


Effect of Educational Videos on the Interest, Motivation, and Preparation Processes for Mathematics Courses

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ABSTRACT

Videos are widely used teaching materials in education. The current research aimed to conduct an examination of the effects that different educational videos prepared for the distance education model had on the motivation, interest, and course preparation processes of students for mathematics courses. A total of 106 (80 females and 26 males) mathematics teacher candidates agreed to participate in the current study. Two different educational videos were used in the study. The first of these was prepared by the educator, while the second was taken from the Khan Academy education videos. It was determined that, although the educational videos prepared by the educator made no significant difference with regard to the motivation of the students toward the course, there was a significant difference with regard to the level of interest in the course. On the other hand, the Khan Academy videos were found to have a significant effect on the pre-test as well as the post-test scores of the motivation of students toward the course, but did not result in a significant difference in their interest in the course.

Keywords: distance education, educational videos, interest, motivation, preparation for the course

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INTRODUCTION

The concepts of distance or online teaching, and distance education are approaches that are not new (Williamson et al., 2020), rather they are interdisciplinary concepts that have emerged in the recent history of humanity (Bozkurt, 2019). In recent years, significant changes have been observed with regard to distance education (Larreamendy-Joerns & Leinhardt, 2006).

With the growth of the Internet and technology, the increase in online learning opportunities, and the use of different applications by universities, interest in distance education has increased (Tallent-Runnels et al., 2006). Distance education started to attract attention as a global norm within the first months of 2020 (Williamson et al., 2020). The rapid spread of COVID-19 has made it mandatory for many universities across the globe to implement the use of distance education.

As technology develops, it continues to offer new learning opportunities to learners (Bozkurt, 2019). One of these opportunities is online videos that help to create rich and powerful learning environments (Zhang et al., 2006). Online videos are one of the teaching materials that educators can use to support their pedagogy (Ratanothayanon, 2018). Furthermore, online videos are easy to access and interesting for the new generation of students; thus, they have an area of use in new learning approaches (Sahin et al., 2015). Online videos affect both individual and collective education. Courses taught with online videos offer many advantages to students, such as freedom

with regard to their space and time (Shroff et al., 2007). Students usually prefer watching videos rather than reading to prepare for courses (Sahin et al., 2015). Moreover, these videos are innovative teaching tools that have positive effects for students with regard to their motivation (Bravo et al., 2011).

Guo et al. (2014) stated that Khan-style, tablet-drawn videos, which are informal and in which the educator speaks eagerly and enthusiastically, are more interesting. Furthermore, it was stated that videos using visual and auditory elements that are not too long are more effective (Brame, 2016; Guo et al., 2014). In the literature, examinations of the effects of online videos used in the field of education were conducted in various studies. In one example, Zhang et al. (2006) conducted an examination of the effects that online videos used in e-learning environments had on learning outcomes and student satisfaction. As a result of that study, the importance of integrating online videos into educational environments was emphasized.

Kay and Kletschin (2012) evaluated the effectiveness of videos designed to improve the meaning of mathematical concepts for undergraduate students. The vast majority of the students who participated in their study reported that they frequently used videos and that they were useful.

Ratanothayanon (2018), on the other hand, found that the videos had no significant effect with regard to the academic success of the students, but the videos used before the lesson were effective in terms of the course content.

Motivation

One of the characteristics that students must have for successful learning is motivation (Choi & Johnson, 2005). Motivation means taking action to do something. An individual who does not feel an urge or inspiration to do anything is considered to be unmotivated, while a person who takes action for a purpose is considered to be motivated (Ryan & Deci, 2000). Motivation that inspired an individual to initiate as well as maintain a behavior is one of the important elements of learning. Since self-learning is in question in distance education environments, motivation is triggered and maintained by the interest of the students (Firat et al., 2018). Liao (2006) stated that the motivation of students is a critical factor with regard to distance education in order for students to continue studying and learning.

