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Student's beliefs about using worked-example based video podcast in mathematics courses

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The goal of the study is to explain the behavioral, normative and control beliefs of vocational college students about their intentions in using worked-example based video podcast (WEBVP) technology in mathematics courses. The research is based on the framework of the Theory of Planned Behavior (TPB). It was carried out on 110 students of Computer Programming Department of Erzurum Vocational College during the spring semestre of 2014- 2015 academic year. Data were collected by employing a questionnaire form (n=110) containing open-ended and close-ended questions developed by the researcher and semi-structured interviews (n=25). The results showed that the students' intentions to use WEBVP in mathematics course are under the influence of their behavioral beliefs such as convenience to individual learning, repeatability and usage of advanced technology and their normative beliefs having social support. In addition, the control beliefs in which conceptual structure of mathematics, academic proficiency and individual learning differences are determined to be forcing factors, and the opportunity to reach information, elasticity in space and time and saving of time are determined to be facilitating factors also significantly affect the students' intentions to use WEBVP.

Introduction

Web 2.0 technologies with their different educational facilities have started to be used commonly in education owing to their potentials of enriching the process of learning-teaching and developing the 21st century skills of the individuals (Partnership for 21st Century Skills, 2010, Sadaf, Newby, & Ertmer, 2012). Web 2.0 applications commonly made up of blog, wiki, podcast, video sharing sites and social network are an indispensable part of academic and daily life for many students because of their socially usage peculiarities (McBride, 2009) like information generating, online information sharing, forming content through active participation and cooperation (Grosbeck, 2009).

Despite the rich and ample opportunities of Web 2.0 technologies in learning process, the studies on the subject show that the students' intentions to continue to use such new generation technologies are low (Chiu et al., 2007). According to Lee (2010), although the acceptance of e-learning is an important step for the success of e-learning, the real success necessitates the continuous usage of this technology. In this research, the factors effecting the intentions to use video podcast technology, one of the important applications of Web 2.0 technology, in mathematics classes by the students of vocational college are studied.

Video podcasts defined as digital audio/video files that are distributed through the Internet by using personal computers or mobile devices (McGarr, 2009) are also called vodcast, webcast and video streaming in literature (JISC, 2009; Shim et al., 2007; Treasure et al., 2010). There are three types of video podcasts used in education: substitutional (Heilesen, 2010), creative (Armstrong, Tucker, & Massad, 2009) and supplementary (Copley, 2007). Substitutional video podcasts are the files containing all the registries about the lesson while creative video podcasts are the ones prepared by the students. Supplementary video podcasts are the materials prepared for the reinforcement of the learning and realization of meaningful and deep learning. Supplementary video podcasts are mostly used in literature (McGarr, 2009).

In this study, worked example based video podcasts (WEBVP) technology, one of the applications of supplementary video podcasts, is used. WEBVP is a Web 2.0 application aiming at helping students to learn how to solve the problems in certain fields (Kay, 2012). The number of studies about WEBVP usage in literature is very limited (Kay & Kletskin, 2012). Any study in Turkish origin context hasn't been encountered yet, therefore, this study is unique in this sense.

According to a comprehensive review of research on video podcasts in education of Kay (2012), it is seen that there are three studies on WEBVP between the years 2002-2011. These studies reveal that WEBVP is a suitable platform supporting learning-teaching process (Loomes, Shafarenko, & Loomes, 2002), effective on acquiring any knowledge on a certain field (Kay & Kletskin, 2012), and it develops the academic success, ability of problem solving and self-sufficiency (Crippen & Earl, 2004). Kay (2014), bridging the gap in this field, developed a theory-based, profound theoretical framework consisting of stages of an effective WEBVP preparation. To this theory, there are four basic requirements to be paid attention in preparing a video podcast: establishing context, creating effective explanations, minimizing cognitive load and engaging students.

