

## Improving the Usability of Massive Open Online Courses by Adapting Problem Solving Video

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**Abstract.** The purpose of this research is to improve the usability of Massive Open Online courses (MOOC) platform that newly established by using the course Web Programming SCSV1223 in OpenLearning as case study. The MOOC has its own drawback where the participants in the courses might not understand well the video lecture and the lecture notes provided in the course. To improve the usability of MOOC platform, this research paper proposed the problem-solving videos as support to the video lecture in MOOC in the aspects usability-effectiveness. The experiment was conducted through formal evaluation methods between two different groups of students in traditional classroom and groups of students that used MOOC video lecture that adapted the problem-solving videos.

**Keywords:** MOOC, online learning, problem-solving video, self-paced learning, paired t-test, usability, effectiveness.

### 1 Introduction

Rapid growth of technologies in the education at Malaysia, plenty of methods was studied to educate the citizens, especially for those who cannot afford to pay for the expensive education fees. Because of that, many online education websites were developed to fulfil this purpose. MOOC is one of the platforms that offered free courses for anyone that has the urge to learn. Over a few years, MOOC integrates the connectivity of social networking, the facilitation of an acknowledged expert in a field of study and a collection of freely accessible online resources [1]. Even though MOOC video lectures have the flexibility to be controlled by the students, there are still some of the participants unable to finish the courses that enrolled in the MOOC. This is because some of the courses provided video lecture with a long duration which results in the students consuming a lot of time to finish the video lecture only. At some point, the video lecture itself is boring enough for the students. These problems that arise in the courses end up becoming a burden to the students to watch the entire video lecture until the end.

### 2 Methodology

This topic is divided into two sections that are section 2.1 and section 2.2. Section 2.1 is discussed on the related work or study that was conducted by other research that related with the research on improving the usability of MOOC by adapting the problem-solving videos. While in section 2.2 is described on the usability by referring to the ISO 9241-11 and the problem-solving methods used to develop the problem-solving videos.

#### 2.1 Related Work

As the evolution of education in ICT, MOOC was introduced as the latest stage of education evolution. MOOC has high potential to improve the education system and was proven to be valuable to the education system.

MOOC is an innovations platform that can help revealed the new methods of online learning, blended learning or face-to-face learning [2]. MOOC platform includes many interactive activities that can be completed by the students that participated in the courses that provided which can afford by learning by completing the prepared activities. The most popular features of MOOC that is used in the MOOC is the video lectures where the instructors give lecture by referring to the lecture slides provided in the course [3].

Even with various activities provided in MOOC platform, there are some limitations and challenges that MOOC platform needs to overcome. Most of the participants that join MOOC are known as heterogeneity where the participant's background, level of maturity, and their experiences about the courses might slightly have differences. One of the problem that was faced by MOOC is high learners' drop-out rate with the average to 5 percent to 15 percent of participants that successfully completed the courses [4]. The engagement of the participants with the video in MOOC shows that the video lecture content is important because the video lecture that have more personnel feel and instructor that speak fairly fast and high enthusiasm are more engaging.

## 2.2 Usability and Problem Solving Methods

In measuring the performance of the adapting the problem solving videos in the MOOC platform, the ISO 9241-11 becomes the guideline for the standards of the usability requirements context that is effectiveness. The usability requirement of effectiveness can be defined as the accuracy and completeness with each users achieved specific goals [5]. The problem-solving method that is used in this research is as in Figure 1. The enhanced problem-solving model consist of four phases that are presenting the analogy, relating the analogy with the chosen topic, problem solving questions, and solutions to the problem-solving questions. First phase is the students are exposed with the general analogy that used from their environment to give the students an idea about the topic. While in phase 2 is the explaining phase which is the analogy given previous was showed the relation with the chosen topic. Next, the student is provided with problem-solving questions based on the given analogy. Final phase provide the solutions to the problem-solving question. Since this problem-solving video was implemented in online learning, answers to the questions must be provided for the students. But, this final phase has some trick to make it became more challenging. The students are required to answer some trivial puzzle before they can unlock the PDF file that contains the solutions.

