



# Establishing Mobile Learning Elements using Competency-Based Education Framework

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**Abstract:** The development of wireless and mobile technologies has contributed to the use of mobile devices as a teaching medium in teaching and learning process. Mobile Learning or M-Learning is a recent E-Learning environment. Unlike traditional learning settings, it has been introduced as a digital learning technology leading to new types of learning through the availability of mobile devices. The purpose of this study is to explore Mobile Learning elements based on Competency-Based Education (CBE) in Technical and Vocational Education (TVET) field. A qualitative study has been done on the six experts which were an expert in Competency Based Education field. The experts were chosen based on specific qualities to obtain the most relevant data via semi-structured interview. The transcribed interview data were analyzed by using thematic analysis using Atlas.ti software to produce elements and matrix tables related to appropriate elements. Based on the qualitative results, eight elements were formed: students, teachers, content, learning design, learning activity, learning environment, technology and assessment. The study generates the implementation framework to utilize the mobile device as a supporting element in teachers instruction and to improve student competency. In conclusion, the development of mobile learning framework provides better understanding and essential for the future of education.

**Keywords:** Mobile Learning, M-Learning, Competency-Based Education, Technical and Vocational Education (TVET)

## 1. Introduction

The world education system is currently undergoing major changes in the delivery system based on the development of Information and Communication Technology (ICT) supporting 21st century learning. In 21st century learning, technological changes in learning, such as E-Learning, have led to the use of technology in the field of Technical and Vocational Education Training (TVET). TVET is the most vital aspect of education in producing human labour to meet the needs of the job market (Manap, Hassan, & Syahrom, 2017). The concept of E-Learning is where learning activities take place through internet channels, network systems or without networks using electronic technology. The use of this electronic technology includes web-based, computer-based learning, virtual learning and digital collaboration (Hamzah, 2016). In line with the rapid development of wireless network technology and various mobile devices, the learning mode has expanded from online learning electronically (E-Learning) to Mobile Learning (M-Learning) (Harteis, Gruber, & Hertrampf, 2010). Mobile Learning is a learning using wireless cell mobile and portable device. It enables the learner to access the learning material, lectures and seminar anywhere and whenever without being tied to time and location (Holzinger, Nischelwitzer, & Meisenberger, 2005; Saleem, 2011). Mobile devices that allow M-Learning include smart phones, MP3 and MP4 devices, personal digital assistants (PDAs), tablet computers and other portable devices (Yorganci,

2017). The use of this mobile technology is not intended to replace the role of teachers as the main source of teaching materials, but it is about creating a significant learning experience and creating a new learning environment that can help in preparing the students in building knowledge and master the skills for the future.

Nowadays, in line with technological development, skilled labour is very important. To produce skilled workforce, the teachers are required to apply various strategy in teaching to produce quality graduates (Manap et al., 2017). TVET aims to increase the supply of skilled human capital through the delivery of quality training programs to ensure students are competent in the knowledge, skills and attitudes or values needed to succeed in work environment (Abd Rahman & Mohd Hashim, 2011b; Anane, 2013). In addition, the concept of competence is the ability to perform tasks in the workplace (Rahman, Hanafi, Mukhtar, & Ahmad, 2014). In order to produce skilled, flexible, and easily trained manpower, teachers must strengthen the delivery of training and develop teaching methods from conventional to 21<sup>st</sup> century pedagogy (Hassan, Ibrahim, & Yaakub, 2018; Ismail et al., 2018). One of the method are by implement mobile learning (Azmi, Mat Noor, and Mohamed, 2017) that will gives a positive impact to TVET students by giving them a higher chance of being accepted to work and quickly adapting to real work situations. The transition from conventional learning system to holistic learning is expected to improve the quality of teaching programs in technical and vocational educational institutions. Competency-Based Education (CBE) is a leading paradigm for innovating technical and vocational education and training today. Competency-Based Education (CBE) is a structured approach to targeted learning and assessment towards achieving certain results.

