Knowledge Construction Process in Open Learning System among Technical and Vocational Education and Training (TVET) Practitioners

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Abstract: Assessment is a method to determine the level of learning and the process of documenting knowledge, attitudes, skills and beliefs. Through this literacy assessment, instructor will have an opportunity to apply relevant strategies and procedures that were considered relevant during their teaching and learning process. However, most of us were familiar with Information and Communication Technology (ICT) based modes of delivery but less familiar with the needs and challenges face in Technical and Vocational Education and Training (TVET) sector. Thus, this study was conducted to investigate whether the process of knowledge construction in an open learning system can assist TVET practitioners in performing tasks that needed to be completed as an important element in assessment in one of their class subject. Computer Supported Collaborative Learning (CSCL) is based on the pedagogical process of observation where these TVET practitioners will learn progressively through active group interaction. The study was conducted on 61 TVET practitioners and two instructors from two classes that were taught using an open learning system environment through Moodle. This study used a quantitative design approach and supported by quantitative and qualitative data. The results of this study indicated that the process of knowledge construction in this open learning system has helped TVET practitioners to perform well in tasks that needed to be completed for their subject and also encouraged them to build a meaningful knowledge in a constant process. TVET practitioners need to explore more information and knowledge in order to justify most of their answers.

Keywords: TVET practitioners; Knowledge construction process; Open learning system; Task-related assessment.

1. Introduction

Technical and Vocational Education and Training (TVET) play an important role in implementing and promoting sustainable development. TVET institutions are major suppliers of workforce who will be in the forefront in dealing

directly with sustainable issues (Paryono, 2017). Here in Malaysia, even though a number of initiatives have been implemented by the government to reduce the skills gap, the negative perception of the public towards vocational education and skills training continues. Plans to lessen the skills gap include short-term strategies such as innovative training models and medium- and long-term strategies such as significant rethinking of collaborative partnerships between training organisations and industry to provide more flexible workplace delivery (Mustapha, 2017). The rapid evolution of information and communication technology (ICT) has changed the face of TVET, especially when ICT was combined with adequate pedagogical foundations.

There are many ways in which ICT can be used to help TVET transform its operations, raise its profile, improve the quality of its courses and services and collaborate to create a training ecosystem wherein, as in natural ecosystems, all the different stakeholders in the internal and external organisational ecosystem share and exchange information, resources and sources to each other's benefit. Nowadays, most of the countries use technologies and methods to increase the reach, equitability and impact of TVET, improve learning outcomes and services to TVET practitioners and establish new paradigms and environments for developing the knowledge and skills required for tomorrow's world of work (Senteni, 2017). Knowledge construction in other hands is the conventional line of the learning process that determines the success of any teaching and learning process. In cognitive and constructivism learning method, knowledge construction plays an important role in determining the effectiveness of the learning process that focus on how people process information and turn it into meaningful knowledge (Woolfolk, 2008). Therefore, regardless on the nature of any learning environment, the issues of the foundation in knowledge construction process are still relevant. Current learning theory also emphasises that TVET practitioners should construct their own meaning or knowledge supported by teaching methods that prepare TVET practitioners the opportunity to participate actively in the learning process (Woolfolk, 2008).

Noroozi, Biemans, Mulder and Chizari (2010) have conducted a study to identify the knowledge construction progress in a computer-based learning environment. The results of the study showed that both TVET practitioners can contribute to a better quality of knowledge construction for the second test compared to their first test. Walker (2005) also state that through writing tasks such as answering and responding to other student questions, analysing case studies, report writing, project summaries, research papers and written assignments collaboratively as a team reports in specific topics, answering questions in group discussion, debating and criticism in form of arguments can improve the process of knowledge construction.

Besides that, Saidin and Beacon (2011) investigate the impact of the use of Web 2.0 in teaching and learning and forming a student's e-portfolio using the tools of ICT platform such as Wallwisher and Kidblog as a process to create learning environment more interesting and effective. The results show that CSCL can help improve TVET practitioners' understanding, stimulate their interest and encourage independent learning among them. The combination of Computer Supported Collaborative Learning (CSCL) and face to face learning also has been used in a learning environment where students can discuss in front of a shared computer (Hashim & Harun, 2014). It also allows students to learn together through computer-mediated networks. CSCL learning strategies that been implemented with an eportfolio as a learning documentation model also expected to foster knowledge construction process by involving students to learn together through computer mediated networks (Hashim, Ismail, & Masek, 2017).