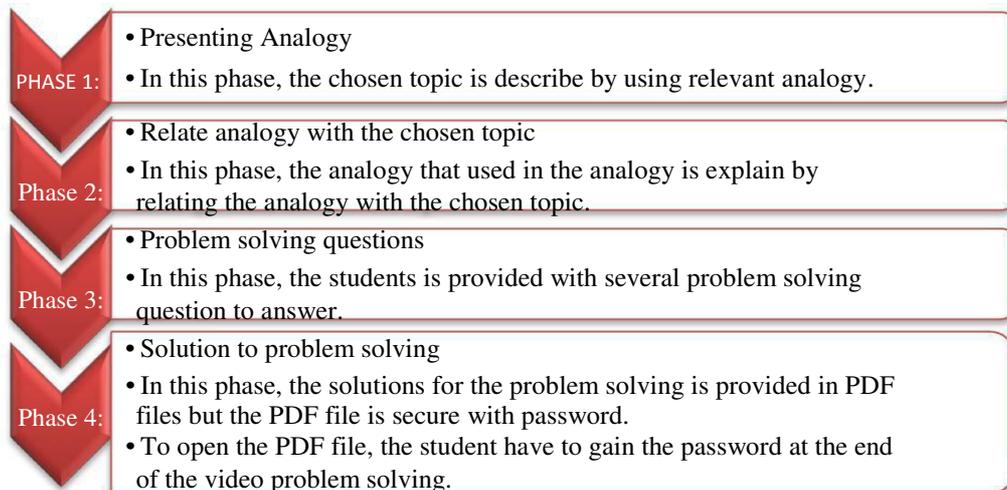
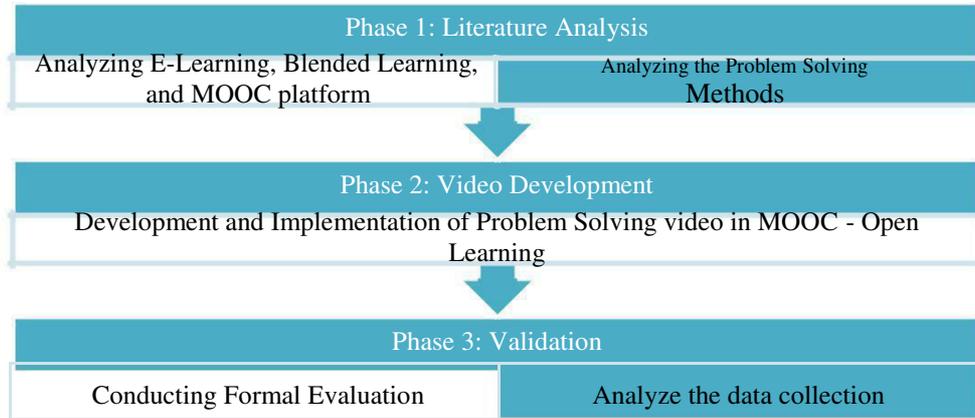


Figure 1: The enhanced problem solving model

## 3 Operational framework

There are three phases for the operational framework that was used as the guideline that are literature

analysis, video development, and validation as shown in Figure 2. Phase one is the literature analysis. This phase is studied the related study on the three difference platforms that are the e-learning, blended learning, and the MOOC platform. The second phase is the development and the adaptation of problem-solving videos in MOOC. Before the development of the problem-solving videos in MOOC courses, the script for the videos was prepared and rendered by using the open source software. The third phase is the validation phase that was conducted by using the formal evaluation. Next, the collected data from the experiment will be analysed by using the SPSS tools and determined if the hypothesis null is accepted or rejected.



**Figure 2:** Operational framework

## 4 Experimental Results

In this topic discussed the results that were obtained from the formal evaluation that conducted between groups of students that are exposed and not exposed with the problem-solving videos in course Web Programming SCSV1223 at MOOC platform. In section 4.1 and section 4.2 discussed the results on the paired t-test for the traditional learning and online learning respectively. The traditional learning is the group of students that not exposed with the problem-solving videos while online learning is the group of students that are exposed with the problem-solving videos.

