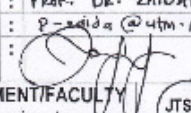


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E-LEARNING ENVIRONMENT FOR DEAF STUDENTS IN LEARNING SCIENCE: A THEORETICAL FRAMEWORK

MOHD HISYAMUDDIN MOHD HASHIM
ZAIDATUN TASIR

1.1 INTRODUCTION

E-learning is one of the most popular platforms that have been used for distributing information in educational departments for many years. It makes the activities for both parties particularly the teachers and students easier in terms of giving and achieving the knowledge needed in their teaching and studying routine by using some alternate approaches. Both teachers and students could collaborate with each other in structuring knowledge based environment, and the latter could benefit from it without any external control particularly from the former (Singh, 2003).

The general society would most probably assume that the deaf individuals face problem only in their hearing capability. However, it is beyond that. Depends on their time lost of hearing, these special individuals would face other difficulties such as reading or speaking in their native language. Deaf individuals that use sign language as their first language would find difficulties when using their original native language for reading and writing purposes (Wu, Chiu, and Guo, 2004). Hence, even though with advanced technologies they would probably still find some difficulties in studying. Thus, these advanced technologies have to be suitable for them, meaning those technologies are featured with attributes

specially formulated for them. Therefore, in order to help them overcome these difficulties while using the e-learning, an added feature must be included within the developed e-learning in order to help them using it in the best possible way.

This added feature is mainly focusing on the implementation of sign language within an e-learning environment. It is also hoping to help them getting the information needed in the most accurate way as possible. This is needed because most of the information out there could not be fully accessible by the deaf students themselves such as some videos or movies that include audio for it to be fully understood. The developed e-learning environment might also be able to be helpful in motivating the deaf students in their studies hence would give them better opportunities in the future life

The Science subject is one of the major subjects taught to the students in schools, both primary and secondary. The Science knowledge is very important since pretty much all the things around us are related to Science, either directly or indirectly. Manifestly, statistics show that the result of Science subject during major exams

is pretty low compare to other subjects. For example, in South Africa, Reddy (2004) stated that there were no improvements in terms of performance in Science from the year 1999 to the year 2003, while in Ohio Graduation Test, students were reported to score lower skill levels in Science compare to other subjects (Palmer, 2009). In Malaysia particularly, the overall performance of the Science subject for the Ujian Penilaian Sekolah Rendah (UPSR) has been declined (Kementerian Pelajaran Malaysia, 2011). It would probably because the subject is not being pushed hard enough to be taught to the students who took the subject.

1.2 CONSTRUCTIVISM

First of all, it has to be known that the primary idea of constructivism is mainly focusing on conceptualizing knowledge as well as the acquirement of it. In this particular matter, most constructivists view the nature of the knowledge itself and how it can be developed into certain level, based on certain philosophical theories. The world of academic literature is somewhat not complete without the mentioning of the term constructivism, particularly to be used in many academic papers or journals and as well as in books that are widely used for teaching, learning, assessment, curriculum development and training for various types of courses and subjects. This includes the Science subject.

In Science education literature, the concept of constructivism is viewed by the constructivist in multiple versions in terms of students' learning (Good, Wandersee, and Julien, 1993). Even though these constructivists have distinguished philosophical point of view, they still share the same constructivist core. The most common constructivist core among them is *"the view of human knowledge as a process of personal cognitive construction, or invention, undertaken by the individual who is trying, for whatever purpose, to make sense of their social or natural environment (Taylor, 1993)"*. Simply said, knowledge is not viewed as the exact attributes of the world or environment, but rather as some sort of construction process of the individuals themselves. Fransella (2008) implies that knowledge acquirement is not merely a transmission of pure knowledge to the individual themselves but instead a construction process by that particular individual. A principle within a constructivism theory by Von Glaserfeld (1983) stated that *"knowledge is not passively received but is built up by the cognizing subject"*. Based on this particular principle, it implies that it is almost impossible to transfer mere knowledge to students'

thoughts, instead students will construct their own ideas and meaning of anything, for example words, images, sound etc that they see or hear. Therefore, the learner can be said as an active knowledge constructor instead of simply being a passive knowledge receiver.

Hence, in order to encourage students to be an active constructor, learning strategies that will be used must allow students to be an active learner. One of the learning strategies that seems suitable is problem solving.

1.3 PROBLEM SOLVING

Bransford and Stein (1984) stated problem solving strategies as a set of steps required in order to solve problems that are occurred within the way to achieve a certain objective. Alternatively, it also can be defined as "*problem-solving cycle*". Some of the steps needed within this particular cycle are such identify the problem, specify the problem, design a series of steps needed to solve the problem, classify any knowledge known or unknown from the problem, and finally assess the most appropriate solution for the problem. In addition, Blanchard-Fields (2007) claims that problem solving can be seen in two sides, rather than just a single side. One side focusing on the types of problems which can have only a single possible solution that can be accepted, such as those of math questions or questions that are based on mere facts. The other side of it is focusing on problems which can have multiple solutions, or a dynamic solution that can keep changing from time to time, regards of its current situation.

