

# Patterns of Online Video Lectures Use and Impact on Student Achievement

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## Abstract

As online video lectures become more prevalent on course Websites, it is important to examine their impact on student achievement. In this study we analyzed data of 1,795 students enrolled in a compulsory undergraduate financial theory course in either face-to-face (F2F) or video conference (VC) groups. We examined the impact of asynchronous online video lectures, which were available on the course Website, on student achievement. The average duration of watching was measured at the beginning, the middle, and the end of the semester. Overall, students who watched the videos were more successful, and spent more time viewing them toward the end of the semester. Therefore indicating active procrastination and positive impact of the video lectures' availability. Conversely, students of VC groups who failed the course spent on average significantly less time viewing online video lectures in the end of the semester, thus implicating passive procrastination and suggesting negative impact of the video lectures' availability. The implications of the findings are discussed, as well as directions for further study.

**Keywords:** online video lectures, patterns of online video-based learning, online video lectures and student achievement, procrastination, attention economy.

## Introduction

Online video lectures are gaining popularity as a medium for distance learning, as well as becoming common supplementary materials on course Websites, which are intended to support face-to-face learning (Brecht, 2012; Brecht & Ogilby, 2008; Copley, 2007; Whatley & Ahmad, 2007). While online video lectures may be helpful for some types of students, e.g., those who cannot attend face-to-face classes (Wieling & Hofman, 2010), their availability may harm other types of students by increasing their tendency for procrastination (Geri, Gafni, & Winer, 2014).

In order to enhance the understanding of the implications of online video lectures availability for learning, there is a need to investigate objective data at the individual student level. The purpose of this study is to analyze temporal viewing patterns of online video lectures in order to identify circumstances where the availability of the videos may cause passive (i.e., negative) procrastination, and other circumstances where the videos may support learning and enable active (i.e., positive) procrastination.

The study is based on objective data of actual viewing time of online video lectures by 1,795 students. It compares temporal patterns of online video lectures use and achievements of students enrolled in face-to-face groups, who may use the videos as a supplementary learning tool, with temporal patterns of students enrolled in video conference groups where the online video lectures are supposed to serve as a primary means for learning.

## Theoretical Background and the Research Questions

This study relies on three theoretical concepts. The first concept is cognitive fit theory (Vessey, 1991), according to which compatibility between task and information presentation format results in superior task performance. In our context, students will choose the mode of learning which fits their preferences. Hence, students who have chosen a video conference group are expected to watch more online video lectures than students of face-to-face groups. The second concept is procrastination (Ariely & Wertenbroch, 2002; Gafni & Geri, 2010), which is a well-known phenomenon among students. This study is concerned particularly with active and passive procrastination (Chu and Choi, 2005), which suggests that active procrastination is a way to take strategic advantage of the time pressure imposed by the academic calendar as apposed to passive procrastination where students fail to meet the course requirements under these constraints. This leads us to the third concept, attention economy (Davenport & Beck, 2001; Geri, Neumann, Schocken, & Tobin, 2008), which implies that students will spend more time learning as the exam date becomes closer, hence they are also expected to spend more time viewing online lectures during that period.

This study examined the following research questions:

- Do students who pass the course tend to watch online video lectures more than those who fail? Are there differences between face-to-face and video conference groups?
- Do students who pass the course spend more time watching online video lectures than students who fail? Are there differences between the beginning, middle, and end of the semester? Are there differences between face-to-face and video conference groups?
- Are the temporal use patterns of online video lectures by students enrolled in face-to-face groups different from those of students enrolled in video conference groups?

## Methodology

This study is based on objective data, and uses data analytics (Hershkovitz & Nachmias, 2009; LaValle, Lesser, Shockley, Hopkins, & Kruschwitz, 2011; Levy & Ramim, 2012) to analyze online video lectures temporal watching patterns (Geri et al., 2014; Grinberg, Naaman, Shaw, & Lotan, 2013) and their impact on student achievement.