Beforehand, there was a finding in a case study that reported on the earlier stages of the knowledge construction process among postgraduate students in the six asynchronous computer conferences in a blended learning environment at Universiti Malaysia Sarawak (UNIMAS) using online learning showed that students were active in attaining knowledge but rarely share their opinions and input among peers or to explain that knowledge in depth (Hong & Lee, 2008). Meanwhile, Zhu (2012) study has found that the Flemish students prefer to learn according to their intellectual level, while the Chinese students are very satisfied when they can collaborate with friends to complete their task. However, the problem is that the Flemish students stated that working on tasks online were very time consuming while the problem reported by the Chinese students is that the lack of interaction between students and teacher when working on online tasks. Based on these findings, it seems that the problem in knowledge construction process also occurs through race and country.

In order to implement CSCL in learning and teaching process, it is important to know the advantages of online learning. Online learning refers to the learning environment that uses internet technology to enable virtual learning sessions (Hashim & Harun, 2014). There are three interrelated elements used in describing the design of web-based teaching by Oliver (2001), which are learning resources, learning support and learning tasks. The existence of online learning environment has invited speculation about how the process of knowledge construction in this environment occurs. Implementation of online discussion is said to have great potential to provide opportunities for students to intellectually engage in knowledge construction process (Rahman, Yasin, Jusoff, Yassin, Nordin & Yusof, 2011). Vygotsky's ideas about the importance of social interaction in the learning process have been used as a framework for a study that investigate on how does TVET practitioners actually gain knowledge in a new learning environments (Saritas, 2008).

Therefore, the aim of this study is to investigate whether the process of knowledge construction in an open learning system can assist TVET practitioners in performing tasks that needed to be completed as an important element in assessment. The open learning system is a tool through Moodle that been used in the process of learning and teaching for the TVET practitioners for one of their subject taken in their class. Meanwhile, TVET practitioners are students with an

aspect of educational process involving the study of technologies and related sciences and the acquisition of practical skills, general education, attitudes, understanding and knowledge relating to occupations in various sectors of economic life.

To support this outcome, Schellens and Valcke (2006) has confirmed that discussions among students in a group through online discussion is a very task oriented and the observation ratio phase for knowledge building is also high and there is a significant improvement in cognitive interaction, task orientation and on a construction phase has detected a higher knowledge construction. Parker (2010) in his research showed that in order to influence knowledge base, skills and behaviour of students, teachers must be willing to accept progress and develop appropriate teaching strategies according to the norm to provide a basic base that involves students to practice and apply the relevant skills and complete them within the time frame provided.

2.   Methodology

This study used a descriptive research method which involves a quantitative survey method through text discussion and interview questions in order to depict the participants in an accurate way. It's aimed at casting light on current issues or problems through a process of data collection that enables us to describe the situation more completely. This study also used a quantitative design approach and is supported by quantitative and qualitative data.

2.1   Samples

A total of 61 TVET practitioners from two classes and two instructors were selected as the respondent. The process of teaching and learning has been carried out in the computer lab for both classes. The distributions of respondents were 2 instructors which also include 28 TVET practitioners from class A and 33 TVET practitioners from class B. This subject is one of the compulsory subjects for them to pass in order to graduate and to obtain certification. In the context of teaching and learning of this subject, remembering and explaining are two common problems faced by the TVET practitioners and instructor, especially to those who are weak in academics (Ahmad & Jinggan, 2017).

2.2   Research Procedure

The TVET practitioner was briefed before being asked to use a learning system. This open learning system was developed using Moodle with the implementation of CSCL environment. Each activity through this open learning system was run in group activities in order to assist student knowledge construction process. A total of four lessons were conducted with each lesson taking about one hour and thirty minutes. There were several tasks that need to be completed by the TVET practitioner in every learning activity for their assessment. For example, the main learning activities in these learning systems is the interaction and discussion between TVET practitioners and instructor to support collaborative learning and group assignments. For this purpose, the learning is delivered in through encouraging discussion, sharing of learning materials and support tools interaction, feedback and information sharing.

