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Research paper



Testing the Usability of a Mobile Learning Module

Nawal Mustafa[1], Norazah Mohd Nordin[2*], Mohamed Amin Embi[3], Mohd Helmi Norman[2]

[1]Centre of Global Professional and Social Development, KPJ Healthcare University College, 71800 Nilai, Negeri Sembilan, Malaysia
[2]Faculty of Education, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia
[3]Center of Innovation in Teaching and Learning, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia
**Corresponding author E-mail: drnmn@ukm.edu.my*

Abstract

Healthcare professionals require skills and knowledge training in order to provide the best services. However, a heavy workload and time constraints have contributed to their reluctance to attend English communication training. Thus, a mobile learning module for continuing professional development has been developed but its usability evaluation would determine if the module will be used by its intended learners. This study aimed to evaluate the usability level of an English Communication Skills mobile module for healthcare professionals using FRAME model's device, learner and social aspects of evaluation. 116 healthcare professionals evaluated the module's usability in a survey questionnaire while five participants were selected to be interviewed. Findings showed a high level of usability and interest to learn in a collaborative learning environment. This usability evaluation would be able to determine user's adoption of a mobile learning approach in a continuous professional development course and would benefit organisations when considering the most suitable mode of training for their employees. Recommendations for further study include assessing the effectiveness of the mobile learning module in developing communication skills among healthcare professionals.

Keywords: *continuing professional development; English communication skills; FRAME model; mobile learning; usability evaluation*

1. Introduction

Training for skills among healthcare professionals is important for their professional development which usually entails skills and knowledge training. Knowledge training consists of training related to their expertise in their field while skills training are related to soft skills of communication. Due to the nature of their work in the hospital, they need to upgrade their skills to be able to communicate better with the patients. Unfortunately, training for such courses has been faced with difficulties. Healthcare professionals have considerable needs for communication skills training due to the lack of relevant educational and training programs as well as the shortage of resources [1], [2].

Learning in a traditional setting requires a venue and specific time for the participants to attend. However, not all healthcare professionals are able to allocate their time due to their workload in the hospital. [3] reported that healthcare students in a Malaysian university were unable to attend extra classes to improve their English. Their heavy workload caused them to be unable to attend English courses to improve their communication skills.

A possible solution to the gap in the healthcare professional's continuing professional development (CPD) is to integrate a communicative English module that the healthcare professionals are able to access online using mobile devices and do not interfere with their time at work. Lately, mobile learning has become a bridge between formal and informal learning, or more specifically between the formal classroom learning and informal learning [4] [5]. In fact, learning is not specified to a particular time or place and formal education cannot provide learners with all the knowledge and skills [6]. Therefore, mobile learning removes some of the formality of learning in which the digital learners may find it to be more attractive and provides the learners with more choice of mediums for effective learning [7], [5]. However, the challenge remains, whether healthcare professionals will be able to adopt English communication skills training using their own mobile devices.

Usability evaluation

In the general sense, an evaluation, as described by [8] addresses several issues faced by learners, educators and other stakeholders, the cost of delivery, comparison to other similar courses and its effectiveness in meeting objectives. Meanwhile, usability evaluation would be able to determine areas for improvement within a system. [9] conceptualised the term "usability" into four aspects: easy to learn, useful, easy to use and pleasant to use. [10] raised the concern of usability testing of interface as being dissimilar to usability testing for mobile based instruction. During user testing, both qualitative and quantitative data pertaining to success, performance speed and satisfaction are collected [11]. Although it seems that usability testing focuses mostly on technicalities, [12] explained that usability testing is able to reduce training budgets in half and double the volume of transactions employees perform within an hour. In order to get users to familiarize themselves with the device and its attributes when evaluating, certain attributes had to be fulfilled in order to determine whether or not to accept the new learning tool. Nevertheless, usability evaluation has an open set of definition. [13] demonstrated the use of PACMAD (People At the Center of Mobile Application Development) usability model which evaluates the attributes of effectiveness, efficiency and satisfaction. Although their findings pointed out cognitive load as an important characteristic to be considered, their research has highlighted "task" and "context" as the most important factor to be researched.

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The FRAME model

One of the prominent models used in usability evaluation is the FRAME model. The Framework for the Rational Analysis of Mobile Education (FRAME) model developed by Marguerite Koole in 2009 has been used in developing other mobile devices, learning content, and in designing teaching and learning strategies for mobile learning. [14] defines mobile learning as the interaction among learners, their devices and the social environment which requires new generation learning skills and modified roles of the teacher and their identities. There are three elements in the model: device aspect, learner aspect and social aspect. In an attempt to define "usability", the criteria proposed by [15] for assessing usability served as a useful guideline for evaluating the mobile learning module (Figure 1).