Furthermore, as online learning environments require a high level of self-control, students need high levels of motivation to actively use their skills (de Barba et al., 2016). Whether the concept of motivation attracts the attention of the student is considered as whether the teaching is related to student goals, establishing confidence in realistic expectations, and ensuring that the student is satisfied with the teaching (Keller, 2008). Therefore, well-designed content, activities, and materials are needed in distance education to increase student motivation (Cakir et al., 2018). What is important here is how long a student can maintain motivation after starting an activity (Sansone et al., 2012).

Interest

Interest has an important role in the process of learning (Geisler & Rach, 2019). For quite some time now, interest has been considered a significant motivational structure in the teaching of mathematics (Carmichael et al., 2017). Dewey (1913) stated that there is a strong link between the interest of an individual in a field and the effort that they make. Bergin (2016) mentioned that the probability of learning will be low when there is no interest. Interest, which is defined in different ways, is basically the preference toward certain ideas, topics, and activities (Bergin, 2016). In the literature, the two distinctions for interest were given as individual and situational (Bergin, 2016; Linnenbrink-Garcia et al., 2010).

While individual interest is defined as the tendency of an individual to participate in certain stimuli, events, and situations, situational interest arises with the influence of the environment (Ainley et al., 2002). Situational interest must be triggered as well as maintained in order to transform into an individual interest (Hidi & Renninger, 2006). Since studies on interest have generally been conducted with regard to traditional classrooms, very limited studies have been done on interest in relation to distance education (Sun & Rueda, 2012). Moreover, little is known about how interest develops, the duration of interest, or how interest is used in the education process (Hidi & Harackiewicz, 2000).

Purpose of the Study

It is not enough for distance education to be carried out only with online presentation formats. Online programs such as distance education should be in a high quality educational effort that will attract more students (Chao et al., 2006). Chang (2004) stated that online videos are preferred as learning material in distance education. However, it is important to determine whether the teaching materials used in distance education affect the motivation of the students (Huang & Hew, 2016). Furthermore, it is essential to evaluate the results of any access plan to provide quality distance education to students

(Williamson et al., 2020). Therefore, the current research aimed at conducting an examination of the effects that online education-based videos had in distance education. In this context, the study aimed to examine the effects of different educational videos prepared for the distance education model on the motivation, interest, and course preparation processes of students for mathematics courses. The study sought answers to the following sub-problems:

1. How do educational videos that are used for distance education affect the motivation of students to mathematics course?
2. How do the educational videos that are used for distance education affect the interest of students in mathematics course?
3. What are the effects of the educational videos that are used for distance education on the preparation of students for mathematics course?

LITERATURE REVIEW

In the literature, the effects of distance education on both the motivation and the interest levels in students have been examined in various studies. For example, in the study conducted by Choi and Johnson (2005), it was observed that the use of video-based education had a significant effect on influencing the motivation that the students had toward the course when compared to traditional text-based teaching. Firat et al. (2018) determined that undergraduate students in distance education had a high level of internal motivation, and this did not make a significant difference according to the program that they studied. In the study conducted by Bertiz and Karoglu (2020) on undergraduate students, the factors affecting motivation in distance education were identified as the time that the students spent in that course as well as how often they participated. Mullen and Tallent-Runnels (2006), in a study conducted on undergraduate and graduate students, found that the motivation perceptions that the students had in distance education was different than what they had when the education was conducted face to face. It was stated that this resulted because the dynamics that exist in distance education are different. Students who participated in the study conducted by Huang and Hew (2016) were satisfied with the teaching materials used in distance education, and their motivation levels were high. On the other hand, Hartnett et al. (2011) found that within learning environments with distance education, teacher candidates were not internally motivated to participate in the course. They attributed this to the fact that student motivation is complex, versatile, and susceptible to situational conditions. In addition to these studies, Weber (2003) examined the relationship between interest and motivation, and made the determination that interest is related to motivation. In their study, Ucar and Kumtepe (2020) found that extra motivation strategies used in distance education positively affected the motivation, academic success, and interest of undergraduate students in courses. Sun and Rueda (2012) examined the relationship between motivation, learning variables, such as interest, self-efficacy, self-regulation, and participation of the students in distance education environments. As a result of the study, it was determined that students who have greater interest with regard to distance learning tend to be more engaged in it. de Barba et al. (2016) conducted a study on students who attended the online course until the end, and found that one of the factors affecting performance was motivation. Moreover, it was determined that situational interest mediated both motivation and performance.