Besides that, jigsaw activity is a part of learning materials that need to be completed in a group of 2 to 3 members. TVET practitioners are required to arrange the puzzle based on the task given to form the image needed. The collaborative learning strategy is used through Round Robin, in which, each student will have to participate interactively to share the ideas each time of their turn. While going through this task, each group member has a responsibility which they can share to be reviewed.

In this study, all the activities must be completed within the time frame set by the instructor and TVET practitioners are required to contribute to group discussions during that period. After a four-week session of learning and teaching took place, students activities while using this learning system will be evaluated to evaluate whether the features of CSCL learning environment can assist them in performing tasks that needed to be completed within times provided based on:

2.2.1   Text discussion in open learning system

When using this learning system, every student and teacher discussion script were coded and analysed based on the observation and a checklist. Instructor would provide some questions about a topic from the subject and start a discussion session in the learning system. This set of data was collected from the transcripts of all messages posted during group discussions within four weeks. Veerman and Veldhuis-Diermanse (2001) coding scheme was used to analyse the types of distribution of the statement from this message. All the messages in this learning system were coded based on the knowledge construction model by Veerman and Veldhuis-Diermanse (2001).

The analysis of the transcribed text went through some procedures before being summarise. During analysis process, the overall procedure is to determine the pattern of the messages from TVET practitioners that will be reconstructed again using a conceptual framework map that shows the interaction flow and the number of messages received from the TVET practitioners. This visual approach enables researchers to correlate and understand the data. Table 1 shows the construction task related elements which is adapted from the model by Veerman and Veldhuis-Diermanse. This scheme was applicable to this study because of Veerman and Veldhuis-Diermanse focus on the collaborative learning as a process of knowledge construction, which is the main focus of this paper. The original categories for analyses are available in Veerman and Veldhuis-Diermanse (2001).

Table 1 - Knowledge construction on task related elements

Knowledge construction on task related elements	Definition
Ask for opinion or encourage participation	Asking a question but not connecting it to other threads or encouraging other members to participate.
Knowledge telling	Statements based on regurgitated facts from the class or from readings without any connection to personal knowledge.
Inaccurate knowledge telling	Statements that are inaccurate and contain wrong facts.
Give opinion	Statements depicting participants' personal views, an interpretation or inference from the discussion.
With examples	Statements accompanied by supporting examples, concrete ideas, or application of knowledge.
New idea	Statements that present new thoughts about the discussion. This includes divergent ideas about the topics learned.
Evaluation	Statements depicting appraisals, critiques, justifications made by the participants. Something that is more than a "*yes, what a good idea*." It requires reasoning and justification of thought.

2.2.2 Thematic analysis for interview questions

In this study, interviews were used to gather a qualitative data in helping researchers to further support the findings of the process of knowledge construction in this learning system which can assist TVET practitioners in performing tasks that need to be resolved. The interview question was adopted from the study of Hong and Lee (2008) in three aspects of teacher knowledge construction, which were questions, observation and definition of concepts. The interview process was conducted on both instructors as they play an important role as an executor in constructing the TVET practitioners' knowledge during the academic lessons.

3. Result

During the teaching and learning process, the instructor and TVET practitioners were given some time to interact and discuss with each other using the forum sessions through Moodle in their learning and teaching process. This set of data is collected from the transcription of all messages posted during the group discussion by both group of respondent in the past four weeks. The messages in this learning system were analyse using content analysis method and coded based on the knowledge construction model adapted from Veerman and Veldhuis-Diermanse (2001).

3.1 Analysis of the text discussion in open learning system

Table 2 shows the percentage of tasks related to student discussions from both group of TVET practitioners based on the messages transcripts that have been analysed according to tasks related statement. These codes are also represented with a theme that has been designated by the symbol BT1 to BT7 that represents the knowledge construction process. The example of BT5 code theme is as follow:

"History allows us to understand and learn the events that have been enacted with regard to themselves, their families and the state of society." (Sample 6, class A)

Overall, 211 or 92.95% of the message code produced by TVET practitioners were tasks related messages with giving opinions theme recorded as the highest frequency, 138 or 60.79% message code. Followed by the second highest theme, process of requesting an opinion or encourages active participation, 51 or 22:47% message code. These findings are generally consistent with Hong and Lee (2008) studies where 396 or 98.26% of the code of the message given by the student were also regarding to tasks related. This finding is also supported by Zhu (2012) in his observation of two groups of students performing online discussion which found that 98.9% message code given by Chinese students were tasks related while 94.2% message code given by the Flemish students were also tasks related.