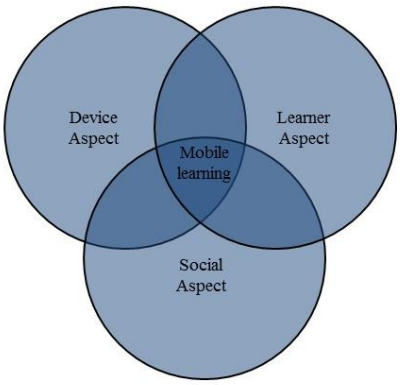

Fig. 1: The FRAME model (Koole 2009)

The device aspect refers to the physical, technical, and functional characteristics of a mobile device which resulted from the hardware and software design of the device. Therefore, in order to evaluate a mobile learning module, one must be able to determine which mobile device offers the most user friendly interface for use in the teaching and learning activities. Meanwhile, the learner aspect took into consideration an individual's cognitive abilities, memory, prior knowledge, emotions, and motivations, while drawing upon learning theories regarding knowledge transfer and learning by discovery. The learner's prior knowledge, intellectual capacity, motivation, and emotional state have a significant impact upon encoding, retaining, and transferring information [14]. Through activities using authentic situations and getting learners to make their own learning discovery, mobile learning help learners to enhance encoding, recall, and transfer of information.

Finally, the social aspect takes into account the processes of social interaction and cooperation where individuals must follow the rules of cooperation to communicate in order to enable them to exchange information, acquire knowledge, and sustain cultural practices. The affordances in mobile learning occurred within the interaction of the three elements mentioned, supports learners' learning both individually and collectively. In other words, a usability evaluation not only validates the learning intervention to ensure all its components are working well and able to provide a solution to the learning problem faced by the specific group of learners, it also ensures the process happens in the most appropriate amount, sequence and most efficient use of learner's time and effort.

Numerous studies have looked at mobile learning as a suitable approach for substituting traditional teaching and learning approaches. Mobile learning has the ability to bridge pedagogically designed learning contexts, facilitate learner-generated contexts, and content (both personal and collaborative), while providing personalization and ubiquitous social connectedness, which sets it apart from the more traditional learning environments [16]. The personalisation of learning and ubiquitousness across various contexts are essential elements of mobile learning that differentiates it from other learning environments. Mobile learning could offer a customised learning experience that is "just-enough", "just-in-time" and "just-for-me" [17], [18], [19].

The use of technology such as mobile devices in a teaching and learning approach, influences the perception of learners and teachers roles into active participants. In a recent analysis of learners roles on social networking sites, [20] found four distinct roles of "lurker", "gradually mastering member or passive member", "recognized member" and "coach". Each learner associated themselves with the roles and modified them according to the task provided, relationship with other members and course facilitator roles. This finding was supported by a recent study by [21], who highlighted learner's changing roles where the new generation of Malaysian learners are interested in learning beyond the traditional learning environments that are connected, mobile, adaptable to their needs and personalises their own learning environment. While in a study done by [22] the teacher's role was found to be greatly impacted through a shift from face to face to online interaction. This shift signals the quick rate of technology adoption in the classroom which in turn changes the learners' and teachers' roles.

Continuing Professional Development

Continuing Professional Development (CPD) courses for healthcare professionals had faced with many challenges which have created the need for alternative means of education. One of the suggested approaches is on-the-job training using mobile learning as a possible solution. The combination of the technology in the form of mobile learning and the need for soft skills training for healthcare professionals has impacted the approaches that have been used in teaching English communication skills. This phenomenon requires a new approach and a new delivery method which do not guarantee that the learners are able to adopt the new way of learning. Although there has been very little discussion about the use of mobile devices in CPD courses in healthcare, its usage has been highlighted across different research on science and technology and engineering education. Research conducted on the effectiveness of mobile learning highlighted the following benefits; increased motivation, sustained self-directed learning behaviours, long-term knowledge retention, comparable content coverage with traditional approaches, learning for understanding and the development of professional reasoning strategies [23],[24], [25].

In this research, the usability evaluation was conducted on a mobile learning module developed for a CPD course in English communication skills specifically for healthcare professionals. The FRAME model [14] was used to determine the level of usability of the mobile module (mobi-CARE) especially in the three aspects of device, learner and social. The results would determine how far the users would adopt the mobile-based modules as a new way for conducting a CPD.

