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A STUDY OF IM-SMARTSAFETY COURSEWARE DEVELOPMENT FOR FOREIGN WORKERS IN SAFETY COURSE MALAYSIA CONSTRUCTION INDUSTRY

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Graphical abstract

Abstract

IM-SmartSAFETY is an application developed as a medium for delivering contents to foreign workers in response to language problem in Health and Safety Induction Course (HSIC). It is a compulsory initial course for all workers including local and foreign workers and professionals before entering into construction sites. In ensuring IM-SmartSAFETY meets the objective of the course, learning theories, particularly constructivism, social, and minimalism, have been applied along the development process. In accordance, this paper discusses the importance of applying learning theories in the IM-SmartSAFETY. Constructivism theory is important in IM-SmartSAFETY because it supports the creation of new knowledge through creative and critical thinking based on the existing knowledge while solving problems in existing cases. Meanwhile through social theory, emphasis on cognitive is deeper than on physical behavior in which visual representation of positive and negative behavior could be imitated. It also promotes social interaction among the peers and between the trainees and the trainers through activities provided in the application. Further, minimalism theory is important because it ensures the application is appealing in terms arrangement of text, information, graphic, color, and audio so that they never confuse the foreign workers, but make them understand.

Keywords: Application, learning theories, safety course, foreign workers, construction industry

1.0 INTRODUCTION

Construction industry involves complex and dangerous activities [8] [12] as well as high risk [1] [16]. Therefore, emphasis on safety and health among the workers is very important to avoid accident. It should be part of the activities in personnel department. Accordingly, in Malaysia, Construction Industry Development Board (CIDB) has proactively designed a special course to handle such issue, named Health and Safety Induction Course (HSIC). It is compulsary to everyone, local and foreign, labour or professional, who involve in the construction industry no matter directly or indirectly.

In principle, the workers have to do the HSIC first before entering the construction site. Nurul Azita [17] found that the delivery of HSIC involves various media including *PowerPoint* slides and video. They are delivered by the trainers in face-to-face lectures, which involves also demonstration, as well as printed materials.

However, they (lecture, demonstration, printed, and electronic) are delivered to the foreign workers in Malay language. In cases the media is in English, the trainers still deliver in Malay language because a big percentage of them are not able to deliver in English.

While the content in the course is comprehensive, this study believes that the barrier in the course is on the delivery language, in which Malay language is used to educate foreign workers who are not able to understand, especially those not from Indonesia. A study has been carried out involving workers from Myanmar, the biggest number of workers after Indonesia. In the study, the language barrier is clearly discovered. Particularly, the study found that only 13.7% (14) understoodwhile 43.1% (44) did not understand oral information delivered in Malay language. Meanwhile, only 6.9% (7) understood while 55.88% (57) did not understand written information delivered in Malay language. On top of that, when asked, those Myanmar workers agree that there is language barrier in the course, in which 43.75% (42) of the total 96 traineesreferred it to oral communication, while it is more serious in written communication when 77.1% (74) agree. More than 85.4% (82) of the trainees agree that the issue arise because the trainers deliver course contents fully in Malay language. Although some of the trainers use English in certain situations, the study also found that 56.9% (58) of the Myanmar workers did not understand oral information in English and 48.03% (49) of them did not understand written English [19].

In fact, previous studies also found that most *PowerPoint* slides are delivered in single-way from the trainer orally to the trainees without any interaction between the trainer and the trainees because of language barrier. This limits the trainees' knowledge creation and active participation. This has been proven by Haryati et al. [11] in which they found that 50% of contractors agreewith 41% of it strongly agree that there are communication (language) barrier in the construction industry. Additionally, an interview by Nurul Azita et al. [18] with five contractors (A, B, C, D, E) in Malaysia also evidenced that the problem is not only in oral communication, but also written communication. Similarly, such barrier has been tabled by Abdul Rashid and Abdul Aziz [2], who found that the foreign workers were not able to understand safety instructions, safety procedures, and were not able to interpret safety signage, which eventually led to accidents. Thus, the recommendations by Teo et al. [21] regarding effective communication (language) as part of important factors in fluencing the implemantation of safety procedures is difficult if no one looks into this language barrier problem.

In accordance to that, an application has been designed and developed as a mechanism for delivering contents to the foreign workers as an alternative in solving the language barrier problem in HSIC. This initiative is inline with Bahn [3], who recommends that upgrading training and course materials could be a way in handling safety procedures and avoiding accidents in work place in construction industry. This is especially effective to be applied among new workers, those immature and less knowledgeable, and those who careless while in the construction sites.

2.0 THE DEVELOPMENT OF IM-SmartSAFETY

IM-SmartSAFETY has been developedby incorporating various media elements in dwi-languages through two phases; application development and application assessment. The detailed steps in both phases are depicted in Figure 1.

