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The Blurred Line between "Long" and "Short": How the Length of Video Lectures Affects the Viewing Behavior of E-Learners

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Abstract

Recent research has focused on the impact of video lectures on students' academic performance rather than the viewing behavior of learners. In this study, we investigate the learners' preferences of video lectures in terms of the length as well as the devices used to access the online learning material. We published two versions of video lectures on two YouTube channels. The online material was produced by recording a real face-to-face class context at the Arab Open University. The video recorded material belongs to a first level course offered to students at the Faculty of Computer Studies. The first version of the online lectures comprised 7 videos and is, hence, called long-run version. The second version, termed as short-run version, consisted of 28 video lectures. Video contents are identical in both versions. Total recording time amounted to 528 minutes in both video versions with an average of 75 and 19 minutes in long-run and short-run versions, respectively. We found that though students alternated between the use of mobile phones, tablets and desktops, however, they mainly accessed the online material through desktops. Moreover, students spent a total of 43765 minutes in viewing the long-run videos compared with 4766 minutes spent on the short-run ones. Considering the number of views (3143 for the long-run and 846 views for the short-run videos) yields average viewing times of 13.92 and 5.63 minutes per views for the long-run and short-run videos, respectively. This is interesting, for these results show that students are willing to spend approximately 14 minutes when viewing an approximately 75 minutes long video lecture, but when offered a 22 minutes long alternative, the time they spend in viewing does not exceed 6 minutes on average. Our results imply that students do access the online video lectures for learning purposes. However, more should be done, so as to approach near-optimal lengths of video lectures that facilitate a complete viewing of the learning material.

Keywords: Video lectures, Blended learning, Viewing behavior, Big data analysis

1. Introduction

Latest expansion in the use and application of information and communication technologies shifted education from traditional face to face meetings to more flexible learning paradigms [1]. A trade-off between traditional and modern educational systems is 'blended learning'. This is the notion of integrating machines based learning in classical face-to-face meetings [2]. One of the defining characteristics of 'blended learning' is the use of video lectures [3]. Video lectures are instructional videos prepared by the course instructor to supplement face-to-face meetings [4].

Several studies were conducted to see the effect of video lectures on various aspects of students' performance. For example, in terms of their usefulness, it was found that recording lectures provides a greater flexibility in managing personal commitments within limited time resources. Specifically, students can accomplish their daily-life commitments without the need to physically attend a class [5, 6]. Other advantages of video lectures also include ergonomic aspects. Particularly, students with disabilities feel free from note-taking during the face to face lecture [7].

Moreover, video lectures can be directly linked to students' performance. For example, Traphagan et al. [8] showed that positive results and higher learning outcomes correlate with the frequency of accessing video-recorded material. Others linked performance to the facility of using video lectures as a complementary part of the learning process [9]. Wieling and Hofman studied this complementary effect and found that the viewing of video lectures and attending lectures in person are approximately equal and that they can both be interchangeably utilized in order to improve performance [10]. However, it is also worth mentioning that some studies could not measure clear effects of video lectures on students' achievements, e.g. see [11].

Other researchers looked at the way students deal with video lectures. Specifically, van Zantan et al. found that students access the recorded material as part of their exam preparation [11]. And when provided with a summary video for the original video lecture, students tend to download the summarized version [12].

All the above studies relied on questionnaires in their investigations of students' preferences and attitudes towards video lectures. However, researchers are, recently, increasingly favoring more direct approaches in gathering data from popular sources like, for example, YouTube.com.

Established in 2005, YouTube.com became the third most accessed website in the Internet [13]. It has a significant impact on the Internet traffic distribution and suffers (at the same time) from scalability constraints. By and by, it is serving as a popular source of data for doing research in a variety of scientific topics [14, 15] as well as a cyber space for social sharing of videos [16].

The present study strives to unravel the relative importance of video lectures in learning by investigating students' viewing behavior *directly* rather than adopting the questionnaire approach. To this end, we published two versions of video lectures on two YouTube.com channels and analyzed the gathered data. The paper is organized as follows: section "Methodology" is dedicated for describing our methodology in designing the experimental setup and the analysis of the gathered data. Corresponding results are discussed in section "Results". We conclude and set out for future work in section "Conclusion".

