. The role and needs of mobile devices in the teaching and learning process can positively impact teachers and students. Teachers need to start with simple concepts and need an approach that suits students. While the ICT element can make the work of teachers and students fun in education, those students should change attitudes and be motivated and skilled through a teacher-organized approach. This study can provide teachers to apply the device in the teaching and learning process. Furthermore, m-learning provides broad access to teachers to impart knowledge and teaching outside the classroom regardless of time and place limits. The relationship between teachers and students can be strengthened because they can always communicate with each other through social media even if they are not studying face to face at this time.

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