Although it is known that the use of video podcasts has positive effects on the attitudes of the students (Copley, 2007; Crippen & Earl, 2004; Hill & Nelson, 2011; Kay, 2014), it seems that students have some concerns about the factors limiting the access to this technology (Moss, O'Connor, & White, 2010). While the acceptance of podcast technology and perception of the students are handled in many studies, the psychosocial factors affecting the access to this technology and its acceptance are neglected. For this reason, depending on the Theory of Planned Behavior one of the most important sociopsychological theories that explain the attitude-behavior relationship thoroughly, the psychosocial factors affecting the podcast use of students are searched. It is thought that the survey findings will contribute to the literature in this field.

Mathematics teaching and worked example based video podcasts

According to Engelbrecht, Bergsten and Kagesten (2012), it is important to use conceptual approaches instead of operational ones in the effective teaching of mathematics. Since the answer to question "how" is sought for, that is, using formula, rule and relation, students can learn how to solve a problem easily. On the other hand, in conceptual approach where the answer to question "why" is given, students can understand not only how to solve the problem but also why it is solved in that specific way. Thus, seeing the processes such as the interpretation of the relations among visual, verbal and numerical statements with algebraic statements and the concepts and their application areas together may improve their understanding. As permanent and effective learning in mathematics are possible only by

balancing operational and conceptual knowledge (Baki, 1998), it is important to provide a learning environment where these two approaches supplement each other.

Research attracts attention to the importance of well- designed technological means in acquiring aspects of mathematics such as problem solving, critical thinking, doing operations and conceptual learning (Raines & Clark, 2011; Tassler, 2003). That could be one of reasons why video podcast technology gains importance in mathematics (Boster et al., 2007). According to Boster and colleagues (2007) video podcast technology is an effective means increasing the attention and participation to the lesson, and changing the nature of class interaction in mathematics classes. From this point of view WEBVPs are valuable approaches for showing the solution of many problems step by step and contributing to the learning in mathematics, engineering and sciences. The pedagogical strategy in this technology is still the narration/presentation of the knowledge to the student. However, learning objectives are more restricted (Kay, 2012). Kay and Kletschin (2012) found out that students regard WEBVP technology as a “useful” application due to the features of presenting the problems step by step and visually explained and also controllable their own pace of learning.

Theoretical Framework

The theoretical framework of the research is two dimensional. In the first section, Cognitive Load Theory forming the basis in the design and the development of video podcasts, and in the second, The Planned Behavior Theory are outlined.

Cognitive Load Theory

Cognitive Load Theory, suggested firstly by Sweller (1988) assumes that memory operation capacity of an individual is limited while the long-term memory is unlimited. Cognitive load theory which has become one of the most basic theories used to define cognitive processes in learning through new technologies since the beginning of 2000 (Brunken, Plass, & Leutner, 2003) accepts that knowledge acquiring depends on using the existing cognitive load sources efficiently (Plass, Moreno, & Brünken, 2010). According to this assumption, the degree of cognitive load is generally determined by three components: Intrinsic load is the cognitive load arising from the difficulty and complexity of the content. The more complex the content is, the higher the intrinsic load becomes. The degree of this load depends on the previous knowledge of the student. Extraneous load is the cognitive load caused by the elements not contributing to learning in the medium of teaching. The more suitable the teaching materials are prepared in the direction of instructional design principles, the lower the extraneous load becomes. The last cognitive load is the germane load caused by the activities enhancing the formation of charts in the medium of instruction and necessary for learning (Sweller, 1998; van Merriënboer, & Paas, 1998). It is necessary that there be excessive load that is, the total of intrinsic load, extraneous load and germane load, not exceed the capacity of working memory (Kılıç-Çakmak, 2007). For this reason, while the envisaged instructional materials minimize the extraneous load, they should aim at strengthening the germane load (Paas, Renkl, & Sweller, 2003). In this study, worked examples accepted as an important design principle in literature are used in strengthening the germane load and lessening the extraneous load in the stage of planning and creating video podcasts (Sweller, 2010).

Theory of Planned Behaviour

According to Theory of Planned Behavior (TPB) (Ajzen, 1985) the behaviors of individuals are under the control of certain factors and depend on specific causes. This theory assumes that there should be an intention towards a behavior so that a behavior can occur (Erten,



2002). Fishbein and Ajzen's (1975) Theory of Reasoned Action which forms the basis of TPB assumes that there are two factors orienting the attitudes to behaviours. The first one of these is "behavior oriented attitude" including the beliefs whether the results, which the behavior will create, will be positive or negative for the individual, and the other is "subjective norm" including the social pressure the individual perceives for developing a behavior or not.