2. Methodology

2.1 The Study Sample

Our viewers' sample comprised mainly undergraduates of the Arab Open University (AOU). AOU is an academic institution, which offers its students a blended learning curriculum. It consists of eight branches located in eight countries in the Arab world. There are five faculties at AOU: the Faculty of Business Studies, the Faculty of Computer Studies, the Faculty of Education, the Faculty of General Studies and the Faculty of Language Studies [17].

Because the video-recorded lectures belong to an obligatory course in the graduation plan of the Faculty of Computer Studies, the striking majority of the 642 potential viewers (224 females and 418 males) were Computer Studies students from all branches of AOU.

2.2 Video-Recording of Class Context

The course instructor, who is the second author of this paper, video recorded seven biweekly lectures. This is the complete face-to-face package of meetings offered to the participants of the course. By this sort of video-recording the instructor acts as a videographer [18]. Doing so has various benefits: (i) it is inexpensive, (ii) it facilitates a quick accessibility of the video-recorded material and (iii) it allows the instructor to focus on certain topics whenever being in students' interest.

Initially, only short-run videos were filmed to each of the seven face-to-face meetings. Afterwards a long-run video version was produced by merging the parts of each lecture together.

More specifically, the short-run version consisted of 28 videos covering the whole course. The total time of recording amounted to 528 minutes with an average number of 19 minutes (SD = 17) per video. The long-run version consisted of 7 videos. Its total time of recording also equals 525 minutes with an average number of 75 minutes (SD = 22 per lecture). Whereas the slides of the face-to-face lectures were presented in English, the tutor adhered to Arabic presentation delivery, for providing Arabic audience additional aids to understand the English written material of the course. However, key concepts were pronounced in English during the presentation.

2.3 Online Publishing of Video-Recorded Material

Video-recorded lectures were made available for viewing on two YouTube.com channels used for hosting and online publishing of the learning material over a lifetime of one academic semester (from September 28th, 2013 to February 1st, 2014).

The two versions of the video lectures were identical in all parameters (*i.e.* their content, the appearing instructor and the online publisher) but they differed in their lengths. The rationale behind this is to measure, if any, the impact of the length of video lectures on students' viewing behavior.

2.4 Data Gathering and Data Analysis

We used YouTube analytics statistical package to gather and analyze data. YouTube analytics provides a number of metrics about the viewing activities. In our study, we focused on the following types: (i) the number of views

each video has daily invoked within the lifetime of the study, (ii) the estimated viewing time, which is the amount of time viewers spent watching a video, and (iii) the type of digital device used in viewing (e.g. desktop computers, smart mobile phones, tablets, etc.).

It is important to notice that the above metrics are provided for the collective viewer rather than for individual viewers. Hence, it is important to look at viewing behavior in terms of the average viewer. This can be achieved by computing the average viewing time from the first two parameters, *i.e.* the number of views and the estimated viewing time.

Moreover, to deepen the comparability of viewing behavior between long-run and short-run video-recorded lectures, we considered a further metric, termed as the Average Percentage Viewed (APV), by calculating the ratio of the average viewing time to the effective length of the corresponding video-recorded lecture. The rationale behind this is to uncover the optimal length of video lectures learners are willing to watch almost completely.

Lastly, as we noticed that YouTube analytics counted views also when viewers clicked the posted videos without spending time in viewing them (*i.e.* the estimated minutes watched = 0), we considered in our analysis of the APV only significant views. These are the views with estimated minutes watched greater than zero.

