Characteristics of Video Learning Based on Project-Oriented Problem Based Learning

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ABSTRACT

Demonstration method is often used in technical and vocational teaching. This has led to a longer period of teaching and learning (T&L) and it is difficult to be repeated if the students missed it. In addition, the diversity of students' backgrounds affects how they think, insofar; influence their thinking skills and the knowledge exhibited. Therefore, the use of video in T&L is the latest alternative to allow students to see the process involved in practical and stimulate students' ability to engage in T&L. This should be added to the Project-Oriented Problem Based Learning (POPBL) because the concept of learning is suitable for learning base on performance and establish the characteristics of the competencies required by employers. Therefore, this study was undertaken to identify the characteristics of video learning base on POPBL. This characteristic was built based from the analysis results of previous study and expert interview in Malaysians.

Keywords: POPBL, characteristics, video, technical, TVE

INTRODUCTION

Technical and vocational education (TVE) without a doubt is the catalyst for national development (Asnul Dahar, et al., 2013). Teaching and learning process in TVE should not only focus on chalk and talk method, but should also emphasize on competencies (Marina & Jamil, 2013). Utilization of various teaching aids is very important to ensure that students can master a task in a specific competency before moving to a new task. Therefore, competency-based education in teaching skills has become a main aspect in education (Asnul Dahar, et al., 2013; Drive & Asnul Dahar, 2006; Lokman, Nurul Qistin, and Mohd Hanafi, 2009; Marina & Jamil, 2013).

In achieving developed nation status in 2020, employers are becoming more critical in the selection of new employees (Rasul, et al., 2009). This is due to the quality of graduates produced by local universities who did not exhibit the required competencies according to the job sector and low capability of graduates to master social skills and manners effectively in the society (Othman et al., 2008). This finding is in line with the technological changes which is constantly improving and advancing from time to time (Hamzah & Musta'mal, 2012). This goes along with the government's desire to create and strengthen human capital skills and knowledge contained in the second core of RMK-9 which is to increase the capacity of knowledge and innovation (Asnul Dahar, et al., 2013). Therefore, POPBL should be applied in teaching and learning in order to produce workers who are innovative, creative, able to solve problems, work in teams and manage projects.

Studies conducted by Hernández-Ramos (2007) and Sampson and Fytros (2008) proved that the use of technology in education offers huge potential as it introduces an innovative teaching and learning modalities among students with different backgrounds. It also provides learning experiences that are similar to the students life experience (Potter, 2005) and also provides support, extend or change in pedagogy and curriculum output (Kearney & Schuck, 2004). Technology and pedagogy are often seen from the perspective of constructivist (Jonassen, et al., 2003).

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In line with the development of technology in the country, the application of video learning is highly encouraged to be used as one of the teaching methods, especially in TVE. It aims to produce students who are skillful and knowledgeable. This is to fulfill the government's efforts to produce highly competent human capital (Shiung & Ling, 2005). Besides, the use of the video also has shown that it has helped educators in T&L process, improve students understanding in mastering a subject (Ismail et al., 2006; Jurich, 1999; Zurina & Zaidatun, 2006) and prepared the students to be equipped with lifelong learning and be proactive when entering the workforce (Gasperini, 2009). Therefore, this study was undertaken to identify the characteristics of Project-Oriented Problem Base Learning in video.

Project-Oriented Problem Based Learning (POPBL)

POPBL is an educational discipline by nature where it can be divided into two themes, namely, project-based and problem-based learning that involves daily lives issues (Krüger-Basener & Kosuch, 2009; Uziak, et al., 2010). Problem-based learning requires students to develop and build the foundation for the synthesis of knowledge from various disciplines (knowledge) while project-based learning requires a wide range of theories and related knowledge (know-why) (Moesby, 2005; Ruhizan, et al., 2011; Uziak et al., 2010).

