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Practical Video (V- Lab) For Teaching and Learning Biology Secondary School in Malaysia

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ABSTRACT: This study aims to develop a biology practical video (V-Lab) and a practical manual to assist teaching and learning of form four (students aged between 16 and 17 years old) biology subject. The study employed the development design and the ASSURE model was the main model referred. This study was conducted in a school laboratory involving teachers and students as respondents. Twelve practical experiments havebeen videotaped. Each video was edited by the inclusion of text, music and shortened to a period of 60 seconds. The practical manual was also prepared to assist the video. The V-Lab and practical manuals are validated by experts with a 92% of expert agreement and have a Cronbach Alpha reliability score of 0.82. The suitability of V-Lab and practical manual were also high (mean = 4.25, SD = 0.67) from the students' point of view. The conclusion is that V-Lab together with the practical manual are good and suitable for teaching and facilitating biology practical. The implication is that both V-Lab and the practical manual can be used to help, and guide teachers and students understand biology practical work step-by-step in theory before conducting real practical in the laboratory. Besides that, teachers and students can watch V-Lab any time and anywhere they like.

Keywords: V-Lab, Cronbach alpha reliability score, ASSURE model

1. Introduction

The fourth edition of the industrial revolution requires high-skilled workers. This requirement demand changes to the education system, specifically in the pedagogy aspectpreparing students for jobs that meet the needs of industrial revolution 4.0. Graduates not only have good characters but will bemore competitive, creative and highly skilled in various fields. In doing so, first we need to improve the teaching and learning in schools, emphasizing on the strategies of delivering the content of the subject matter. Changes in teaching and learning strategies need to be done to strengthen the education system and this was incorporated in two of the 10 shifts that were mention in Development Malaysian Education Plan (2013-2025) that leverage on ICT to enhance the quality of education in Malaysia and transformation of the ability and capacity of education delivery. Strategies or learning delivery needs to be flexible and not conventional. Teachers need to be more creative and innovative in carryingout teaching and learning approachesor strategiesso that students could acquireknowledge effectively (Che Ahmad et al., 2017)

In science learning, the laboratory is an important learning environment as students undertake practical work to link the theories with practical taught. Biology is the life science or

scientific study of life (Campell, Mitchell & Reece 1994). Biology courses focus on scientific knowledge and biology learning focused on theoretical learning to expose students to knowledge and concepts as well as practical activities or field studies. In this regard, science process skills and manipulative skills need to be emphasized and mastered by students. These skills could be practice and enhance through practical work in the science laboratory.

Despite the importance of the practical work, there have been some confining issues and challenges in conducting laboratory worksuch as excessive spending and time-wasting (ZolAzlan, 2000), teachers are not adequately exposed and lack of laboratory equipment. There are still school science labs that have problems with the lack of equipment and materials to carry out practical work (Chiappetta &Koballa 2006; Siti Aisyah&Suhaili 2004). Studies have also found that science laboratories lack equipment for performing work, lack of technological support such as computers, insufficient safety equipment, limited movement space, and inconsistent water and electricity supply (Che Ahmad, 2011).Kim and Tan (2011) also mentioned about limited time, large number of students, availability of resources, low proficiency of teachers and the absence of trained laboratory assistance as some issues, while Kilinc (2007) outlined lack of materials and longer time duration. Lack of time and content overload, lack of expert technical support; and lack of teacher expertise and withdrawal of the practical exam in class are some of the other issues raised (Childs et al., 2012).

Thus, the use of multimedia materials as teaching aids such as video is an alternative way to addressing the practical constraints faced by teachers. The use of video in laboratory work might enhance the teaching and learning process making it more effective and enjoyable. Video consist of audio, images, graphic and sometimes assistwith harmonious music that could trigger all students' senses. The integration all of these elements will enable students to easily visualize and understand the scientific process. Holland et al. (2013) argued that the use of video could assist the development of psychomotor skills. Teaching strategies that include videos provide a visual demonstration in a simulated close to real setting (Cardoso et al., 2012; Hansen, 2011), offering context to the skill (Sowan and Idhail, 2014) and allowing students to experience performance of the skill by linking classroom (face-to-face) learning to practice (Duncan et al., 2013; Holland et al., 2013).

2. Methodology

This study involved two stages.The first stage was the construction of the practical video (V-Lab) and the practical manuals were based on the ASSURE model which involved five phases which were analysis, setting objectives, choosing methods, using materials and media, student engagement, and assessment.

In the analysis phase, researchers did the need analysis to identify the topic and experiments that need to be recorded. This stage-involves biology teachers and form four science students. Students' background and their characteristic were also analysed tounderstand their interest and needs. Thisinformation would serve as basis of media selection and materials. The need analyses were conducted through interviews and survey among teachers and students to identify the important and appropriate practical topic to be recorded. The characteristic of the desired recorded practical video were also explore and identified.

In the objective setting phase, the researcher sets the minimum level of what students should learn and understand from selected practical topic. These were based and parallel with the Malaysian curriculum Biology Specification. The objectives were focused on new knowledge, skills, and attitudes.