### 4.1 Analysis of Paired T-Test for Traditional Learning

The analysis of the pre-test and post-test that was conducted for the course Web Programming SCSV1223 by traditional learning was used by the SPSS software. The marks that was gained by the students are continuous scale data that summarized by calculating their mean and standard deviation values. The paired t-test technique was used for comparing the means of the pre-test and post-test. The null hypothesis and alternative hypothesis is as below. The result from the paired t-test was displayed in the Table 1.

#### Hypothesis:

**H<sub>0</sub>:** There is no difference in mean pre-test and post-test marks for traditional-learning

**H<sub>1</sub>:** There is a difference in mean pre-test and post-test marks for traditional-learning

**Table 1:** Paired samples test for traditional learning

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre_ Test - Post_ Test	-1.1	1.91	0.6	-2.47	0.27	1.82	9	0.102

Table 1 shows that the t-value=1.82 and p-value=0.102. By using the confidence interval of 95%, the alpha value is 0.05. Since the p-value is greater than 0.05, there is no evidence against the null hypothesis and the data appear to be consistent with the null hypothesis that there is no difference in mean between the pre-test and post-test. Therefore, the null hypothesis is accepted and rejecting the alternate hypothesis.

#### 4.2 Analysis of Paired T-Test for Online Learning

The analysis for the pre-test and post-test that was conducted for the course Web Programming SCSV1223 by online learning was used by the SPSS software. Data that was gathered for the online learning that adapted the problem-solving video was conducted almost the same like analysis for the pre-test and post-test for traditional learning that is using the paired t-test techniques to evaluate the data. The result obtained from the paired t-test technique is as in Table 2. The null hypothesis and alternative hypothesis for the online learning is as follow.

##### Hypothesis:

**H<sub>0</sub>:** There is no difference in mean pre-test and post-test marks for online learning

**H<sub>1</sub>:** There is a difference in mean pre-test and post-test marks for online learning

**Table 2:** Paired sample test for online learning

		Paired Differences			95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
					Lower	Upper			
Pair 1	Pre_ Test - Post_ Test	-1	2.4	0.76	-2.72	0.72	1.32	9	0.221

Table 2 shows that the statistical value that was obtained are t-value=-1.32 and the p-value=0.221. By using the confidence interval of 95%, the alpha value is 0.05. Since the p-value is greater than 0.05, there is no evidence against the null hypothesis and the data appear to be consistent with the null hypothesis. Therefore, the null hypothesis is accepted where there is no difference in the mean of the pre-test and post-test marks for the online learning.

## 5 Discussion

Referring to the experimental results that was obtained from the Table 1 and Table 2, both of the paired t-test evaluation shows that there is no difference in mean for pre-test and post-test for both groups that exposed and not-exposed to the problem-solving videos. This is because, both of the analysis of the paired t-test accepting null hypothesis and rejecting alternate hypothesis. The results that were obtained might be because of some constraints that were encountered during conducting this research. This constraint justified for the reasons of the experimental results is as it is.

The first constraint that was encountered is the hard time on finding the volunteered for participates the experiment which leads to time consuming and cause to small participants that joined the experiment. Next, small sample of data that was used during conducting the analysis by using the paired t- test is also too small. The small sample used for both test groups then caused the inability to find the difference in the mean test scores for the pre - test and post-test that might be exists. If the sample of data used is larger, than the results might be vice versa from current results.

## 6 Conclusion

In this research, the usability of the MOOC platform was studied to improve the MOOC platform. The usability that was discussed in this research paper is the effectiveness. That is to study whether by adapting the problem-solving videos in MOOC platform can improve the effectiveness of the MOOC platform. The formal evaluation that conducted to test the effectiveness parameter is by using the paired t-test technique for both groups that exposed and not exposed to the problem-solving videos. The results that was obtained for both groups shows there is no difference in mean pre-test and post-test for both groups. The results obtained as it is were justified by describing the constraints that was encountered during conducting the experiment. The constraints are the time, participants that was involved, and the size of the sample data. Even though the results of this research should support the MOOC platform, due to the constraint that was mentioned earlier, the result is not as expected. But, if the sample data that used is larger, there is might be difference outcome can obtain.

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