POPBL approach encourages students to engage in more complex scenarios or complex problems given to them. They need to identify the information they have learned and the skills they need to have in order to have good problem-solving skill (Ruhizan, et al., 2011). In POPBL structured methods, in the early stages of the course, students carried out simple projects at the beginning through self-study followed by critical and complex questions (Moesby, 2005; Uziak, et al., 2010). Many of the earlier projects were done through self-study that helps students to revise or develop the necessary basic concepts, learn how to use the design tools, develop problem solving and critical thinking skills and develop independent learning skills (Ruhizan, et al. 2011; Uziak, et al., 2010).

Ruhizan, Saemah and Kamaruzaman (2011) have done a study for trainers in 12 polytechnics in Malaysia. The result showed that the use of technology in the implementation of POPBL is able to give positive impact on students' knowledge and technical skills. The key features of POPBL are student-centered, providing instruction through skills required, process-centered, group-based, experience-based and problems are treated as the core issue in learning (Ruhizan, et al., 2011; Uziak, et al., 2010).

The practice of POPBL in designing and craftsmanship requires special attention because it improves the design thinking, the skills and experience (Ruhizan, et al., 2011). It also promotes and supports teamwork and improves the retention of knowledge in valid multi-disciplinary design scenarios, as well as crossing geographical boundaries and cultures. POPBL approach can also help students to learn design thinking effectively because it encourages creativity and enhance a comprehensive approach to solving problems (Uziak, et al., 2010). According to Krüger-Basener & Kosuch (2009), POPBL is able to attract female students to study science and technical subjects.

According to Moesby (2005), the characteristics POPBL is to state the problem according to the level, strong group planning which is led by individuals who are experienced in every level and validated discussions are the keywords used in categorizing individual skills and talents. In addition, through POPBL, students' personal efficiency is very significant and higher when compared with conventional techniques. POPBL is also seen to be having the potential to foster the ability of students to learn actively, think critically and solve problems through teaching process that focuses on practical tasks (Aziz, Sicard, & Dhia, 2010; Othman et al., 2008). It also encourages students to conduct group discussions. Moreover, POPBL can create independent learning, improve soft skills, develop first class human capital and form an active, constructive and creative learning (Othman et al., 2008).

According to Dolog et al., (2010), POPBL has different perspectives among students, teachers or trainers and educational institutions. From the students' perspective, POPBL involves problems related to daily life, which attract students' interests and increase students' motivation. Meanwhile, lecturers or teachers believe that POPBL promotes mutual learning among their students. Finally, from the point of view of educational institutions, POPBL is able to motivate students, produce graduates who are competent and enhance collaboration between institutions and industry.

METHODOLOGY

In order to develop a CBE-based video learning for Technical and Vocational Education (TVE), first, researchers need to identify the characteristics of CBE in the video. For that purpose, researchers have conducted structured interviews with four CBE experts in Malaysia. Before the actual interviews were

conducted, structured interview transcripts were confirmed in advanced by two Universiti Teknologi Malaysia (UTM) lecturers. Next, pilot interviews were conducted to identify if there are any weaknesses in the interview transcripts. Once improvements were made, actual interviews were carried out.

The raw data from the interviews conducted were recorded, compiled, analyzed and interpreted to make it meaningful in this study. These data were processed using ATLAS.ti software. Data were analyzed through three procedures which were reduction, verification and presentation of data (Miles & Huberman, 1994). In reducing the data taken from the interviews session, the researchers need to read the transcript of the interviews several times, select and summarize data that are meaningful to the study The meaningful data were classified into units called 'segmenting' while data that did not give any significance were left out.

RESULTS AND DISCUSSION

This section discusses the analysis of elements of the Project-Oriented Problem Based Learning (POPBL) through the use of video. These elements were obtained through the analysis of transcripts that have been carried out by five experts in the POPBL field. Findings showed that there are four constructs in POPBL through video which are; video quality, delivery instruction in video, video design and learning content. Further details are discussed as follows:

Quality Video

Based on the results of transcript analysis that has been done, researchers found that quality video is one of the elements that should be taken into consideration when applying POPBL. A good quality video greatly affects the audiences, especially students who have different learning backgrounds and abilities. Good quality video can also stimulate the focus of the audiences or students. Based from the analysis conducted, researchers have identified two sub-elements in video quality which were display and audio. Clear and attractive display is very important in ensuring a high quality video. This was stated by a number of participants in this study.