2. Methodology

Usability questionnaire

The study is a case study of the final phase usability evaluation of mobi-CARE, a mobile learning CPD module. The acronym mobi-CARE stands for "**Mobi**le learning **C**ommunicative **A**pproach in **R**esponsive **E**nglish". The usability evaluation of the mobile module was conducted using a questionnaire adapted from the FRAME model [15]. The questionnaires were then distributed to 116 participants who had completed the module after 12 weeks of learning. At the same time, five students were selected among the participants to be interviewed on the usability of mobi-CARE. The usability questionnaire underwent a reliability test and found to have a Cronbach alpha value of above 0.7. As suggested by [26], this shows in general, each construct has a high reliability or

internal consistency. The reliability of the usability questionnaire for mobi-CARE displays a value of 0.798 to 0.946.

The 116 participants were sampled through purposive sampling of the healthcare professionals who have enrolled in an English communication skills CPD course. The participants came from different fields of expertise; nursing, physiotherapy, medical imaging and pharmacy. The variety determined each field of expertise would be represented in the mobile module evaluation and as a way to get further discussion based on their different background.

Semi-structured interview

The data taken from multiple users or designers would allow the researcher to gain a better insight of events, determine the reasons they occurred and gather participant's thoughts and beliefs [27]. Interviews serve the purpose of collecting in-depth responses regarding the issue discussed and due to this, it has its own interview protocols to adhere to. The evaluation phase was conducted using a semi-structured interview on five participants who had undergone the mobi-CARE course for the duration of 12 weeks. The interview questions were adapted from [15] as well as additional questions from the research objectives.

Data collection

The data collection took a total of three months and included four different locations in the district of Kuala Lumpur and Selangor. The participants' involved as learners in the mobile learning module were asked to evaluate in the usability of the mobile module by filling in a questionnaire at the end of their 12 weeks session. The questionnaires were distributed in the training room of each of the four hospitals. They were given a consent form that states their voluntary participation in the study. The evaluation session lasted 15 minutes and the questionnaires were immediately collected. Five participants who have been selected earlier for the semi-structured interview were invited for an interview at the end of the CPD course session.

Data analysis

After completing the data collection, the researcher analysed the results using analysis software packages, SPSS (Quantitative Data) and Nvivo (Qualitative data). The data from both questionnaires were analysed using descriptive statistics, analysing mean scores to determine the level of usability. The analysis of data using descriptive analysis were also conducted by other researchers such as [28] and [29]. The interpretation of the mean values of usability levels were based on [26] score interpretation. The semi-structured interview was recorded, transcribed and analysed using Nvivo 11 qualitative data analysis software. The analysis grouped the codes together and into categories or themes.

3. Results and Discussion

Demographic profile

The participants consisted of 116 respondents, 42 were male (36%) and 74 respondents were females (64%) from four different private hospitals in the district of Kuala Lumpur and Selangor in Malaysia. A large percentage of 62% were from the youngest age group of 22 to 25 years old, followed by 26 to 30 years olds at 22.4%. While the more mature groups of 31 to 35 years old and 36 to 40 years old were at 12.1% and 3.4% respectively. The profession of the respondents were distributed almost equally with physiotherapists making up the largest group at 26.7%, followed by medical imaging at 25%, while pharmacy and nursing were equally represented at 24% of the total respondents. Lastly, the respondents were largely diploma holders at 93.1% as compared to bachelor's degree holders who were the minority group at 6.9%.

Findings of Usability Questionnaire

The first aspect evaluated by the learners is the device aspect. Elements of device user friendliness within the device of participants using the mobile module is shown in Table 1 where the analysis found a high mean value of more than 4.00 for all items in the device user friendliness aspect of the module. The highest mean value of 4.24 for ease of navigation within the module and a mean value of 4.23 were given for icons that were easily identified.

Table 1 Device aspect

Item	Mean value
The mobi-CARE app is easy to navigate	4.24
Icons in the mobi-CARE app are easily identified	4.23
Icons in mobi-CARE connects to the intended pages immediately	4.17
There are no broken links in the mobi-CARE app	4.13

The second aspect evaluated by learners was the learner's learning elements as shown in Table 2. Overall, the mean values for each item were at 4.20 and above indicating highly rated learning elements especially "self-check" which has the highest mean value of 4.49. Although the learning element that received the lowest mean was the "CARE network" with a mean value of 4.18, the value is still above 4.00. Hence, the learner's learning elements guiding the learners in this module were well-presented and clearly indicated.