CBE goals is to prepare students effectively for real workplaces, which means that the acquisition of competences takes into account the requirements of companies and industry (DeiBinger, 2005). Besides that, the self-paced and flexible structure of CBET programs encourage learners to become responsible for their individual learning process. CBET is an approach that very suitable for training in Technical and Vocational Education (TVE) because it emphasize on the curriculum focused on the acquisition of employable and lifelong skills (Ayonmike, Okwelle, & Okeke, 2014). Learning outside the classroom gives students the opportunity to learn authentically through real work. this becomes a challenge to teachers as teachers face difficulties in providing real learning experiences to students (Guthrie, Harris, Simons, & Karmel, 2009). (Sturing, Biemans, Mulder, & de Bruijn, 2011) highlighted ten principle of CBE which are (1) The study programme is based on core tasks, working processes and competences (the qualification profile), (2) complex vocational core problems are central (3) Learning activities take place in different concrete, meaningful vocational situations, (4) Knowledge, skills and attitudes are integrated in learning and assessment processes (5) Learning activities take place in different authentic situations (6) Students are stimulated to take responsibility for and reflect on their own learning (7) The study programme is structured in such a way that the students increasingly self-steer their learning (8) The study programme is flexible (9) The guidance is adjusted to the learning needs of the students and (10) In the study programme attention is paid to learning, career and citizenship competences.

Besides that, wworkplace experience learning is important component in CBE because it affords the students the chance to put into practice in a real work situation what he/she has been taught in order to perfect his/her competences (Anane, 2013). The learner's skills, knowledge and understanding against the standards (occupational standards) laid down for a particular unit are measured (Ayonmike et al., 2014). CBE also emphasis on student-centred approach with a small class sizes to enable CBE effectively implemented. The estimated number of students in a class to implement the CBE approach is 16 to 20 people. However, it was found that there is a large number of students in the classes (Kanyonga, Mtana, & Wendt, 2019). As a result, it required skilful and creative teachers with relevant training to deliver CBE to fulfil the demand. This is difficult because the teachers are low qualified and not skilled (Anane, 2013; Rahman et al., 2014; Tambwe, 2019). On the other hand, the teachers prefer to use traditional approach and use the simplest learning resources such as handout, lecture/talk or sometimes no sheets provided (Khamsang, Methapatara, & Sintanakul, 2018). Due to poor instructional methods, it leads to the declination of the quality of TVET graduates (Kiadese, 2011) and lack of actual work experience among students (Maina, Kahando, & Maina, 2016).

The integration of mobile learning with competency-based education approach is one of the new alternatives, which can be implemented in technical and vocational education. This integration model is needed to ensure the quality of teaching and learning that will benefit the students and at the same time diversify alternative methods to improve student performance in TVET (Irwan Mahazir, Norazah, Rosseni, Azwin Arif, & Ridzwan, 2015). In this study, the integration of mobile learning and competency-based education is defined as a learning model using mobile device as a learning medium to enhanced student competency based on elements in Competency based education approach. The focus of this research is how to integrate mobile learning and competency-based education to be implemented to diversify teaching approaches and increase student competency. Therefore, this study aims to explore the elements that need to be considered to implement Mobile Learning based on Competency-Based Education.

## 2. Methodology

### 2.1 Research Design

The researcher uses qualitative research in this study to understand the situation or phenomenon studied in depth. The design of this study is qualitative in nature involving case studies. Researcher uses qualitative study because it helped

the researcher to gather information in understanding informants' perspectives on their lives, experiences, or situations in detailed (Majid, Othman, Mohamad, Lim, & Yusof, 2017; Taylor, Bogdan, & DeVault, 2016). Case studies are usually conducted because researcher is interested in exploring, interpreting, and gaining an in-depth understanding of the case (Creswell, 2012; Othman Lebar, 2018). Thus, this study focuses on the researcher's goal to explore significant factors in the implementation of M-Learning based on Competency Based Education. An interview were conducted as data collection technique. According to Ryan, Coughlan, and Cronin (2009), interview is a flexible and useful method of collecting data and is especially appropriate for collecting information on participants experiences, belief and behaviors. In this study, the researcher used a semi-structured interview by preparing questions, recording and writing the answers given by the respondents to find out the elements related to the implementation of M-Learning. The researcher interviewed the respondents by asking open-ended questions and give respondents the freedom to express their responses. Expected answers are not provided and all possible answers from respondents are accepted. This format allows the researcher to respond to the situation at hand, to the emerging worldview of the respondent, and to new ideas on the topic (Merriam, 2009).