The study was conducted at the Open University of Israel, and focused on a financial theory compulsory undergraduate course. Previously, an exploratory study examined the impact of online video lectures on retention and achievements of 32 overseas students enrolled in the same course during the years 2010-2011 (Geri, 2012). This study investigated the two major categories of students within the course who were enrolled in face-to-face (F2F) and video conference (VC) groups, during 2012 and the beginning of 2013 (i.e., semesters 2012B and 2013A). The sample included 1,795 students, and the analysis involved examining their actual video lectures' viewing time data, as recorded by the system.

The viewing average time was summarized in three periods: The beginning of the semester; the middle of the semester; the end of the semester including the exam period. The middle of the semester (7-8 weeks) is longer than the actual end of the semester period (the last three weeks of the semester plus the exam week). The data presented in the current study is the total unstandardized aggregate time watched during each of the periods, and it includes only the data of students who watched the videos. This issue is elaborated in the discussion and conclusions section.

## Results

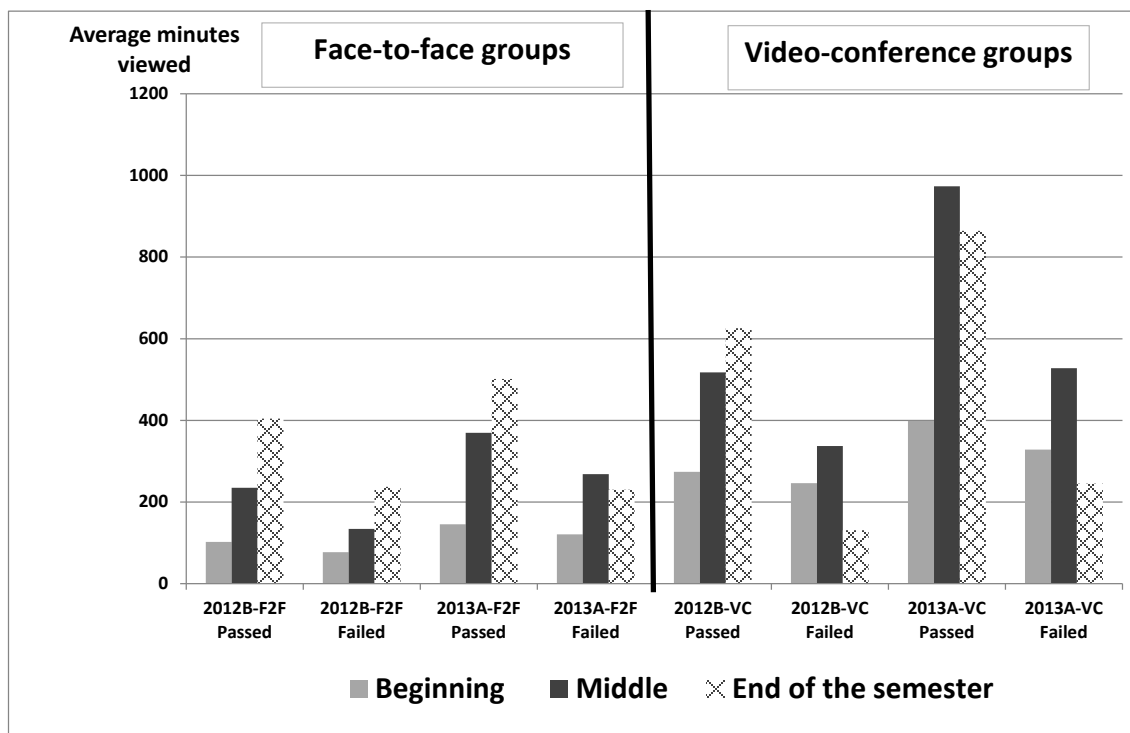
Table 1 presents the achievements of 1,582 students who were enrolled in F2F groups and of 213 students of VC groups, and compares those who watched the online video lectures with those who did not watch the videos. There was no significant difference between the success rate of the F2F groups (63.7%) and the VC groups (58.2%),  $\chi^2(1, N = 1,795) = 2.21, p = .1371$ . Most of the students enrolled in the VC groups (92.5%), who could have attended the lectures in