"Video should be interesting" and have "interesting package of video" and "video is clear" (PK1)
"Video must use colours, focus and clarify which is good and perfect" (PK4)

In addition, quality video should also focus on the work flow closely and clearly. This was stated by several participants in this study as follow:

"Video focused on one task in detail" (PK2)
Besides, "zoom in on a critical process carefully" and "zoom in the technical aspect that is done" (PK4)

Based from the recommendations provided by the Kappa agreement value, researchers found that video should have a high resolution display. The feedback is as follows:

"Video has a high resolution display"

A quality video should not only have a good view, but good and clear audio too. It should be supplemented by animation and goes along with the movement in that video. This was highlighted by a number of participants.

"Narrator is clear" (PK1)
"...animation and lighting parallel with the sound of the narrator in the video" (PK2)
"Video sound must be in line with movements in the video" (PK4)

Instruction Delivery in Video

Instruction delivery in a video presentation is also one of the elements in POPBL. Among the features of this element is segmented video, video content delivered in phases and step-by-step, video content delivered ranging from low to high level and the teaching and learning process displayed in the video is authentic. This was highlighted by several participants in the study, namely:

"Video should be segmented", "video displayed part by part" and "video showed a step by step content" (PK1)
"Additionally, the video should start from low level to high level" (PK1)
"Segmented video" and "there is an interval of time for students to think" (PK2)
"Video showed step by step, these steps should be complete" (PK2)
"Video shows actual and reality recording" (PK3)

"Video shows actual work process" (PK4)
"The learning process happened outside the classroom among the students can be turned into video" (PK5)

Video Design

Video design is also one of the elements in POPBL. Among the features of this element are the existence of the presenter in the video, there are text graphics to support questions raised by the presenter, there is a time lapse for the audience to respond and the work processes shown in the video is labeled. This was highlighted by the participants as follows:

"the teacher as a facilitator either in the video..." (PK1)
"the video has interaction between teachers and students" where "there is a lecturer in the video" (PK2)
"there is a facilitator in the video itself" (PK4)
"video makes students wanting to ask which nurture thinking skills among students" (PK1)
"create questions to the students on why a problem arises"(PK2)
"task is labeled" (PK1)

Learning Content

The findings from the analysis of transcripts that have been done showed that learning content is an element that should be taken into consideration when applying POPBL. This element has four sub elements, namely the introduction, work process, enrichment and evaluation. Introduction is the first element in the sub element of learning content. Introduction plays a crucial role in displaying equipment used during the work process, stating the work to be done and highlighting the requirements' needs before starting a task. This was stated by the fourth participants:

"There are guidelines on the work process in the video itself" (PK4)

"States the need for the work process" (PK4)
"Video shows the equipment needed to carry out the work" (PK4)

The work process is the second sub element in learning content. Among of the characteristics in this element clearly display the actual problem and scenario, give solutions to the problem as well as explain and demonstrate the impact of the problem. This was stated by several participants:

"The video starts with a problem" where "the real problem is described" or "real problem" (PK1)
"Video describes a real problem" (PK2)
"The existence of real scenarios", "display the actual scenario" and "the existence of other alternative scenarios" (PK3)
"The existence of real scenarios" that "portrays the real atmosphere instead of acting" and "displays the actual scenario and the real environment" (PK4)
Video "begins with a problem" where "the problem is authentic" (PK3)
"Video displays problems followed by explanation" (PK5)
"Video shows solutions" (PK5)
"Find a problem, show the problem, solve the problem, give a clear explanation of the cause of the problem and its consequences" (PK2)
"Video displays negative input and shows its effects" (PK4)
"Exposes weaknesses that led to the case to occur. Focus on the weaknesses that arises which led to the case to occur"(PK4)
"The video shows the problems that have occurred and displays what happens when these problems arise and also displays the effects of it if the problem persisted" (PK5)