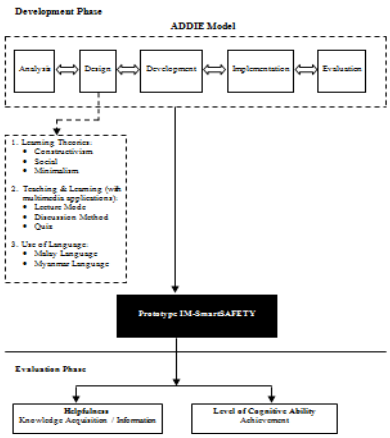


Figure 1 Conceptual Framework

The development phase was carried out using the ADDIE model, which involves analysis, design, development, implementation, and evaluation activities. Meanwhile, the assessment phase involves an assessment of the developed application using selected constructs in terms of how it assists Myanmar workers in meeting their needs. It was measured based on the knowledge they have acquired, seen through their behavior and cognitive development after using IM-SmartSAFETY in the HSIC. Data were mainly

gathered quantitatively, supported with some qualitative techniques. Only workers from Myanmar involved in this study because they are the second largest foreign workers in construction industry in Malaysia after Indonesia (statistics by Malaysian Immigration Department until 31 December 2010). They are the general workers based on the registry at the CIDB, who operationalize the construction works in construction sites, as commanded by their employers.

While language is the barrier, the development of IM-SmartSAFETY has to cater all aspects to ensure the trainees feel easy to use. Hence, it should be based on certain systematic procedures. Accordingly, ADDIE model has been used to drive the development, in which detailed activities are outlined illustratively in Figure 1. Among the major concern is the incorporation of learning theories, so that the approach in the application is effective and leading to the achievement of the ultimate objective of the HSIC.

3.0 DEVELOPMENT THEORY OF IM-SmartSAFETY

In ensuring the learning process takes place effectively, it has to apply some learning theories. According to Mohd Azhar et al. [15], learning theory refers to certain description on actions, suggestions, and thinking upon something related to situations where theories are applied to guide the process so that it is not deviated from the aspired purpose.

It is also similar in preparing the teaching materials. It should consider recommendations by learning theories to support the achievement of learning outcomes. Hence, in designing interactive application for certain course, consideration on applying certain theories is very beneficial because it could ensure the development process is well-managed. According to Gagne [9], applying theories in application development could synergize the instructions with the effects of learning and the expected learning outcome. Similarly, Janudin [13] adds that applying theories into application could ensure the learning process is not deviated from the expected learning outcome. It also ensures that learning process is effective, meeting the users' aspiration in terms of acquiring knowledge. Accordingly, IM-SmartSAFETY that is designed and developed for Myanmar workers applies three theories to support the learning process; constructivism, social and minimalism theories.

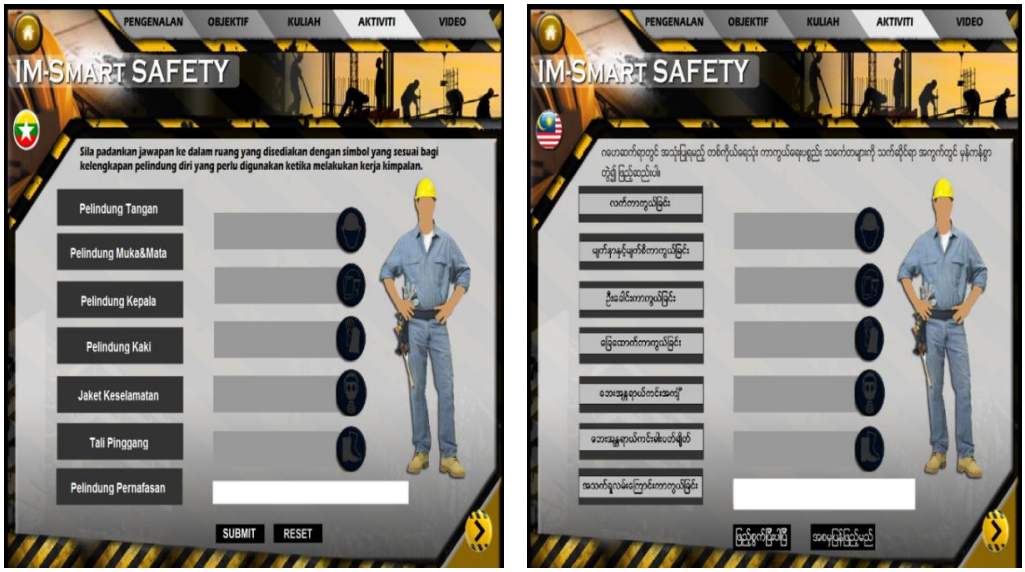
Constructivism theory has been established by Bruner [5]. It explains about a learner who thinks and learns through cognitive structure, that the learner could create knowledge when their cognitive is challenged. Further, they could integrate new knowledge with the existing one in a new situation. In fact, the creation of new knowledge happens through social interaction. In this study, knowledge is created through discussions in solving certain problems, in which according to Vygotsky [22], such interaction could stimulate mental development to a further level. Hence, it could be deduced that theories are important in IM-SmartSAFETY so that the Myanmar workers could develop their cognitive and knowledge, improve their understanding through creative and critical thinking in solving problems by synergizing new knowledge with the existing knowledge invoked from case studies related to construction sites. Thus, IM-SmartSAFETY as suggested by the learning theories incorporates various media elements including text, graphics, animation, audio, and video [7]. While it is in line with the recommendations by the theories, it is highly possible to meet the learning outcomes. Also, the application provides opportunities for the trainers and trainees to communicate and interact in two ways through provided activities. They do the activities, including discussions on certain problem solving as seen in Figure 2 in their own language. This is totally different then the existing information delivery media that are in the form of presentation and one way, in which in such situation, the Myanmar workers just listen everything (in Malay language) and do nothing without challenging their cognition. This really keeps their critical thinking freezes without creating any new knowledge.