Phase three is a selection of methods, media, and materials. The researchers determine the method that fits the learning task, select the appropriate media to implement the selected method and select, modify or design the predefined media. In this phase, based on the

identified practical topic, researcher selected the appropriate method with the relevant apparatus and materialsto conduct the experiments.
The fourth phase involves the use of apparatus and materials that have already been identified in practical video development. The experiments were performed and recorded. The process of recording practical video was carried out in the laboratory where the researcher conducts practical activities. The practical video was recorded one by one and if there was any mistake occur during the recording, the process was repeated until it was well recorded. All the video recordings were edited and included music and text to help in explaining the practical video recorded. The recording is also shortened so that the execution duration is within 60 seconds. This is to prevent students from getting bored.
The fifth phase involves students. In this phase, the researcher will ensure that all strategies and activities planned could actively engage students in practical work such as observation, recording, practicing, and discussion.
The sixth phase is the evaluation phase. In this phase the evaluation is done on the material that has been developed, namely V-Lab and practical manuals. V-Lab and its' practical manual weregiven to five experts to determine its validity. The experts'comments were used to improve V-Lab and practical manual. Subsequently, a pilot study was conducted to determine the reliability of V-Laband its' manual.

The second stage was the evaluation of V-Lab suitability and practical manual employing the survey design. After determining the validity and reliability of the module, a survey of 100 respondents was conducted to identify the suitability of V-Lab and the practical manual from student perspective. The findings of this survey were analysed using the mean value and standard deviation to determine the suitability of V-Lab and practical manual built.

Findings and Discussion of the Study

V-Lab and practical manual

V-Lab is a series of short videos that focus on the procedures and techniques of conducting biological experiments. V-Lab emphasizes autonomous learning by providing experiment-related recipe books for students to easily understand and control. Twelve practical videos had been created that covered five areas of learning in the Biology KSSM form four, as shown in Table 1.

Table 1 V-Lab Mapping with Biology KSSM Form 4

V-Lab Mapping with the Biology KSSM Form 4	
Learning Areas	**Learning standards**
Biology and Organization Cell	Identify plant cell structures based on observation by light microscope.
	Identify animal cell structures based on observations by light microscope.
Material Movement Across The Plasma Membrane	I studied the movement of materials across partially soluble membranes.
	Determines the concentration of plant tissue sap.
Metabolism and Enzymes	To study the effect of pH on amylase enzyme activity.
	To study the effect of pH on pepsin enzyme activity.
Nutrition and Human Digestion System	To study the presence of reducing sugars.
	Examine the presence of non-decreasing sugars.
	Study the energy values in different food samples.

	Determines the content of vitamin C in ascorbic acid.
	Determine the vitamin C content in orange juice and pineapple.
Homeostasis and Human Urinary System	To study the effect of different volumes of water on urine formation.

The video had been edited and shortened into a60 seconds video to encourage the engagement of students and prevent boredom among students. Stoerger (2013) stated that prolonged video will cause students to become bored and Kostereliogl (2016) argued that short-term use of video can increase the effectiveness of its use in learning
V-Labdemonstrates experiments carried out step by step. The equipment used is also mentioned. There is pleasant background music to add an element of attraction to this video. Practical steps are organized and presented in the simplest form for students to understand. This is in line with the findings of a study conducted by Bravo, Amante, Simo, Enache, & Fernandez (2011) stating that students enjoyed short videos rather than long written descriptions.Videos were used in learning for several reasons (Açikali, 2014). Video could provide visual and auditorylearning (Johnstone, 1999). Capture students' attention (Hew & Brush, 2007), making connection with daily life and giving examples from everyday life (Chang, Quintana, &Krajcik, 2010) and adding fun in learning (Al-Fudail& Mellar,2008).

However, to better students' understanding, this practical video is assisted by a practical manual, which is a comprehensive guide for students in implementing practical work in laboratories. The manual provided is simple and easy to use to engage students in practical work. The use of technological aids in learning could enhance learning and help teachers increase the effectiveness of their teaching. According to Açikalin, (2014), most of biology teachers were more likely to use PowerPoint presentations, videos, textbooks rather than blackboards, laboratory work, worksheets, supplementary books, and animations

2. The validity and reliability of V-Lab and practical manuals

V-Lab andits manual were given to 5 experts to validate its content. The results showed that V-Lab Biology and manual has good validity with an expert agreement rate of 88%. This shows that all content in the V-Lab and manual are in line with the form 4 biology syllabus. The validity of the V-Lab and practical manual are good because they exceeded the content validity requirement of over 70% proposed bySidekMohd Noh and Jamaludin Ahmad (2005) and 0.78 by Polit, Beck, and Owen (2007).
To determine the reliability of V- Lab and manuals, a pilot study was conducted involving 20 biology teachers. The obtained Cronbach alpha value was 0.82. The reliability index of the V-Lab and manual are good (Cohen et al., 2007) and this demonstrates that the V-Lab and the manuals are useful in helping teachers and students perform practical work.

3. The suitability of V-Laband practical manuals from students view

The level of suitability of the V-Lab was tested through 100form four students in 2 schools in Selangor. Students provided positive perceptions regarding the suitability of V-Laband practical manual (Mean = 4.25,Sd = 0.67). This shows that students were convenient to employ V-Lab and its manualin carrying out practical work in school. A study conducted by Kostereliogl (2016) showed that using video in learning could enhance students' interest, focus, and memory. In addition, the use of video could also make the learning content more

attractive and enhance self-learning among students (Bravo, Amante, Simo, Enache, &Fernandez, 2011) Video animation could improve their imagination and visualization (Agustini& Kristiantari,2016).

3. Conclusion

V-Lab and its manual demonstrate good validity and reliability. Students also provide positive views on the suitability of employing V-Lab and its manual during laboratory work. It can, therefore, be concluded that V-Lab together with the practical manuals can be used to assist in teaching and facilitating biology learning in schools.

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