In addition, the real problem shown must be informed in a 'trigger' way, phase by phase, starting from a low level to high level and starting from high level to low level. This was stated by some participants as follows:

"Problems are expressed through 'trigger'" and "is expressed phase by phase" (PK3)
"The question starts from easy to difficult" or "from difficult to easy" (PK1)
Additionally, the questions start "from minor problems to major problems" or "from big matters to small matters" (PK2)
"States small problem into a big problem" (PK5)

In addition, work processes flow need to be addressed when applying POPBL elements in a video. Findings from the interview transcripts with the POPBL experts indicate that the correct and incorrect way of work processes need to be displayed, competent individuals should be shown, the use of equipment while carrying the work should be demonstrated, technical skills should be shown step by step, the same alternative scenario should be given, complexity of the process of the work done must be explained and error while executing the work should be highlighted. These were stated by the following participants:

"Shows actual experience, giving experience on the process of carrying out the right work" (PK3)
"Giving experience from incorrect work process" (PK3)
"Video shows actual experience (PK3)
"Video gives explanations that have been done by someone else and the results obtained" (PK5)
"Shows how the equipment is used" and "state of the equipment involved" (PK4)
"Video shows hands on activities, part by part" (PK1)
"Students are shown the process involves step by step" and "described the process in stages" (PK4)
"Video displays how the practical work is done following a standard operation procedure (SOP) of which the video describes in detail one by one". (PK5)
"Shows how to use the equipment step by step" (PK5)
"Give various examples of work and create work processes" (PK3)
"There are a lot of solutions in the same frame work where problems will lead to a many and open-ended solutions" (PK1)
"Existence of many examples of the same process" besides "video shows skills that are being done" (PK4)
"Video-record a project that need to be done to document the trouble in implementing the project" (PK4)
"...attached picture that shows incorrect wiring that causes burning. Also included are images of burning" (PK2)

The third sub element in learning content is enrichment. The characteristic of enrichment identified in the video is the video shows repetition of work process that shows errors being done and repetition of the same work process. This was stated by two participants as follow:

"Shows flashback of video that indicate the mistake done" (PK2)
"Requires repetition of work process" (PK3)

Evaluation is another sub element in learning content. Features of evaluation include the following criteria: video displays a checklist for work processes and displays aspects that are assessed in every stage of the work process. This was stated by the following participant:

"..have checklist for what needs to be done" (PKI)
"POPBL is a process centre where assessment supports the process centre, assessment for each work process" (PK1)

The units of POPBL elements identified through video and interviews with POPBL experts are presented in Table 3.
Once all the data were transcribed, the researchers used a coding system based from the recommendations made by Marohaini (Marohaini, 2001). Fixing a code for each transcript and segment is important to facilitate the process of retrieving the original data and to ease cross-referencing of information when writing and reporting (Marohaini, 2001). Next, the researchers have verified the interviews data to ensure the validity and reliability of the findings of the interview data. The verification process is performed by obtaining index inter-rater realiability towards the code and the unit using Kappa Agreement values (Cohen's Kappa). The formula for finding the coefficients of the agreement is as in Figure 1.

$$K= (fo-fc) / (N-fc)$$

Where,

K= *A Coefficient of Agreement*
fo= the number of units in which the judges agreed
fc= the number of units for which agreement is expected by chance

FIGURE 1. Formula for Cohen's Kappa

According to Marohaini (Marohaini, 2001) the reliability of qualitative data can be achieved if the transcripts were reviewed by a panel of judges consisting of at least two independent and credible researchers. Therefore, researchers have chosen two Problem Oriented Project Based Learning (POPBL) experts and formula (Rust & Cooil, 1994) as shown in Table 1 was refered. Approval of experts in Kappa agreement values is very important in determining the reliability of the themes developed by the researcher. Both experts were provided with a copy of the guidelines and suffiecient code schedules. Both must agree in understanding the code and the purpose of the theme (Marohaini, 2001).