Three problem solving strategies for deaf students have been developed by Mousley and Kelly (1998). The first problem strategy that will be implemented requires the involvement of peer observer by giving them an explanation in the form of sign language. This

particular understanding of the certain topic that has been acquired will then be transformed into a solution in a written form. Two main purposes of this strategy is to show that the deaf students clearly understand the problem solving rules through the explanations and to evaluate whether the deaf students' reading levels would influence the explanations made through sign language as well as the written form. Based on Pau (1995), it is said that the problem solving performance of deaf individuals are somehow related to their reading ability. The two explanation methods, sign language and written form, were found based on the technique suggested by Woditsch (1991) in assisting the deaf students in enhancing their thinking ability through a process, in this matter, problem solving process. The second problem solving strategy required them to visualize what is to happen within the problem solving process, from start to finish. This style is vital in making sure that the students will be able in developing a thoughtful strategy required in solving the problem given to them. Appropriate series of steps are necessary in order for the students to acquire the best solution possible to the certain problem, and not only merely solve the problem. The last strategy required the deaf students to observe their teacher on each and every step needed within the problem solving process for each problem given to them. This particular strategy encourages the deaf students in translating the sign language instruction given by their teachers into the actual steps needed in solving the problem, instead of simply writing it down.

Besides learning strategies, since this research is focusing on the use of e-learning in learning Science, therefore interaction among students and students and students and teacher must be based on certain human computer interaction principles.

1.4 AFFECTIVE HUMAN COMPUTER INTERACTION

Within an e-learning context, affect has acquired some new level of certain attention. Affect can be said as something which is brought by the learners into the e-learning environment, which subsequently will connect them to the purpose of their learning in general. Some latest developments within learning theories have emphasized the importance of affective in learning. Learners' internal priorities and drives, also known as their motivation to learn, has been stressed out within the learning theory and practice fields. Schunk (2002) described motivation to learn as the most vital affective learning factor which can define the interaction occurred between the users and the e-learning environment itself.

In the field of Human Computer Interaction (HCI), the term addressing affective may contribute to various meanings, depends on that particular affective roles and functions within the HCI. Some of the meanings are such recognizing user affect, adapting to the user's affective state, generating affective behavior, modeling user's affective state, or perhaps generating affective states within an agent's cognitive structure (Hudlicka, 2003). Some degree of user affective modeling may be involved within the recognition process of users' affective state, which can be the subset of users' motivational-behavior across different types of contexts. The emotion effects of the users' affective state can be classified into four categories, which are somatic-physiological, cognitive-interpretive, motivational-behavioral, and experiential-subjective (Clare and Ortony, 2002).

Usability questionnaire created by Zaharias (2009) will be chose for this study. The selection is based on the purpose of the instrument which is not only on the usability alone, but in analyzing the learners' motivation to learn as well. Evaluating motivation of the deaf students is one of the important features within this study. Therefore, the selection of this questionnaire, which consists of eight dimensions, content, learning and support, visual design, navigation, accessibility, interactivity, self-

assessment and learns ability, and motivation to learn seemed appropriated based on the objective of this particular study.

1.5 ONLINE LEARNER READINESS ASSESSMENT

The evaluation of the e-learning readiness can be defined as the ability in pursuing any chances produces by the usage of the e-resources available (Choucri *et al.*, 2003). Hence, the assessment is needed to explore the exact capacity acquired by the users in pursuing knowledge in any specific context. E-learning readiness can be defined as the level of readiness of certain institution or organization towards various aspects of the technology of e-learning, before the whole e-learning environment being applied for various purposes. Therefore, any e-learning readiness will be conducted prior to the introduction of the e-learning technology itself to the prospects users, whom will be the respondents to the e-learning readiness assessment. The typical e-learning readiness assessment will measure the users' ability in adapting to technological challenges, collaborative learning and training as well as the synchronous and asynchronous self-paced learning and training.

The online learner readiness questionnaire developed by Watkins, Leigh, and Triner (2004) will be used as the instrument to assess the students' e-learning readiness. This particular questionnaire consists of six different dimensions, mainly are technology access, online skills and relationships, motivation, online video, internet discussions, and importance to your success.