Table 1. The rate of students who watched the educational videos

Items	Group I		Group II		
	f	%	f	%	
Did you attend math courses by watching educational videos?	I watched all.	34	65.4	27	50.0
	I watched most.	14	26.9	22	40.7
	I occasionally watched.	4	7.7	5	9.3
	I never watched.	-	-	-	-
Did you feel the need to watch the videos of that course again after the course?	I watched all again.	12	23.1	11	20.4
	I mostly watched again.	13	25.0	10	18.5
	I occasionally watched again.	24	46.2	30	55.6
	I did not feel the need to watch.	3	5.8	3	5.6
How do you prepare for mathematics courses?	From the text book.	14	26.9	3	5.6
	From other supplementary text books (including online sources)	14	26.9	6	11.1
	By trying to find videos about the course	23	44.2	37	68.5
	I do not prepare.	1	1.9	3	14.8

METHODS

The method of the study was conducted using a pretest–posttest and quasi-experimental design model.

Working Group and Application Process

Herein, 106 elementary mathematics teacher candidates, who were registered at the Faculty of Education of one of Turkey's public universities, were included. Of the participants, 80 were female (75.5%) and 26 were male (24.5%). The study was conducted with 2 different groups. The first experimental group (group I), included 52 (41 females and 11 males) students who were enrolled in the second-year Analytical geometry course, while the second control group (group II) included 54 (39 females and 15 males) students who were enrolled in the first-year analysis 1 course. The sample of the study was a convenience sample. The content of the analytic geometry (2-hour a week) course consisted of vectors in plane and space, lines in plane, and lines and planes in three dimensional spaces. The content of the analysis 1 (2-hour a week) course consisted of functions, limits, continuity, derivatives, and the applications of derivatives. The study lasted for 10 weeks. Educational videos suitable for the subject content to be covered were prepared for both groups every week. The educational videos were prepared by the educator for group I. The prepared videos were uploaded to YouTube. The average duration of the videos varied between four and 10 minutes. The educational videos of group II were selected from those of Khan Academy.

The average duration of these videos varied between six and 17 minutes. An average of 2-5 educational videos were prepared each week for both groups, depending on the content. The links for the videos were shared with the students four or five days before the course. Before participating in the distance education mathematics courses, the students were all instructed to first watch the educational videos and then participate in the course. **Table 1** shows information about the rate of students who watched the educational videos.

More than half of the student participants in group I and half of those in group II stated that they attended mathematics courses by watching educational videos. In both groups, none of the teacher candidates reported not watching the videos. In both of the groups, about 50% of the students reported that they watched the videos occasionally after the mathematics courses. Moreover, 44.2% of the student participants in group I and 68.5% of those in group II answered the question "how do you prepare for mathematics courses" as "by trying to find videos about the course".

Data Collection Tools

Herein, three different tools were used for collection of the data. Of these, the first was the instructional materials motivation survey developed by Keller (2010). Dincer and Doganay (2016) translated the survey into Turkish. The survey has 33 items and four factors, comprising (i) attention, (ii) relevance, (iii) confidence, and (iv) satisfaction. The Cronbach's alpha internal consistency coefficient of the survey was calculated as 0.93. For this study, the pretest Cronbach's alpha internal consistency coefficient was calculated as 0.90, and that for the posttest was 0.91.

Another tool that was used for collection of the data herein was the course interest survey developed by Keller (2005). Ucar (2016) translated the survey into Turkish for doctoral thesis. The survey has 16 items and four factors, which comprised (i) attention, (ii) relevance, (iii) confidence, and (iv) satisfaction. The Cronbach's alpha internal consistency coefficient of the survey was calculated as 0.91. For this study, the pretest Cronbach's alpha internal consistency coefficient was calculated as 0.83 and that for the posttest was 0.82. Both surveys are 5-point Likert-type scales that were applied as a pretest at the beginning of the study and posttest at its conclusion.