Table 2 - Percentage of tasks related student discussions for both groups

No	Variables	Class A (%)	Class B (%)	Total (%)
1.	BT1: Ask for opinion or encourage participation	28 (22.40)	23 (22.55)	22.47
2.	BT2: Knowledge telling	1 (0.80)	16 (15.68)	7.49
3.	BT3: Inaccurate knowledge telling	0 (0)	0 (0)	0
4.	BT4: Give opinion	86 (68.80)	52 (50.98)	60.79
5.	BT5: With examples	0 (0)	4 (3.92)	1.76
6.	BT6: New idea	0 (0)	0 (0)	0
7.	BT7: Evaluation	0 (0)	1 (0.98)	0.44
	Total	**115**	**96**	**92.95**

Then, table 3 shows the percentage of non-task related student discussions for both group of TVET practitioners based on the findings from the messages transcripts that have been analysed according to non-tasks related statement. BBT1 to BBT4 code represents the non-occurrence of the knowledge construction process. For example, in BBT4 code for baloney theme:

"There is no UFOOOOOO" (Sample 4, class B)

Table 3 - Percentage of non-task related student discussions for both groups

No	Variables	Group 1 (%)	Group 2 (%)	Total (%)
1.	BBT1: Planning	0 (0)	0 (0)	0
2.	BBT2: Technical	1 (0.80)	0 (0)	0.44
3.	BBT3: Social	8 (6.40)	3 (2.94)	4.85
4.	BBT4: Nonsense / Irrelevant	1 (0.80)	3 (2.94)	1.76
	Total	**10**	**6**	**7.05**

For the code for messages of non-task related for these TVET practitioners, the social themes recorded the highest frequency, 11 or 4.85% code followed by the theme of the message is distorted by the frequency of 4 or 1.76% code message. In conclusion, based on the data obtained, the process of knowledge construction in this Open learning system has helped TVET practitioners from both groups to perform the tasks that needed to be resolved as one of an element in School Based Assessment because the percentage of task related messages codes obtained is 92.95%.

3.2 Analysis of teacher interviews

An interview process was conducted to support and strengthen on the data that the process of knowledge construction in this open learning system that can assist TVET practitioners in performing tasks that need to be resolved. The data that were collected through interviews on instructor were analysed by statistical methods using qualitative analysis base on category and according to the theme. The conceptual analysis was used to determine and select the number of times to test the concept and existence of the theme in the text that has been recorded. During this process of defining the content for the theme, all the text was analysed by word and paragraph to construct the themes and the outcome of this analysis is highly dependent on the focus of the study.

The interview processes were used to gain a deeper understanding of the opinion of the instructors about the knowledge construction process in the study. The instructors were asked several questions regarding the process when it involved open learning system. Sample of the question were asked are, *what is your strategy to create a discussion environment among the students about the topic being learned? What is your role in assisting the student to gain more understanding about the topic in an open learning system?*

Based on the analysis, there are three major themes that emerged from this interview process consists of "question", "monitoring" and "concept description". The first theme that emerged based on the teacher's script was "question" theme. The main characteristics to be identified from this interview are questions that rise by them about the content that being

exploited. Examples of the statements that lead to an effort of instructor to help TVET practitioners build knowledge through this learning system are:

"I'll give the **questions** during class time or give a **question** in the form of handouts." (Instructor 1)

Next theme that has been identified from the interview scripts is "monitoring" theme. The monitoring elements and characteristics that are trying to be identified from instructor interviews are statements that describe the instructor as moderator of a discussion group that been carried out on an on-going basis, including their method to identify TVET practitioners' understanding. Examples of the statement that lead to an effort of instructor to help TVET practitioners build knowledge through the learning systems are:

"I will **monitor** their work and will make sure they really understand about the topic." (Instructor 1)

Finally, the last theme that has been identified is regarding "concept description". An element for the concept description also focuses on statement that containing an explanation, reason or justification of the concepts that been learned. Examples of the statements that lead to an effort of instructor to help TVET practitioners build knowledge through the learning systems are:

"I will ask them a question. If they do not understand, I **will explain again and again**. At the end of class, I will have a quiz session with them." (Instructor 2)

The correlated data from an interview helps in examining the process of knowledge construction in this learning system that can assist TVET practitioners in performing tasks that need to be resolved. The data were compared with the themes that are used to determine the process of knowledge construction generally. Instructor answers or statements during the interview is related as an initiative to help TVET practitioners to build knowledge within issues of variables discussed such as questioning, monitoring and defining concepts. As a conclusion, it appears that the process of knowledge construction in this open learning system has helped TVET practitioners in performing tasks progressively.