Figure 2 Screen of Problem Solving With Application Constructivism Theory (Social) (Discussion Method)

Social theory on the other hand combines behaviorist and cognitive psychology using inner thoughts. Bandura [4], concerns on cognitive process involving modeled process through observation and imitation over something being observed compared to behavior. The main learning concept for this theory is focused on memory i.e interaction with individuals, attitude, and environment. Meanwhile Rotter [20] concerns on social interaction with other people, and that the environment influences human attitude. That is the reason for applying it in IM-SmartSAFETY (depicted in Figure 3), so that the Myanmar workers who are not able to understand Malay language could observe and imitate the contents they watch in the application. With that, they get sufficient information on positive and negative attitude through graphics and videos. On top of that, social interaction takes place also through interaction with their peers and their trainers through the activities and tasks based on certain situations. Nevertheless, Duan and Song [7] address that complicated information could be conveyed interestingly through a combination of various media. This is because learners learn better through graphical representation than textual alone. Hence, in overall, this study has found that media elements including text, graphics, animation, audio, and video are good in conveying information to Myanmar workers in HSIC [17].

Figure 3 Screen of Application Social Theory

Minimalism by Carroll [6] is another theory applied in IM-SmartSAFETY. It is a framework that guides in designing training materials to computer users such as preparing complete learning activities so that learners could create knowledge on their own, error free, and providing learning activity based on past experience and knowledge. Besides that, the theory emphasizes on minimizing loads through the use of basic characteristics in the design. As an example, the most important element is placed at the most visible area [14]. The use of appropriate colors is also emphasized besides limiting cognitive loads by providing simple structures and consistent design for text, graphics, and audio. This includes minimizing teaching materials by omitting unnecessary information [10]. Besides that, every page in IM-SmartSAFETY in maintained short, requires no page scrolling. Further, Figure 4 illustrates the effect of Minimalism on the page design. This shows that the theory is important because it guides to a good design, to ensure the IM-SmartSAFETY is easy from the Myanmar workers' perception. In this context, easy implies to the arrangement of text, graphic, color, and audio, so that they do not confuse the Myanmar workers, and further easily understand the contents.



Malay Language Myanmar language

Figure 4 Screen of Application Minimalism Theory

4.0 CONCLUSION

Overall, the design, development, and utilization of IM-SmartSAFETY in HSIC has assisted foreign workers particularly Myanmar a lot in their safety training. The application really encourages their active participation, which develops their knowledge through various activities along the course. This has been discovered through the early stage of this study, in which the Myanmar workers agree that they have gained a lot through the application. Language barrier is also solved because IM-SmartSAFETY provides information in their own language. The effectiveness of the learning application is based on the incorporation of learning theories (constructivism, social, and minimalism), which besides making the IM-SmartSAFETY attractive, it ensures also the application supports the learning outcomes. In fact, constructivism encourages and forces learners to think critically and creatively, which leads to the making of new knowledge based on their existing knowledge in solving problems provided in case studies. Meanwhile through social theory, cognitive process is formed through modeled process. In this context, the Myanmar workers could observe and imitate positive attitudes by watching the provided graphical and video contents. Besides that, they could discuss and interact with their peers and trainers through the provided activities. On top of that, minimalism theory is applied, to guide the design of the application. Basically, the theory addresses principles to make the application easy to use by the Myanmar workers. Based on the recommendations by minimalism, IM-SmartSAFETY incorporates various media elements including text, graphics, animation, video, and audio. This ensures IM-SmartSAFETY does not confuse the Myanmar workers.

Based on the discussion in the previous paragraphs, this paper deduces that incorporating learning theories in IM-SmartSAFETY is really important, for various reasons. More importantly, it leads to the accomplishment of the learning outcomes, which concerns on the acquisition of the learning contents in the HSIC.

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