On the other side, TBP taking form by the addition of "perceived behavioral control" factor, which refers to how difficult or easy it is perceived by an individual to perform a behavior, to the Theory of Reasoned Action is made up of a three-factor structure. TBP focuses on the intentions of the individual in realizing a behavior and assumes that intentions cover the motivational factors affecting behavior. According to Ajzen (1991:181), the stronger the intentions of an individual are, the more it impacts his/her behaviors. The intention to behave finds an expression only if behavior is realized by the individual and he/she acts by deciding to do or not to do that behavior by means of the intention.

Behavior oriented attitude, subjective norm and perceived behavioral control factors forming the basic of TBP are under the effect of three beliefs respectively. Behavioral belief supposed to effect the attitudes related behavior, normative belief constituting the indicators underlying the subjective norms, and the control belief constituting the basis of perceived behavior control (Ajzen, 1991) (Figure 1).

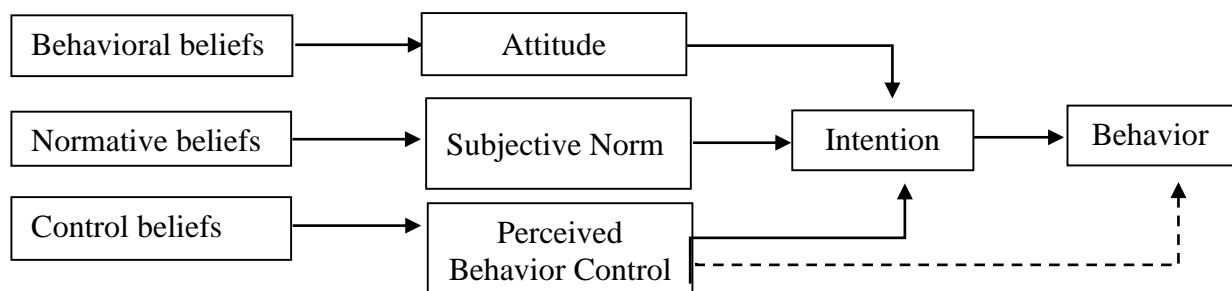


Figure 1. The Model of Planned Behavior (Ajzen, 1991).

Behavior oriented attitude, subjective norm and perceived behavioral control factors affect intention, and intention affects behavior. When the perceived behavioral control is involuntary, it can directly effect the behavior.

Purpose and research questions

The purpose of the research is to determine the behavioral, normative and control beliefs of vocational college students' intentions to use WEBVP in mathematics classes. The answers to the following questions were sought:

1. What are the behavioral, normative and control beliefs of vocational college students from the point of their intentions in using WEBVP in mathematics course?
2. How do these behavioral normative and control beliefs affect the intentions of students to use WEBVP in mathematics course?

Methodology

Study group

The stratum of the study consists of 110 first year spring semestre students at Computer Programming Programme of Erzurum Vocational College, Ataturk University in 2014-2015 academic year. The distribution of gender, frequency of access to internet and video podcast experiences of students are shown in Table 1.

Table 1. Personal characteristics of the students

Characteristics	Number (f)	Percentage(%)	
Gender	Male	65	59
	Female	45	41
Frequency of Access	Seldom	18	16.3
	Sometimes	39	35.5
	Everyday	53	48.2
Video Podcast Experience	None	15	13.6
	Little	20	18.2
	Normal	45	40.9
	High	30	27.3

Design of the study

Course instructor created a total of 25 worked based video podcasts for use in this course. The video podcasts covered four main areas. These are functions and their graphs, trigonometric functions, limits and continuity. In accordance with Sweller's Cognitive Load Theory (1988) and Kay (2014) recommendations for "key components of model for developing video podcasts" were taken into consideration. From this point, every video podcast included a clear unique title, a problem answered by the teacher and a corresponding problem to be explained by the student (Kay & Kletskin, 2012) (see Figure 2).