The data was collected through semi-structured interviews lasted from 20 to 40 minutes on average conducted by the researcher from August 10, 2020 to September 9, 2020 over face to face and online video conferencing due to nationwide lockdown arising out of the outbreak of COVID-19. The semi-structured interviews that have been conducted involving a panel of six experts using an interview protocol as the instrument.

## 2.2 Sampling and Data Collection

The samples for data collection in this study were obtained using purposeful sampling method. According to Etikan (2017) and Sharma (2017), the purposive sampling method is a sampling techniques that rely on the judgment of the researcher as to who will provide the best information to succeed for the objectives study. Six respondents have been chosen for a specific purpose by using purposive sampling. According to Cohen, Manion and Morrison (2018), purposive sampling is used in order to access 'knowledgeable people', in other words, those who have in-depth knowledge about particular issues. There are two criteria to select study participants. First, they have at least five years of experience in technical and vocational education. Secondly, they are directly involved in improving student skills through competency-based education approach. According to Berliner (2004), in the field of education, individuals with more than five years of experience in their specific field can be referred as an expert. Full explanation was given to the respondents regarding the nature of the research and the format of the interview and researcher has obtained expert consent before the interview started. While interviewing, the respondents were probed a question in order to collect detailed information and gain a deeper understanding of the context. The interviews were audio taped, transcribed and interpreted. Thematic analysis was used for identifying, analyzing and reporting patterns in the data. The data was analyzed by extracting elements or generalizations from evidence and organizing data to present a coherent, consistent picture (Neuman, 2014).

## 3. Data Analysis

### 3.1 Background and Context

The respondents consisted of 4 males and 2 females. Each of them was selected from Institution 1, Institution 2, Institution 3, and Institution 4, while two of them were from Institution 5. Three of them are Associate Professor, two are Senior Lecturers and one is the Head of a Department. They are lecturers with experiences in teaching and working in Higher Education Institution and Skills Training Centre in Malaysia associated with TVET implementation and instructions based on Competency-Based Education. All respondents (N = 6) are individuals who are directly involved in Technical and Vocational Education field. Table 1 presents the demographic of the interviewed respondents:

**Table 1 - Demographics of interviewed respondents**

Participant code	Gender	Academic Qualification	Position	Institution	Teaching Experience
TB/S1	Male	Doctorate	Senior Lecturer	Institution 1	21 years
TB/S2	Female	Master	Head of Department Electronic and Multimedia Unit	Institution 2	21 years
TB/S3	Male	Doctorate	Associate Professor	Institution 3	34 years
TB/S4	Male	Doctorate	Associate Professor	Institution 4	21 years
TB/S5	Male	Doctorate	Senior Lecturer	Institution 5	12 years
TB/S6	Female	Doctorate	Associate Professor	Institution 5	22 years

### 3.2 Elements to Implement Mobile Learning based on Competency-Based Education

From the thematic analysis, eight elements were formed. There are students, teachers, content, learning environment, technology, assessment, learning design and learning activity. Direct quotations are used to explain these elements. The results of interviews related to the implementation of M-Learning based on Competency-Based Education are shown in Table 2:

**Table 2 - Elements and indicator formed from interviewed respondents**

Elements	Indicator	TB/S1	TB/S2	TB/S3	TB/S4	TB/S5	TB/S6
Students	Students Readiness	/			/	/	
	Students Diversity	/			/		/
	Students Characteristic	/	/	/			
	Students Role		/	/	/		/
Teachers	Teachers role as Material Provider	/		/	/		/
	Teachers role as a Material Designer	/			/		
	Teachers role as Planner	/		/			/
	Teachers role as Facilitator	/		/	/		
	Teachers Readiness	/	/	/	/		
	Teachers role as Evaluator					/	/
	Teachers Characteristics	/	/	/	/		/
Content	Content Design	/	/	/	/	/	
	Content Selection	/	/	/	/	/	/
	Content Arrangement		/	/		/	/
Learning Design	Learning Objective	/	/	/			/
	Teaching Activity	/	/	/	/	/	
	Student-Centred Strategy		/	/	/	/	/
	Materials-Centred strategy		/	/	/		
Learning Activity	Activity selection		/	/	/	/	
	Learning interaction	/	/	/	/	/	
	Assessment activity		/	/			
Learning Environment	Learning Situation	/			/	/	
	System Support			/		/	/
	Learning Materials	/	/	/	/	/	/
Technology	Mobile Device Hardware Specification	/	/		/	/	
	Mobile Learning Software		/		/	/	/
	Mobile Learning Infrastructure	/	/	/	/		
Assessment	Assessment Characteristics	/	/	/	/	/	/
	Formative Assessment	/			/	/	
	Summative Assessment	/			/	/	