TABLE 1
Kappa Agreement Value Scale (Rust & Cooil, 1994)

Kappa (K)	Strenght of Aggrement
K<0.00	Very weak
0.00<K<0.20	Weak
0.21<K<0.40	Moderately weak
0.41<K<0.60	Moderate
0.61<K<0.80	Good
0.81<K	Very good

In this study, the approval of two POPBL experts was obtained from the results of their evaluation of 43 units for POPBL. After two evaluators gave their approval, the calculation process was carried out and the agreement value between the inter raters was 1.0. The value belongs to a very good level in the reliability scale for POPBL based on Table 1 (Rust & Cooil, 1994). The process of obtaining the Kappa agreement value shown in Table 2.

TABLE 2
The Calculation of Kappa Coeffiecient Agreement Value between POPBL Experts

Kappa Agreement Value Coefficient Expert 1	Kappa Agreement Value Coefficient Expert 2	Total Kappa Agreement Value Coefficient Average
fa=57 fc=30 N=60	fa=58 fc=30 N=60	
K=(fa-fc) / (N-fc)	K=(fa-fc) / (N-fc)	
K=(57-30)/(60-30)	K=(58-30)/(60-30)	K=(0.90+0.93)/2
K=0.90	K=0.93	K=0.92

Therefore, the reliability of coding in this study is quite high. This shows that this data has high reliability for each unit which is used to describe a theme. Finally, the data obtained from the interviews should be displayed and according to Miles and Huberman (Miles & Huberman, 1994), there is no specific format for reporting qualitative data research. Therefore, researchers have compiled the interviews data in the form of construct arrangement which was obtained with its respective unit. Table 3 shows the constructs and unit for POPBL in the video.

TABLE 3
POPBL Characteristics in a Video

No.	Construct		POPBL Elements in Video
1.	Video quality	Interface	Clear display
			Attractive display
			Quality video in terms of content and security
			High resolution of video display
		Audio	The sound and movements are parallel
			Clear background sound in video

2.	Instuction Delivery in Video		Segmented video
			Video content is shown in phases
			Video content begins from low to high level
			Displays actual T&L process
3.	Video Design		Graphics text is to support questions raised by the presenter
			Time lapse for audience to respond
			Presence of presenter in video
			Work processes shown in the video are labeled
4.	Learning content	Introduction	Video displayed the tools/equipment that are used when carrying out task
			Video states the work processes to the students
			Video states the requirements before starting a task
		Work process	Video starts with a problem/scenario
			Video clearly displays the actual problem
			Video shows example of problems that had happened
			Video shows the complexity of work process done
			Video shows the aspects assessed for each work process
			Video shows how groups are formed, work process done and information obtained
			Video shows the true scenario clearly
			Video shows errors done when tasks are executed
			Video shows the impact of the offense committed while performing tasks
			Video shows the solution to the problem
			Video explains the source of the problem
			Video explains the effects of the problem
			The actual problem shown in the video is through 'trigger'
			The actual problem shown in the video starts from low to high level
			The actual problem shown in the video is in phases
			Video shows the use of equipment when carrying out task
			Video shows demonstration from experienced individual
			Video shows the right work process
			There are various solutions for the same problem in the video
2.			Video shows the same alternative scenario

			Video shows technical skills step by step
			Video shows various demonstration for the same task
		Enrichment	Video shows flashback of work flow that indicates mistake made
			Video shows repetition of the same work process
		Evaluation	Video shows a checklist for work process
			Video shows aspects that are being assessed in each level

CONCLUSION

Realizing that these learning problems have offered solid solutions, many researchers have been conducting research on POPBL elements that are essential in the production of video learning especially in technic and vocational education. Researchers selected video as a medium to develop students' competency as it has been proven from previous research that multimedia is able to attract students' interest and a very effective tool. Unfortunately, current medium does not help much in shaping students' compentencies and is not suitable to be used in TVE. Therefore, the characteristics of video learning based on POPBL was developed to serve as a reference in the construction of a video that emphasizes skills and become an instrument for assessing existing videos that possess skill-based learning content.

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