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Technical Criterion for an Effective Video in Learning Mathematics

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Abstract

Mathematics is a fundamental subject for all courses especially in engineering, business and economics. A good understanding of mathematics will help in daily activities and in many other situation either in simplified or complex forms. However, some students may have difficulties learning this subject and often felt that they need extra help from different resources. One of the learning methods that commonly used is through visualization where students view video in order to understand the topic. This study aimed to identify the technical criterion in producing an effective video to assist the process of teaching and learning. The main instrument implemented is by conducting a survey and follow-up by assessment questions with the respondents. The response and comments from the student's perspective are taken as a guide to help educators to improve video making in learning mathematics.

Keywords: Mathematic, Teaching and Learning, Video

Introduction

Teaching and learning mathematics has been an interest to researchers as this subject requires a way of logical and abstract reasoning and it may be assumed to be difficult for some individuals (Ball, 2000; Clark & Yinger, 1978; Kersting et al., 2010). No doubt, educators have a big influence on student learning (Fennema & Franke, 1992; Hiebert & Grouws, 2007; Nye et al., 2004). Therefore, educators need to know the most useful representations for explaining given concepts or ideas; the most powerful analogies, illustrations, examples, explanations, and demonstrations; what makes a content easily understand for learners; and common student misconceptions and mistakes (Shulman, 1986).

However, in recent years since technology is more advanced, educators need to use technology in class to make the class more interesting and innovative compare to the chalk and board method. Although there are many technology-based teaching methods and resources, educators may still encounter difficulties when using technology in the classroom. One of the

methods that has been commonly used is by presenting videos to the students. This type of method is suitable for the visual type of learners where they are keen to visualize the mathematical concepts and theorem. Mitchell & Savill-Smith, 2004 state the usefulness of video in encouraging the learning process. They explain that video can stimulate enjoyment, motivation and engagement of users, aiding recall and information retrieval, and can also encourage the development of cognitive skills. A research was done by Presmeg, 1986 where the author did a study to measure student's preference for visual method compares to the conventional method. The author identifies the strength and limitations of the visual processing in learning mathematics. The conventional method is described by memorizing the rules and formulae, meanwhile the approach that we are discussing is by using visualization, a method that can build the creativity in effective teaching and learning process.

In this paper, we discussed thoroughly on the technical criteria of an effective and presentable video based on student's perspective and feedback.

Methodology

An animation video on indices and logarithms properties was shown to a group of students from first semester diploma students in a local university. The indices and logarithm, a pre-calculus topic was uploaded at youtube <https://youtu.be/dddMtXjSsbE>, and evaluated by the students. This video act as a benchmark for indicating the criteria in producing a good video in learning mathematics subject. Students evaluated the video and rated the scores of 1 to 4 where score 1 represents 'below standard', score 2 represents 'needs improvement', score 3 represents 'satisfactory' and score 4 represents 'excellent'. After the evaluation, assessment questions were asked to get the details of the student's perspective. Table 1 represents the description for each five technical item and on the knowledge of content following Vural (2013). Meanwhile, Table 2 is the sample assessment questions that was asked to the respondents.

Item	Description
Text	The usage of the type of font in video learning that may contribute to an effective presentation of the video. (Brame, C.J. 2015)
Graphic	The selection of the graphics and images contribute to the effective learning of the video throughout the presentation. (Thomson A. et. al 2014)
Music	The selection of the music in the video may distracting or complement in the presentation. (Oliver et al. 2012).
Duration	The time of video presentation have sufficiently enough in delivering the during the video presentation (Thomson A. et. al 2014)
Pace of delivery	The delivery of the narration in the video presentation may give the impact to the audience by using words and pace appropriately. (Thomson A. et. al 2014)
Content	The students are able to understand in interesting manner for the particular subjects. (Guo et al., 2014)

Table 1 : The Item Description

Item	Assessment Question
Text	What type of font do you prefer? How do you like the important key point being highlighted?
Graphic/Colour	True or false : Video with animation are more interesting. Should graphics relate to the content? What kind of graphic that may distract your attention towards the content? Do you prefer bright or pastel colour for video presentation?
Music	What type of music is nice for presentation? Do you like a video with a music background or with a narrator voice?
Duration	Which one do you prefer, one long video or multiple short videos? How long can you focus on a video presentation?
Pace of delivery	True or false : A human narrator voice sounds more comfortable with the content compared to a robot narrator.
Content	Is all mathematics topics suitable to make a video? In general, what is your opinion of a good video?

Table 2 : Observation Item

Results and Discussion

The results of the evaluation are shown in Table 3 where overall item scores 3 and 4. This shows that students can accept a simple video as a teaching aid as long as the content of the video is good and informative.

Item	Below Standard Score : 1	Needs Improvement Score : 2	Satisfactory Score : 3	Excellent Score : 4
Text	0	5.9%	35.3%	58.8%
Color	0	2%	47.1%	50.9%
Music	0	11.8%	47.1%	41.2%
Duration	0	11.8%	51%	37.3%
Pace of delivery	0	6%	48%	46%
Content	0	2%	45.1%	52.9%
Overall Performance	0	3.9%	43.1%	53%

Table 3 : Video Evaluation

Text – The font used in the video is considered suitable and satisfied by the audience since the results was rated the highest at score 4 with 58.8%. Students agree with the font used as long the font is not too fancy. Students would prefer a video with a formal format font such as San Serif, Times New Roman or Ariel. Furthermore, the important theorem or point should be highlighted in bold or in contrast with the overall text.

Colour - Background and foreground colour must be in contrast. For example, if the background colour is white, the foreground should be in black. This is to ensure that the text is readable and students can stay connected without feeling irritated. Few students comment that the light grey used as the background in the video is not suitable as it does not show a big contrast to the black text. However, the highest percentage is still score 4 which is 50.9%.

Music - Background usage should be an energetic sound to stimulate energy to student. According to Cutnell et al. (1998), the frequency for a healthy young person is within the range 20Hz to 20Khz. 11.8% students rates the music needs improvement, 47.1 % satisfied and the rest, 41.2% rate excellent. However, students prefer that the video has a narrator to explain some part of the video. The narrator voice must be comfortable with the content. Words should be clear and pacing is appropriate.

Duration –Students are satisfied with the duration of the video. The preferable average duration is not more than 10 minutes for a topic. This is to ensure that the students can focus on the topic. Students also prefer multiple short videos instead of one long video. Duration used in the benchmark video is 8.36 minutes for indices topic and 4 minutes for logarithm topic.

Pace of delivery - The percentage score for satisfactory is 48%. This means students are satisfied with the transition time use from scene to scene in the video. One of the main advantages using video is that students are able to play and pause the video in their own pace.

The overall performance of the video shows that the learning video for indices and logarithms properties score was excellent by 53%. Hope that the response and comments from the student's perspective together with the findings from the video evaluation can be taken as a guide to help educators to improve video making in learning mathematics.

Conclusion

Educators may use video as a teaching aid in class since most of the students prefer visualizing the notes. However, in learning mathematics, students still need to work on the solutions in order to fully understand the topic. The findings obtained from the video evaluation, response and comments from the student's perspective can be taken as a guide to help educators to improve video making in learning mathematics.

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