Table 2 Learner aspect

Item	Mean value
Introduction	4.32
Learning outcomes	4.28
mobi-CARE module	4.39
Self-check	4.49
Resources	4.33
My Videos	4.41
My Reflection	4.39
My Evaluation	4.33
CARE network	4.18
Discussion Room	4.27

The third aspect evaluated is the social aspect of the element "discussion room" in mobi-CARE. Table 3 represents the mean values for the items in social aspect with an overall value of 4.00 and above indicating the use of "discussion room" as efficient in facilitating social interaction between learners and instructors. The highest mean value is at 4.21 for the ability to access lecturer for support while the lowest mean value of 4.02 was for the ability to interact with group members. Learners prefer to use the discussion room to interact with their group members (mean = 4.17) and were able to cooperate (mean = 4.16), and receive feedback on their video presentation project with other learners (mean = 4.16).

Table 3 Social aspect

Item	Mean value
I am able to interact with my group members using the "Discussion Room"	4.02
I am able to learn by interacting with my group members in the "Discussion Room"	4.03
I like to use the "Discussion Room" to interact with my group members	4.17
I am able to share resources with my group members in the "Discussion Room"	4.15
I am able to cooperate with other students easily through the "Discussion Room"	4.16
I am able to receive feedback from other students of my project through the "Discussion Room"	4.16
I am able to access my lecturer for support through the "Discussion Room"	4.21

I am able to interact with my group members using the "Discussion Room"	4.02
I am able to learn by interacting with my group members in the "Discussion Room"	4.03
I like to use the "Discussion Room" to interact with my group members	4.17

Findings of semi-structured interview

The learners were asked about their perception on their learning experiences, preferability, initial reaction, strengths and weaknesses of their mobile module experience. First, they were asked about their experiences of using mobile devices for learning in which they responded by citing the use for informal learning such as searching for new words, reading news, recipes, ideas for home improvement and learning foreign language (Italian). Secondly, all five respondents prefer to use their mobile devices (smartphones and tablets) due to its portability or interchange the use of smartphones and laptop depending on what they want to view. When asked specifically which devices were used when learning mobi-CARE, there was a unanimous agreement on the use of two main devices, which are smartphones and tablets, while two participants added laptop in their devices used. When asked about the frequency of learning, all answered on average two times a week while two participants reported more than twice a week.

The learners were also asked about their initial reaction when using mobi-CARE for the first time. They responded positively by stating it was a *"good idea"*, *"sounds promising"* and would *"love to see how it works"*. Yet, one respondent was apprehensive when she said she was *"not sure"*. Although there seems to be one respondent who was unsure, the majority were optimistic about their initial encounter with the mobile module.

Among the strengths of mobi-CARE, as stated by the participants, in terms of the learners, they were able to control their own learning and use their own devices. They also admitted to having fun making videos. On the other hand, learners encountered technical issues especially when using apple products operation on iOs (Apple's operating system). Whereas learners on the Android platform reported having no trouble at all installing the application. Weaknesses discussed were mainly technical in nature. Most importantly, internet connection needs to be strong. This response was agreed among all 5 respondents. Respondents faced problems to discuss and plan for their video presentations.

Finally, when asked about their recommendation, the learners mentioned a progress bar to identify their own progress within the course. "*Highlight the steps maybe. A progress bar showing where you are at the point.*" While another participant echoed a similar comment providing her reasons, "*A roadmap of some sorts. I got confused of where to navigate next.*" A suggestion was to have a blended mode where participants are able to have a discussion face to face and at the same time create dialogues and videos to be posted online. Finally, all the respondents recommended the use of mobi-CARE mentioning that *"a lot of staff can benefit from this"*.

The usability evaluation of mobi-CARE has indicated a high degree of usability among learners and instructors. Although [10] highlighted the issue of usability testing as one that is separate from interface usability test, a usability evaluation was used to identify whether the module is easily accessed, well-organised and user-controlled. Firstly, the findings from the usability evaluation of the device used in accessing mobi-CARE shows the device characteristics have a significant impact upon usability. In order for a mobile device to be portable, the size, weight, structure, and composition must match the physical and psychological capacities of the individual users [14]. Hence, in order for a mobile module like mobi-CARE to be considered as fulfilling the usability criteria, it should be hosted on a portable device and have the appropriate dimensions to suit the users. The usability results showed the learners did not have any problems in using the device for their learning, but did have initial problems in downloading the link on certain operating systems. This clearly indicates the need to ensure cross platform accessibility since the initial experience may dampen the learners' motivation.