real time either in class or virtually, significantly tended to watch the asynchronous video lectures more than the students of the F2F groups (67.7%),  $\chi^2(1, N = 1,795) = 54.43, p < .0001$ . Furthermore, the VC groups' students who watched the asynchronous videos were significantly more successful (60.9%) than those who did not (25%),  $\chi^2(1, N = 213) = 6.44, p = .0112$ . This finding is consistent with the field observation that many of the VC groups' students do not participate in the synchronous video sessions, and instead they watch the video lectures at their convenience. However, the interesting finding relates to the F2F groups. Although the online video lectures were supplementary, i.e., non-compulsory material, for the F2F groups, the students who watched them were significantly more successful (71.2%) than those who did not (47.9%),  $\chi^2(1, N = 1,582) = 80.21, p < .0001$ .

**Table 1. Distribution of students by their learning group, achievement, and use of online video lectures**

	Watched online video lectures		Did not watch		Total
<b>Face-to-face groups (F2F)</b>					
Passed	763 (71.2%)	75.7%	245 (47.9%)	24.3%	1,008 (63.7%)
Failed	308 (28.8%)	53.7%	266 (52.1%)	46.3%	574 (36.3%)
Total F2F	<b>1,071</b>	<b>67.7%</b>	<b>511</b>	<b>32.3%</b>	<b>1,582</b>
<b>Video conference groups (VC)</b>					
Passed	120 (60.9%)	96.8%	4 (25%)	3.2%	124 (58.2%)
Failed	77 (39.1%)	86.5%	12 (75%)	13.5%	89 (41.8%)
Total VC	<b>197</b>	<b>92.5%</b>	<b>16</b>	<b>7.5%</b>	<b>213</b>
<b>Total students</b>	<b>1,268</b>	<b>70.6%</b>	<b>527</b>	<b>29.4%</b>	<b>1,795</b>

The next phase of the analysis focused on the 1,268 students who watched the online video lectures. We measured the duration of viewing at the beginning, the middle, and the end of the semester, and its impact on student achievement. This analysis was conducted separately for two semesters, 2012B and 2013A, in order to account for increased rate of adoption of online video lectures use over time, as well as to corroborate the findings. Figure 1 presents the average minutes viewed by students who passed the course and students who failed it, for the F2F and the VC groups. As can be seen in Figure 1, the use patterns of these two categories differ, along with differences in the use patterns of those who passed and those who failed the course.



**Figure 1. Comparison of average minutes of online video lectures viewed by students according to their group type and achievement**

Table 2 presents a detailed analysis of the average time the online video lectures were viewed, over a period of two semesters, for the F2F and the VC groups. The analysis compared students who passed the course and students who failed it, and measured their average seconds viewed during the beginning, the middle, and the end of the semester. The most evident result is that in all groups, at all times, those who failed, spent less time watching online video lectures than those who passed. However, the differences were not significant at the beginning of the semester, became significant during the middle with small-medium effect sizes, and were significant at the end of the semester with medium-large effect sizes.

As can be seen in Figure 1, the viewing patterns of successful students differ from those who failed the course, as well as among the two groups. The following results are additional paired-samples t-tests that were performed on data presented in Table 2. The students of the F2F groups who passed the course viewed significantly more online video lectures in the end of the semester ( $t = 5.624$ ,  $p < .000$ ,  $n = 429$ , Cohen's  $d = .34$  for 2012B;  $t = 2.959$ ,  $p = .003$ ,  $n = 334$ , Cohen's  $d = .20$  for 2013A). Those who failed in 2012B also followed this pattern ( $t = 2.320$ ,  $p = .022$ ,  $n = 136$ , Cohen's  $d = .25$ ), and for 2013A the results were not significant.