4.   Discussion

Based on the data obtained, the process of knowledge construction in this open learning system has helped TVET practitioners in groups one and two to carry out the tasks that need to be resolved as one of an element in School Based Assessment because the percentage of the task related message code that is high for both group of TVET practitioners. This finding is similar with Rahman et al. (2011) who showed that the majority of the respondents agree that online discussion facilitates the process of knowledge construction through critical observation of other people's ideas during discussion sessions. It is in accordance with social constructivism learning theory by Vygotsky (1978), student's knowledge construction is actively constructed through social interaction in online discussion.

This finding is also consistent with Schellen and Valcke (2004) who found out that student in the group   discussion of their research has a task oriented discussion and has helped these students to perform the tasks that needed to be completed in a CSCL learning environment very well. Instructor plays an important role in creating learning readiness among TVET practitioners. Among several initiatives that are important were to assist TVET practitioners learning is the willingness of instructor to be creative through expanding their teaching methods. The method that can be implement such as working in groups, pairing the TVET practitioners and apply peer discussion where TVET practitioners are willing to be assisted by TVET practitioners who are knowledgeable (Hashim & Harun, 2015). The results are also consistent with comparable studies of Weerd, Tan and Stoyanov (2017). The results from their study confirm that students in the discussion groups showed more knowledge construction occurrences of utterances seeking clarification and positioning one's perspectives. In the social mode of knowledge construction, students also displayed more conflict-oriented and integrated consensus building statements to negotiate shared knowledge.

There were some advantages found in this open learning system for example the collaborative learning method can be applied among the TVET practitioners when they were asked to work together in groups to provide their own opinions related to a topic of lessons. This result reflects those of Mathew and Iloanya (2016) who also found that open learning system could improve access and interaction with lecturer as well as other learners through group discussion. This method is beneficial as it can help to motivate, guide and encourage TVET practitioners to engage actively in two-way communication activities. As open learning system is making a substantial contribution to learners, previous study by Karsent and Collin (2012) also demonstrated that this system able to trigger student's motivation and perseverance in learning. However, this research is not expanded to identify the quality and level of TVET practitioners' knowledge construction process in particular. The aim of this study is mainly to identify the effects of the use of open learning environment on students' knowledge construction process and to get an overview on the stages of TVET practitioners learning process after using this intervention of learning method which is open learning system as a medium for knowledge construction process.

Data from the current study was correlated and tabulated by the observation of online discussion and interview of instructor who teach these TVET practitioners. It is proposed for the future research to examine and collect the data through interviewing TVET practitioners and parents for data validity and reliability so that the same approach can be carried out in the process of learning and teaching in the future.

5.   Conclusion

Knowledge construction process among TVET practitioners in open learning system was studied. In four weeks of study, four lessons were conducted and learning is delivered through discussion, sharing of learning materials, support tools interaction, feedback and also information sharing. Results revealed that open learning system has helped TVET practitioners to perform the tasks in online group discussion. The interaction that exists online group discussion has triggered active participation among TVET practitioners and in turn, this enabled the tasks to be completed within the given time frame.

Despite active participation among TVET practitioners, the instructor also plays an important role as a mediator in the discussion session. Besides that, the instructor presents their readiness to be creative and to expand their teaching methods as learning is delivered through online learning environment.

Given the tremendous potential of knowledge construction process among TVET practitioners in open learning system, future researchers are recommended to examine the TVET practitioners' intellectual level and phase of knowledge construction during the process of teaching and learning. In addition, it is important to conduct a research on how TVET practitioners' knowledge is constructed and can influence the level of student performance from different intellectual levels either low, intermediate or high should be endeavour as it will be beneficial for the future of teaching and learning process.

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