Secondly, the learner aspect takes into consideration an individual's cognitive ability, memory, prior knowledge, emotion, and motivation [14]. The results and findings for this aspect described how learners use what they already knew and how they approach the learning activities, and adapt to the new learning environment. Here, the learner is the most important element as their learning characteristics, background knowledge and suitable learning activity is taken into consideration. Thus, the characteristics of the learners influenced the usability of the module.

The next element is "social aspect". This element considers the processes of social interaction and cooperation where learners are able to communicate in order to exchange information, gain knowledge and observe cultural practices. In mobi-CARE, this social aspect is seen in its physical form in the face-to-face group discussions, and virtual form in the online discussion room. It is through interaction that the learners receive feedback which is reinforced in social and cultural beliefs and behaviours [30]. The social aspect of the module is embedded in the activities where learners discuss with each other in groups to come up for a solution and plan their choices of solutions with team members through the "discussion room".

From the interview, it was found that they engaged in collaboration with more discussion although it may encourage the habit of gossiping. Online collaboration received a positive response yet some skepticism arose as the learners viewed the tendency to be side-tracked in discussing other matters. [31] mentioned one of the most important criteria for assessing the worthiness of a module is through its usability. The usability of mobi-CARE according to the learners was also found to be high with three constructs of device user friendliness, learner's learning element and social aspect indicated mean values of 4.00 and above.

A new finding unnoticed before is the collaboration between different departments. Interactions done in the classroom and online discussions have encouraged correct responses, elicited answers, removed them from their comfort zone and organised the learner's roles. Mobi-CARE was found to have encouraged speaking among differing disciplines and encouraged interdisciplinary communication. [32] highlighted the importance of focusing on a specific language learning in developing English language skills among learners in institutions of higher learning. Nevertheless, the use of a mobile learning module should not be focused on its application solely within the learning environment, as it was unclear whether the interdisciplinary communication was due to their use of mobi-CARE or the necessity to communicate among the learners.

Another surprisingly unexpected result was seen in the active participation of the learners. Since the learners were informed at the beginning of the course that their participation in the discussion rooms and the final presentation would be graded, their active participation could be attributed to the graded value announced. [33] noted that mobile learning tasks were usually made as a compulsory component which is monitored and graded as part of the course work. Without an emphasis on assessment, learners would be reluctant to participate in the tasks. Therefore, the integration of the activities in mobile learning should be made as a graded course requirement. Overall, the results of the usability evaluation indicated mobi-CARE to be suitable for use by learners and instructors due to the high usability indicators in its device, learner and social aspects.

4. Conclusion

The practical contribution of this research is the cost effective measure for organisations to conduct professional development courses. The practice of using technology such as learners' own

mobile devices for CPDs would reduce the cost for training. Currently, organisations would have to spend according to budget per person for the training attended. Through mobile learning, the organisation would be able to monitor staff training and their progress online. Finally, organisations benefit by being among the first to benefit through the latest trend of training that has been implemented in many organisations around the world. Companies with large number of employees will find this approach to training beneficial. The trend of training around the world have shifted to a tech-based training for acquiring knowledge and skills. Trainers are able to extend their learning to include cross-disciplinary interaction and also share communication styles between each department in the hospital. There would also be sharing of knowledge and skills between each department, thus encouraging deeper learning among the healthcare professionals. Therefore, a mobile learning CPD session would not only be limited to traditional classroom approach, learners would also be able to discover other modes of training.

Since many organisations in Malaysia are moving towards using ICT and new technologies such as mobile learning and MOOCs for the professional development of their employees, there are concerns over the return of their investments as this form of training requires consistent monitoring and a high initial start-up cost. What this research offers is a way for organisations to conduct an early feasibility study of tech-based training by testing usability of the product. A high usability level can predict the adoption rate of the training in the near future. A usability evaluation can be used to determine the success and adoption rate of mobile learning approaches. Findings of the research indicated the usability evaluation of the module would be an indication to the adoption of the module by the users. A recommendation for further study would be to assess the effectiveness of the mobile learning module in developing communication skills among healthcare professionals.

New technologies being used in continuing professional development courses are being introduced to replace approaches that did not yield positive outcomes to an organisation. Thus, it is important to conduct a usability test in order to choose a suitable approach to suit the learners.

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