In the study, the preparing mathematics course in distance education survey was further prepared to get information about the preparation processes of the students for the course. The survey aims to determine how educational videos affect the preparation of students for mathematics courses. The survey questions were prepared considering the relevant literature and the purpose of the research. The survey was applied in the last week of the study. The study data were all collected from voluntary and willing teacher candidates who wanted to answer the surveys

Data Analysis

In order to find the appropriate technique in data analysis, first, the conditions used to meet the relevant assumptions were examined. The normal distribution of the data was examined using skewness, histograms, kurtosis coefficients, Q-Q graphs box line, and the Kolmogorov-Smirnov test (George & Mallery, 2010). Since the data exhibited non normal distribution, the Wilcoxon signed-rank test was used in the analysis of the data. In statistics, non-parametric standards are used when tests and models do not conform to parametric standards, that is, when the data are not assumed to meet a known distribution (de Barros et al., 2018). The Wilcoxon signed-rank test is designed for measurements in which data are repeated under two

Table 2. Effect of the educational videos on the motivation of the students toward the mathematics course

	Pre-test/post-test	n	Mean rank	Sum of the ranks	z	p-value
Group I	Negative rank	23	25.74	592.00	-.666	.506
	Positive rank	28	26.21	734.00		
	Tie	1	-	-		
Group II	Negative rank	13	24.92	324.00	-3.468*	.001
	Positive rank	40	27.68	1,107.00		
	Tie	1	-	-		

Note. * On the basis of a negative rank

Table 3. Effect of the educational videos on the interest of the students in the mathematics course

	Pre-test/post-test	n	Mean rank	Sum of the ranks	z	p-value
Group I	Negative rank	17	22.97	390.50	-2.388*	.017
	Positive rank	33	26.80	884.50		
	Tie	2	-	-		
Group II	Negative rank	22	22.59	497.00	-1.937	.053
	Positive rank	31	30.13	934.00		
	Tie	1	-	-		

Note. * On the basis of a negative rank

different situations or conditions (Pallant, 2002). To be able to make a determination about the size of the effect that caused the difference between repeated measurements, calculation of the effect size was performed using the formula: $r = z/\sqrt{N}$ (Field, 2009). To interpret the result obtained from this formula, the cut-off points were considered as $0 < r < 0.1$: low, $r < 0.3$: medium, and $r > 0.5$: high (Cohen, 1998).

FINDINGS

This section contains information about the findings obtained in the study. Herein, the effects that educational videos, used in distance education, have on the motivation, interest, and course preparation processes of the students were examined. **Table 2** presents the effect of the educational videos on the motivation of students toward the mathematics course.

Following the analysis, the results showed that there were no statistically significant differences between the pre and posttest motivation scores of the student participants in group I [$z = -.666$, $p > .05$]. However, there was a significant difference between the pre and posttest motivation scores of the student participants in group II [$z = -3.468$, $p < .05$, $r = .333$]. Considering the difference in the scores in the mean rank and the sum of the ranks, the difference that was observed was determined to be in favor of a positive rank, that is, the posttest. The effect size calculated for these data was at a medium level. According to the result, it can be said that Khan Academy videos affected motivation of the students toward the course in a positive way.

Table 3 shows the effect that the educational videos had on the interest of the students in the mathematics course.

Following the analysis, the results showed that there was a statistically significant difference between the pre and posttest interest scores of the student participants in group I [$z = -2.388$, $p < .05$, $r = .234$]. Considering the difference in scores in the mean rank and the sum of the ranks, the difference that was observed was determined to be in favor of a positive rank, that is, the posttest. The effect size calculated for these data is at a low level. No significant difference was determined between the pre and posttest interest scores of the student participants in group II [$z = -1.937$, $p > .05$]. For this result, it can be said that the

videos prepared by the educator positively affected the interest of students toward the course.