1.6 LINGUISTIC INTERDEPENDENCE MODEL

In deaf education world, most bilingual-bicultural models implemented are based on the theoretical idea by Cummins (1989), called linguistic interdependence model. This particular model implies that all languages used worldwide bear a common

proficiency. This model argues that deaf individuals which have solid foundation of their native sign language can use this advantage in supporting the usage of other majority languages in a written form during their learning activities. This allows the knowledge to be transferred without any occurrence of language barrier. Nevertheless, the knowledge transferred are mainly on academic and literacy skills rather than all types of skills.

The existence of linguistic interdependence within the deaf education world is rather clear, in very defined and specific ways. A very strong and firm correlation has been identified between the reading as well as the writing skills in the native language and mastering the same skills for other language (Treger and Wong, 1984). Hence, the usage of this model is vital in making sure that the deaf students could master the literacy skills in multiple languages, rather than the native language alone.

1.7 CONCLUSION

This paper explains the concepts within the theoretical framework of an e-learning environment for deaf students in learning Science, which are connected to each other. The sign language is chosen to be the main element for the e-learning environment is simply because it is the language used by these deaf students in their learning activities. However, with the collaboration with the e-learning technology it could give some advantages if it is to be compared to the usage of sign language conventionally. The usability of the e-learning is to investigate deaf students' point of view towards the developed e-learning environment to be used in their studies in learning the Science subject. The e-learning environment usability assessment based on the affective human computer interaction model is an appropriate way to measure the usability of the deaf students since it involves the assessment on the deaf students' motivation to learn as well. Finally, the ideal

technique identified could be a guideline in developing any other e-learning environment not only for the Science subject but perhaps for other subjects that seem appropriate.

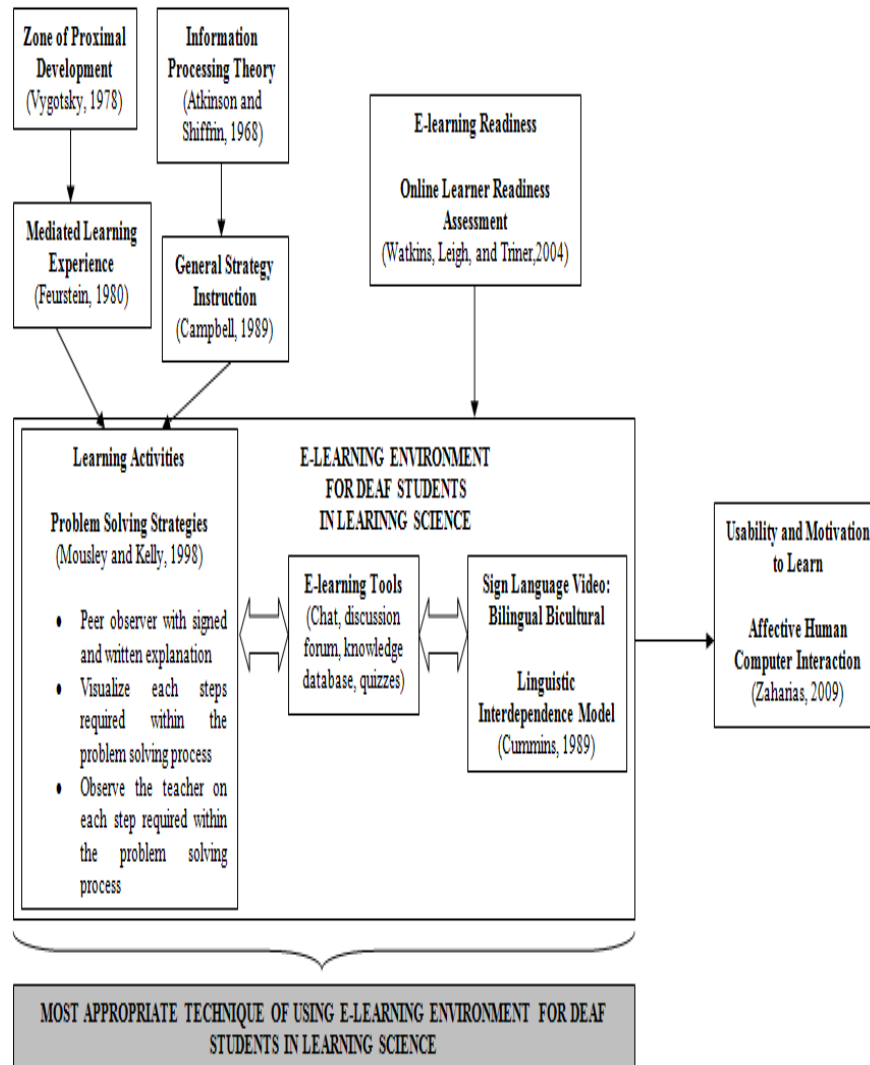


Figure 1 Theoretical framework of the study

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