Firstly, the researcher discovered that the indicators which formed the element of 'students', consist of students' readiness, diversity, characteristic and role.

*".....when I give a task, the student can do the task regardless of time or regardless of the level of speed to complete it"*  
(TB/S1)

*"For me, the skills that the student needs to have are the skills of using Mobile Learning itself"*  
(TB/S4)

*"context we look at the characteristics of the student, then how they wants to use the mobile"*  
(TB/S1)

*It can cause a person to learn independently, self-directed, and self-reliance learning. Students explore on their own"*  
(TB/S3)

Secondly, the indicators which formed the element of ‘teachers’, consist of teachers’ role as material provider, material designer, planner, facilitator, evaluator, teachers’ readiness and characteristics.

- “The teacher has to provide materials that support him for this self-learning.”* (TB/S4)
- “Teachers can be content developers. If the teacher has the expertise, he can do everything.”* (TB/S1)
- “.... may need to create a task for students for how many hours of context hour for this self-directed learning.”* (TB/S6)
- “In terms of instructor he must equip himself with ICT, more literate with ICT. Instructors have to explore no matter what age you are.”* (TB/S2)
- “teachers can also ask students to update progress at each level. Maybe the student has followed the learning in the workshop, he needs to update his project through mobile”* (TB/S5)

Apart from ‘students’ and ‘teachers’, ‘content’ is also an acquired element. Indicators for ‘content’ element are Content Design, Content Selection and Content Arrangement.

- “we focus on content as a whole. in terms of learning outcome, student learning time and assessment.”* (TB/S1)
- “Learning materials must be user friendly”* (TB/S4)
- “So to create a real learning situation atmosphere, teachers need to bring that mood. That means if the picture, the real picture, if the video, the real event.”* (TB/S4)
- “the competency steps shown must be clear, steps 1 steps 2, steps 3”.* (TB/S2)

Next, ‘learning design’ element is represented by learning objective, teaching activity, Student-Centred Strategy and Materials-Centred Strategy.

- “The teacher must understand what the learning outcome (LO) is. So interactive materials are given, which can increase knowledge. The strategy for teaching must depend on LO. teacher knowledge, that's what matters.”* (TB/S1)
- “In terms of delivery, the teacher's instructions have to be one by one. The teacher shows the students how to work one by one.”* (TB/S2)
- “The principle of this mastery is to ensure that the student masters some knowledge before learn other knowledge. That is one of the good things we can control with this mobile”* (TB/S1)
- “.... can include lectures, tutorials, practical, include demonstration videos, can be for tests and exams.”* (TB/S3)

‘Learning activity’ is also formed from the analysis. The indicators for ‘learning activity’ are the criteria of activity selection, learning interaction, and assessment activity.

- “teacher can use Mobile Learning to teach students, give materials through E-Learning platform before or after the students do projects. So it's like a complement.”* (TB/S3)
- “..... group discussion using mobile,”* (TB/S4)
- “Through the assignment given, meaning the content in the assignment, maybe students can explore on their own”* (TB/S2)

*“All lecture notes can be given, the assessment, then you can ask the students to submit, after that, you can also share the score, students can look and so on.”* (TB/S3)

Learning situation, system support and learning material indicator formed ‘learning environment’ element.

*“You also need to look at the environment to make E-Learning. It means more to the ability. I mean in terms of materials there is no problem, facilities, access right.”* (TB/S3)

*“in terms of the theory class, the instructor can show the video and so on. they have to come to the real situation.”* (TB/S2)

In addition, ‘technology’ is an important element to implement Mobile Learning. The indicators for this element are hardware specification, Mobile Learning software and Mobile Learning infrastructure.