3. Results and Discussion

3.1 Average Viewing Times and Accessing Devices

Tables 1 and 2 show the average viewing times for both long-run and short-run versions, respectively, in regards to the devices used to access the online published learning material. Students spent a total of 43765 minutes in viewing the long-run videos compared with 4766 minutes spent on the short-run ones. Considering the number of views (3143 for the long-run and 846 for the short-run videos) yields average viewing times of 13.92 and 5.63 minutes per views for the long-run and short-run videos, respectively. This is interesting, for these results show that students are willing to spend approximately 14 minutes when viewing roughly 75 minutes long video lectures. But when offered a 22 minutes long alternative, the time they spend in viewing does not exceed 6 minutes on average. On one hand, this result is in line with the findings in [12], which showed preference towards summarized video versions compared with the longer originals. This is evident from comparing the AVP (see section 3.2). On the other hand, however, such a viewing behavior is paradoxical in that it does not account for the lesser readiness to spend more time on shorter videos when students have already done it with the longer ones. Apparently, students are scanning the video lectures for the search of particular contents. And this correlates with the results in [9] and qualitatively with the complementary effect in [10].

With respect to the digital devices used in accessing the online published material, students showed a clear preference towards using desktop computers more frequently than any other device. This applies, in particular, for the long-run version of video-recorded lectures.

Comparing average viewing times of desktop computers in both long-run and short-run video versions, however, confirms this viewing behavior as pointed above (column 3 in Tabs. 1 and 2).

3.2 Average Percentage Viewed

Figure 1 shows the average percentage viewed (APV) of all video lectures as a function of their actual length. The x-axis represents the effective length in minutes of each video lecture, whereas the y-axis refers to the corresponding ratio of the computed average viewing time to the effective length of a video lecture.

Obviously, there is an inversely proportional relationship between the APV and the length of a video lecture: the shorter a video lecture is, the more completely students will view it. Moreover, for videos with lengths greater than 40 minutes, the corresponding APVs do not exceed 30%. On the other hand, videos with lengths less than 40 minutes reach high levels of APVs (e.g. close to 80%). This suggests that short-run video lectures are more advantageous in terms of providing a higher possibility to be viewed completely.

Table 1. Long-run videos

Device	Views	Viewing Time (min)	Average Viewing Time (min/view)
Desktop	2564	38341	14.95
Mobile	358	2920	8.15
Tablet	224	2504	11.17
Total	**3143**	**43765**	**13.92**

Table 2. Short-run videos

Device	Views	Viewing Time (min)	Average Viewing Time (min/view)
Desktop	694	3954	5.7
Mobile	73	364	4.99
Tablet	79	448	5.67
Total	**846**	**4766**	**5.63**

4. Conclusion and Scope of Future Work

A lot of research on video recordings for teaching has been conducted, going back a long way. As it appeared earlier, there are conflicting opinions about the efficacy of video lectures, but that is because their effectiveness depends on so many factors such as learner attitudes and skills, the topic, the pedagogical design, the skills of the presenter, the delivery environment, and many other factors. Also the design of many studies is not sufficiently rigorous to really establish beyond doubt what has worked and why.

This paper focused on viewing behavior of students towards video lectures hosted on YouTube.com channels, in a blended learning context. We tried to account for the viewing behavior of students towards online learning material.

The device that scored the highest viewing volume was with no mitigation the desktop computer. This indicates that students prefer to sit and watch these videos, reflecting a feeling of interest and a willing to learn efficiently. Students expressed a committed behavior toward the short version of video lecture; videos with length less than 20 minutes, showed different figures of relative percentage viewed, while the long run videos revealed less figures. On the other hand, the length of 14 to 15 minutes revealed a very strange behavior: viewers seem to be considering this length as long and short at the same time. This important fact should be considered for future design of video lecture, so as to measure the real impact and efficiency of such a value of a video length.

Another important aspect, which was revealed by this study is that viewers showed a stable behavior towards long-run videos. But when it comes to short-run ones, their interaction exhibited a pseudo-random behavior.