Conversely, the students of the VC groups who failed the course spent significantly less time viewing online video lectures in the end of the semester than they did during the middle of the semester ( $t = 2.624$ ,  $p = .014$ ,  $n = 31$ , Cohen's  $d = .55$  for 2012B;  $t = 3.542$ ,  $p = .001$ ,  $n = 46$ , Cohen's  $d = .63$  for 2013A). There was no significant difference in the viewing of students of the VC groups who passed. As already mentioned, the middle of the semester is longer than the actual end of the semester period, so if there is no significant difference between the two periods, it actually means that the intensity of viewing was greater during the end of the semester.

**Table 2. Comparison of online video lectures view patterns by group type and student achievement**

Semester	Group type	Period within the semester	Grade	N	Average seconds viewed	Std. Deviation (seconds)	T value (2-tailed)	Cohen's d	
2012B	F2F	Beginning	Fail	136	4,637	9,237	NS		
			Pass	429	6,151	12,136			
		Middle	Fail	136	8,041	15,652	3.143		0.26 Small
			Pass	429	14,100	28,664	0.002		
		End	Fail	136	14,226	31,334	<b>3.245</b>		<b>0.32</b> <b>Small</b>
Pass	429		24,255	31,429	<b>0.001</b>				
2013A	F2F	Beginning	Fail	172	7,249	14,375	NS		
			Pass	334	8,737	18,144			
		Middle	Fail	172	16,098	24,813	2.164		0.19 Small
			Pass	334	22,188	38,055	0.031		
		End	Fail	172	13,795	24,846	<b>5.673</b>		<b>0.49</b> <b>Medium</b>
Pass	334		30,071	39,374	<b>&lt; 0.000</b>				
2012B	VC	Beginning	Fail	31	14,779	10,837	NS		
			Pass	53	16,447	16,983			
		Middle	Fail	31	20,232	26,944	1.841		0.41 Medium
			Pass	53	31,054	25,435	0.069*		
		End	Fail	31	7,826	17,114	<b>4.801</b>		<b>0.99</b> <b>Large</b>
Pass	53		37,532	39,089	<b>&lt; 0.000</b>				
2013A	VC	Beginning	Fail	46	19,706	16,775	NS		
			Pass	67	23,920	17,457			
		Middle	Fail	46	31,668	28,994	4.012		0.74 Medium
			Pass	67	58,389	41,806	< 0.000		
		End	Fail	46	14,693	24,341	<b>5.341</b>		<b>0.96</b> <b>Large</b>
Pass	67		51,828	48,749	<b>&lt; 0.000</b>				

\* Significant at 1-tail level,  $p = 0.035$

## Discussion and Conclusions

The findings indicate that in both F2F and VC groups students who watched the videos were more successful, and spent more time viewing them toward the end of the semester. These patterns may be interpreted as active procrastination and positive impact of the video lectures' availability. Nevertheless, students of VC groups who failed the course spent significantly less time viewing online video lectures in the end of the semester than during the middle of the semester, thus implicating passive procrastination and suggesting negative impact of the video lectures' availability. The relatively high standard deviations in viewing times of online video lectures observed in this study suggest that there is a large diversity of viewing patterns among students within each of the examined groups. Further study may identify other factors that affect viewing patterns, as well as student achievement.

It is already known from a prior study (Geri et al., 2014) that during the middle of the semester the average weekly pageviews of the video page on the course Website is significantly smaller than other periods of the semester, following a U-curve of e-learning. As mentioned above, the data presented in this study is the total unstandardized aggregate time watched during each of the periods. Figure 1 does not follow a U-curve pattern, which suggests that although there are fewer pageviews the students who watch the online video lectures during the middle of the semester spend more time viewing them.

Finally, the findings suggest that video watching patterns in the beginning and middle of the semester may be used to identify students who are prone to fail, and an intervention during that time may increase these students' chances to pass the course. Further research is required to examine this notion.

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