*“In terms of smartphone specs, RAM is big, space is a lot, memory is big, internet speed is good,”* (TB/S2)

*“since its mobile I recommend when you develop it, it is open source, easy to access”* (TB/S6)

*“as long as they have devices and networking. They have an internet network and so on.”* (TB/S2)

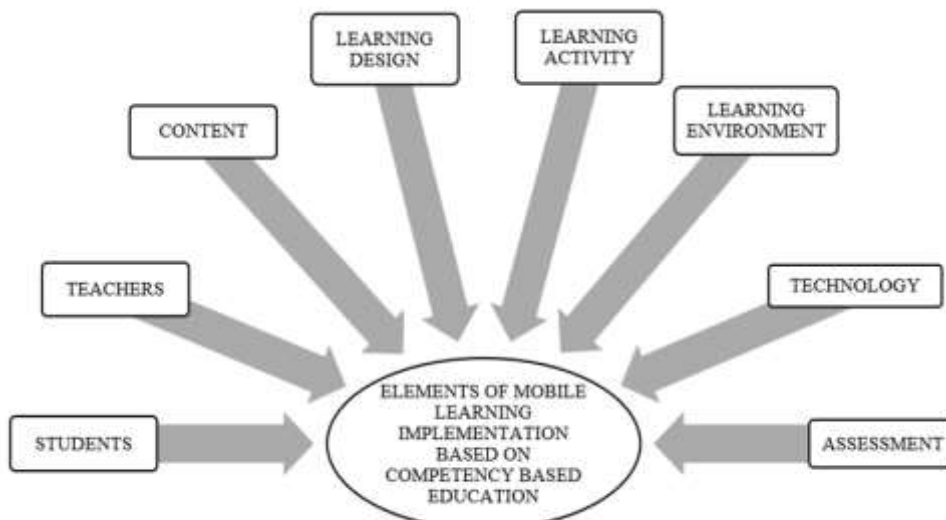
Lastly, ‘assessment’ element was formed according to its indicator which are assessment characteristics and type of assessment (formative and summative assessment).

*“the assessments are usually people go through simple quizzes, it is like a part of reinforcement, reinforcement of learning. Probably can use a lot of gamification tools. There are many tools.”* (TB/S2)

*“If formative assessment, we can use questions and answers, objective questions, matching, that is one of the formatives. This formative means we measure from every little content we learn, we measure”* (TB/S4)

*“Usually we use the exam. Online exam is suitable, it can be implemented. Written assessment is possible, even objective is possible. I can feel that there is no problem with online evaluation. Other than that, interviews, oral online.”* (TB/S2)

In conclusion, from the analysis that have been done, the eight elements formed are shown in Figure 1.



**Fig. 1 - The elements of mobile learning implementation based on competency-based**

#### 4. Discussion

In this study, the findings show that there are eight elements acquired to implement Mobile Learning based on Competency-Based Education. The eight elements are (1) students (2) teachers (3) content (4) learning design (5) learning activities (6) learning environment (7) technology and (8) assessment elements. These eight elements can be used as a guide to improve the quality of teaching skills and learning process through the integration of mobile technology. The results show that students are one of the elements to implement M-Learning. Students are more knowledgeable about these high-tech devices such as smartphone and use them in everyday life (Mahazir, Norazah, Ridzwan, & Rosseni, 2013). According to research findings, it has been found that the roles of the students to implement Mobile Learning are to be able to be self-responsible on the task given, able to access information, learning at their own pace, discover their preferred learning style, explore new information independently through web, sharing information with teachers and friends, and keep track their progress. Students must be prepared and wise to adapt and master the learning well at their own pace to improve the competencies. This is because, student is individually different and unique. According to Ayonmike, Okwelle, et al., (2014), CBE program involves students who learn at their own pace and organize their own learning methods to achieve learning objectives.