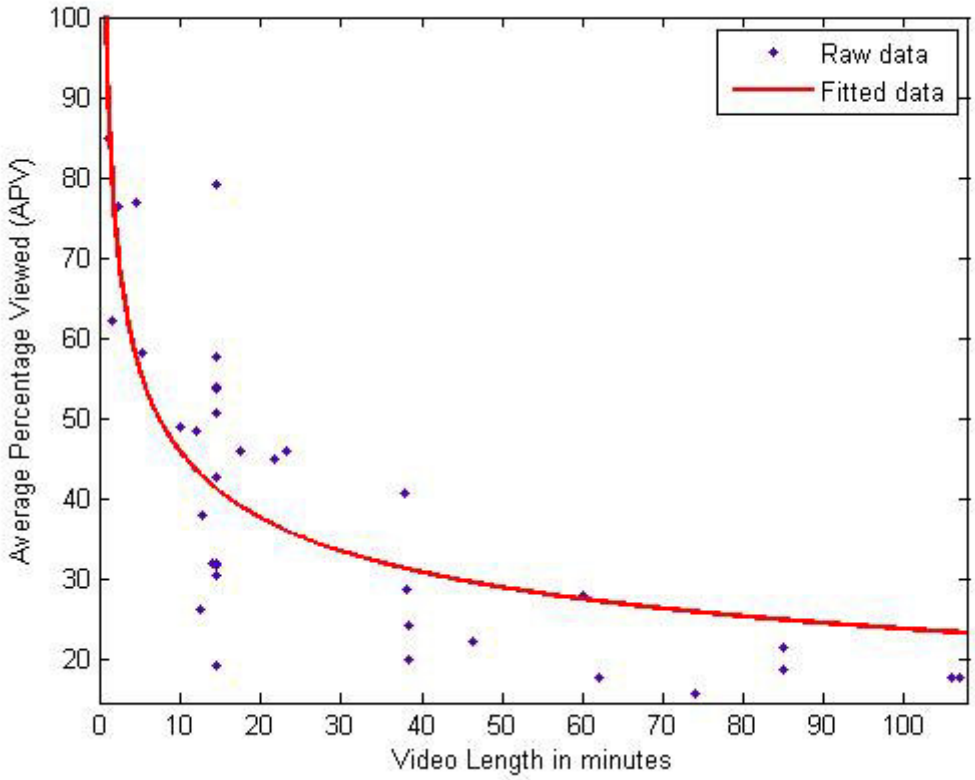

Figure 1. The Average Percentage Viewed (APV) as a Function of the Video's Length

This is related to the video unity content, the long video presented a complete learning topic, but the short ones are fragmented from their class-room context, so from the perspective of content, they might not expose a complete topic. To validate the results described in this paper, a new experiment will be designed with respect to the following conditions. First, the length should be around 14 minutes. Second, this video should be designed as a stand-alone lecture in order to cover an independent and complete learning unit. Also to propose many formats to be conform to the viewers preferred devices.

Another aspect that could also be considered here is the approach used for gathering the data. Specifically, we relied completely on automatically collecting data from the YouTube.com server with no feedback from the users. While this helped understand viewers' behavior by measuring it directly as it was our intention, a user subjective measure, however, could add to the relative importance of the automatically collected data. To complement our approach in the current study, we plan further experiments where the design of the paradigm would focus on the length of the video lectures, as an effective determinant of E-learners' viewing behavior.

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Authors' Biographies

Oussama H. Hamid received in 2011 a Ph.D. degree in Natural Sciences from the University of Magdeburg, Germany. The title of his doctoral thesis was: "On the Role of Temporal Context in Human Reinforcement Learning". Before, he was awarded a Master's degree in Computational Visualistics (Germany, 2002) and Bachelor degrees in Computer Science (Germany, 2000) and Mathematics (Germany, 1998). Dr. Hamid's research interests include the investigation of both theoretical and practical aspects of Human-Machine-Interaction, Neural Network Functions, Cognitive Systems and Big Data Analysis. He has published his research

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Ayman El Samad received in 1996 a Master's degree in Electrical Engineering from the Institut National Polytechnique de Toulouse (INPT) (France). Currently, working as a lecturer at the Faculty of Computer Studies at the Arab Open University, Mr. El Samad is interested in studying the impact of video lectures on the achievements of students.

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