Table 4 provides information about the answers of the students to the course preparation survey.

When the answers to the survey that were given by the students were examined, 84.6% of the student participants in group I and 83.3% of those in group II stated that they watched the educational videos and they made them feel confident in the course; 93.3% of the student participants in group I and 88.9% of those in group II stated that the educational videos made it easier to understand the courses; 82.7% of the student participants in group I and 88.9% of those in group II stated that the educational videos increased their interest in the mathematics course; 88.4% of the student participants in group I and 87.1% of those in group II stated that their motivation for the course was positively affected. Furthermore, 92.3% of the student participants in group I and 90.7% of those in group II thought that the educational videos helped them to be prepared for the course. Moreover, most of the student participants in both of the groups stated that they preferred a course with educational videos. However, it was observed that 32.7% of the student participants in group I and 44.4% of those in group II were unsure about the benefit of educational videos during the preparation for exams.

CONCLUSIONS, DISCUSSION, & RECOMMENDATIONS

In this study, the effects of educational videos prepared for distance education on the motivation, interest, and course preparation processes of students were examined. Two different educational videos were used in this study. The educational videos prepared by the educator had no significant impact on student motivation toward the course. However, there was a significant difference between the pre and posttest scores with regard to the level of interest in the course. On the other hand, the Khan Academy videos had a significant impact on student motivation toward the course, but did not make a significant difference with regard to their interest in the course. Similar results can be found in the literature. In the study of Vidergor and Ben-Amram (2020), Khan Academy videos were observed to have been motivating factor for

Table 4. Effect of the educational videos on the preparation processes of the students to the mathematics course

Items		I strongly agree		I agree		I neither agree nor disagree		I disagree		I strongly disagree	
		f	%	f	%	f	%	f	%	f	%
Attending the course by watching the educational videos helped me feel confident in the course.	Group I	31	59.6	13	25	5	9.6	1	1.9	2	3.8
	Group II	8	14.8	37	68.5	6	11.1	3	5.6	-	-
The educational videos helped me prepare for the course.	Group I	36	69.2	12	23.1	1	1.9	-	-	3	5.8
	Group II	12	22.2	40	74.1	1	1.9	1	1.9	-	-
I did not need to study much for the exams due to watching the educational videos regularly.	Group I	3	5.8	25	48.1	17	32.7	6	11.5	1	1.9
	Group II	-	-	10	18.5	24	44.4	19	35.2	1	1.9
Educational videos helped me understand the content of the course easily.	Group I	24	55.8	19	36.5	-	-	2	3.8	2	3.8
	Group II	9	16.7	39	72.2	4	7.4	1	1.9	1	1.9
I would prefer a course without educational videos.	Group I	2	3.8	-	-	4	7.7	11	21.2	35	67.3
	Group II	2	3.7	-	-	2	3.7	37	68.5	13	24.1
I think that educational videos increase the quality of mathematics teaching.	Group I	37	71.2	9	17.3	3	5.8	-	-	3	5.8
	Group II	15	27.8	34	63	3	5.6	1	1.9	1	1.9
Educational videos increased my interest in the course.	Group I	25	48.1	19	36.6	4	7.7	1	1.9	3	5.8
	Group II	8	14.8	40	74.1	5	9.3	-	-	1	1.9
Educational videos made me more motivated to the course.	Group I	31	59.6	15	28.8	2	3.8	1	1.9	3	5.8
	Group II	11	20.4	36	66.7	5	9.3	1	1.9	1	1.9
The educational videos helped me be prepared for the course.	Group I	38	73.1	10	19.2	-	-	1	1.9	3	5.8
	Group II	12	22.2	37	68.5	4	7.4	-	-	1	1.9

students when learning mathematics. Choi and Johnson (2005) revealed that videos created a significant difference in terms of motivation, but had no significant difference with regard to interest, confidence, and satisfaction.