A good TVET program depends on the teacher's skills in delivering the training. The learning objectives can be achieved depending on the way the teacher presents and teaches. To implement M-Learning, the teachers need to be creative in diversifying approaches in teaching, develop the learning materials and plan learning activities which are suitable to be delivered by using mobile device. Hence, teachers need to improve the ICT pedagogy in teaching and learning. With the availability of advanced online learning technology, teachers need to provide authentic learning experiences in a domain of competence to transmit knowledge (Chu, Nnam, & Faizefu, 2018). The TVET contents and curriculum must engage effectively between training and the real world of work (Maina et al., 2016). Supporting teachers' role with technology could be a potential solution of the issues related to the lack of skilled teachers (Yasak & Alias, 2015). In addition, the content design on the M-Learning must be in line with the learning objectives, learning activities and forms of assessment that can be done using mobile equipment.

The findings of the study also found that M-Learning design is an important element that must be present. The M-Learning design must be able to provide students with experiences regarding real work situations. This is because, through the learning experience, students can develop planning, organizing, interpersonal and problem solving skills as well as technical competencies (Anane, 2013). The planned M-Learning activities will be formed, based on the learning environment. As we know, among the benefits of M-Learning is to provide an opportunity for students to stay involved in their learning environments that cannot be obtained through static technology devices such as desktop computers. Solvberg and Rismark (2012) stated that the learning activities that students follow occur in three learning environment, namely attending classes, activities inside the school and activities outside the school. So, the students' role for each of these learning spaces are different and it depends on how students worked with the learning materials, interaction between students, the way the students use mobile technology. Therefore, to enable M-Learning to be implemented effectively, an environment that supports M-Learning needs to be addressed.

In terms of technology, smartphone is most suitable to use as a medium in M-Learning. According to Abd Rahman and Mohd Hashim (2011a), smartphones are a combination of mobile phones and PDAs. This phone uses Symbian software, Windows Mobile and other mobile software. It is also equipped with internet access and capable of supporting multimedia applications. Through these advantages, the interface of M-Learning system smartphones is able to display graphics or icons that has a positive impact on TVET students. This is because, TVET students have tendency to remember things in visual rather than verbal (Azmi et al., 2017). The smartphone also has certain features such as its smaller size and lighter than a laptop, making it easier for users to carry it at all times to allow the learning to happen at any time and wherever the location is (Jamilluddin, Rahman, & Razali, 2017). In addition, smartphones have functions such as internet connection, multimedia messages, information storage, and showing failed files and audio (Alhassan, 2016).

Mobile technologies which are integrated in course activities led to assessment. Apart from learning design, assessment is also considered as an important element. It is important for student engagement and successful educational outcomes. It also improves their learning performance and achievement (Sulisworo & Toifur, 2016). Therefore, various forms of assessment can be implemented to implement M-Learning assessment based on Competency-Based Education. Among them are online quizzes, reports, exams, presentations, online discussions and folio. Competencies demonstrated by students are measured by Standards Reference consisting of performance standards (academic), and competency (vocational) (Rahman et al., 2014). Competency assessment includes determine the purpose of the assessment clearly, using appropriate approaches to gather evidence of competency, interpreting and conclude the competencies demonstrated, record and report competencies to relevant stakeholders (Mukhtar & Ahmad, 2015).

#### 5. Conclusion

In conclusion, based on the findings, there are 8 vital elements to implement Mobile Learning based on Competency-Based Education. The elements are (1) students (2) teachers (3) content (4) learning design (5) learning activities (6) learning environment (7) technology and (8) assessment. This element that has been explored can be considered to signify

the importance of context when designing mobile learning for enhance student's competency. Overall, the researcher believes that this study can contribute to the field of TVET where the elements can enhance the quality of the teaching and learning delivery system and leads to produce high skilled workers. The proposed M-learning elements is to help TVET instructors in teaching and learning process using competency-based education approach. Traditional TVET delivery teaching faced in constraints in terms of face problems in terms of cost, real-time explanation and demonstration that cause a lot of time, provide real work situation, limited working space and no feedback interaction between teachers and students throughout a lesson. Hence, all stakeholders including the government, service providers, instructional designers, teachers and students need to give their commitment to ensure it is successfully implemented. The researchers hope that the findings of this study can benefit other researchers as well as educators who are interested in conducting further research related to M-Learning with technical and vocational scope in Malaysia.

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