Learning is about the motivation of the learner (Keller, 2008). Cakir et al. (2018) stated that the reasons for the dissatisfaction of students with low and medium levels of motivation in distance education were the lack of interaction, negative perception, and adherence to traditional methods. On the other hand, highly motivated students stated that they considered distance education to be effective because it is independent with regard to time and place. As a result, the use of videos in mathematics lessons affects student interest and motivation in the lesson.

Murphy and Alexander (2000) opined that motivation and interest were interrelated. Weber (2003) reported that interest was more related to internal motivation rather than external motivation. The internally motivated person takes action for fun or as a challenge, not because of external impulse, pressure, or reward, but because it is necessary (Ryan & Deci, 2000). The students stated that the educational videos contributed positively to their interest and motivation toward the course. However, it was determined that the videos prepared by the educator were more effective on the interest and the Khan Academy videos were more effective on the motivation of the students toward the course. This study lasted for one term. Students cannot be expected to have the same level of motivation and interest throughout this period. Keller and Suzuki (2004) reported that technology offers many new features to attract the attention of students, but these features are of interest because of their newness and become less interesting as the students get used to them.

Park and Choi (2009) reported that the supplementary resources used in distance education may cause students to lose their interest and motivation unless they are prepared to meet the expectations of the students. Sun and Rueda (2012) reported that strategies to increase the self-regulation skills of students in distance education should be

considered as more important. On the other hand, Huang and Hew (2016) found that the teaching materials used in distance education should be improved. The students stated that the educational videos helped their motivation toward the courses. In another study that can be conducted, the opinions of students with regard to how educational videos should be prepared for mathematics courses can be inquired about. How educational videos affect the motivation of students toward the course in terms of duration, content, and quality can be examined further.

Programs that normally offer distance education both attract the attention of the students and are in competition with traditional programs (Rovai, 2003). However, during the process of the study, the students had to attend distance education. They did not make this choice themselves. The students were of the opinion that the educational videos positively affected their interest in the course. Interest can develop and take shape in relation to the learning environment. Teachers, peer communication, participating in extracurricular activities, or performing a task all have an important place in the development of the person in question (Renninger & Hidi, 2011).

On the other hand, Bergin (2016) reported that the individual interest is stable by definition, but it may change over time. Studies conducted on interest have shown that students may or may not be aware of their interests. Students may be unaware that their interest has been triggered. There are different ways to trigger the interests of students (Renninger & Bachrach, 2015). Qualitative research can be conducted on how the educational videos prepared to teach mathematics courses in distance education more effectively affect the interest of students toward the course.

The student participants in this study said that the educational videos helped them to be prepared for mathematics courses and feel confident in the during the course. A similar result was reached in the study conducted by Carney et al. (2015). They stated that the videos helped the students to understand new and complex concepts, and also

contributed to the participation of the students in the course in a prepared manner. On the other hand, Sahin et al. (2015) reported that courses with videos helped the students to perform better in the classroom.

Furthermore, they concluded that the students preferred the courses with videos. The majority of the student participants in the current study said that they preferred courses with videos. However, it can be said that the students were undecided about the contribution of educational videos to those preparing for exams. In future studies, whether educational videos are effective in reducing the test anxiety of students can be examined.

Guo et al. (2014) stated that videos are widely used resources for online learning. Ratanothayanon (2018) reported that videos are the most needed supplementary material by students and educators, stating that the students who participated in the study mostly attended mathematics courses by watching videos. Moreover, the students stated that the videos helped them to prepare for mathematics courses. In the study of Kay and Kletschin (2012), it was determined that the students considered the videos to be easily used and effective tools for learning.

Considering the technological developments, each student has a different learning need. Courses designed with different models for distance education should support the preparation and motivation of students for the learning environment (Bertiz & Karoglu, 2020). It can be said that, for students, educational videos, prepared for use in distance education, contribute positively to the preparation process of the course. However, Zhang et al. (2006) stated that including videos in e-learning environments may not always be sufficient to improve learning. Considering these opinions, further studies can be conducted on the contribution that the use of videos in mathematics courses has toward student learning.

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