Podcasts were then uploaded to the course sites on Moodle (the course management system, CMS) with the name "MESLEKİ MATEMATİK". Students logged into Moodle before utilizing podcasts. Some students did not know what podcasting was. Therefore, step-by-step basic information was developed to guide students during the download of the podcasts from Moodle.

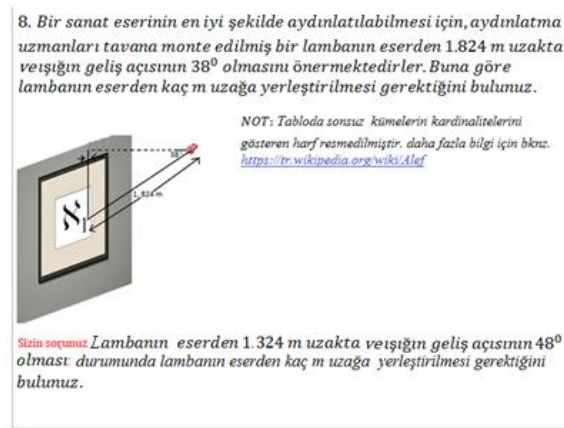


Figure 2. A selected screenshot from WEBVPs

Course instructor proposed that students watch the podcasts related to topic after lectures in order to minimize cognitive load, to assist students in learning how to solve specific problems and to facilitate the comprehension of complex concepts.

At the end of the semester, students who agreed to participate in the study were asked to complete the survey using an online assessment tool. After logging into Moodle, students viewed the invitation, consent form, and were redirected to the online survey.

Data collection tool

A questionnaire was prepared by the researcher in order to determine the behavioral, normative and control beliefs of the students about their intentions on using WEBVP in mathematic courses. For this purpose, literature review was carried out and the statements to be used in questionnaire form were specified. There are three open-ended questions in the questionnaire form designed in the direction of TBP (Ajzen, 1991). The questions in the form were prepared in order to collect data about the subproblems of the research. The question types with possible answers ‘yes’ or ‘no’ were not used in order to get detailed information from the students.

After the questionnaire form had been prepared, the opinions and approval of the professors about the content validity of the draft questionnaire in the fields of assesment and evaluation (two persons) and mathematics education (two persons) were received. Making the necessary editing in the questions in accordance with these opinions, the form was applied to five students out of the study group. The questions in the form were tested from the point of content and writing. The last version of the questionnaire was given after some simple changes in the statements were done according to the pilot study results.

The questionnaire form prepared goal oriented is made up of two sections. In the first section, personal information, and in the second, the questions to determine the opinions of the students to use video podcasts in mathematics courses take place.

The following questions were put to find answers to the sub-problems depending on the objective of the study:

1. What advantages would you get by using WEBVP in mathematics courses? Explain.
2. Do you think that the people around (friends, teachers, family etc.) have an effect on your using WEBVP? Explain the reasons.
3. What are the most important factors effecting the use of WEBVP in math course?

The questions oriented to the students in semi-structured interviews are focused on TPB variables to determine the behavioral, normative and control beliefs as in the questionnaire form. Face to face interview was performed with 25 students and each interview lasted approximately 25 minutes. The following questions were directed to the students in the interviews:

1. What are your thoughts about the use of WEBVP in math classes?
2. Would you like to use WEBVP technology again in learning mathematics? Why?
3. Can mathematics courses be taught effectively and efficiently through WEBVP technology? If your answer is ‘Yes’, indicate what peculiarities of WEBVP use should have in math classes; If ‘No’ indicate why WEBVP can’t be used in math classes.

Data analysis

Content analysis, a qualitative research analysis method, was used in the analysis of the data. In this context, the data obtained from the questionnaire form were examined, codes were set. After coding procedure, codes were brought together and common characteristics were found and each code was separated into behavioral belief, normative belief and control belief themes.

Afterwards, the data obtained from the interviews were encoded and the constant comparison technique of Miles and Huberman (1994) was used in the formation of behavioral, normative and control belief themes. The data investigated are encoded in categories and at the same time, they are compared with the investigated data constantly in constant comparison technique (Ekiz, 2009). A great number of codes belonging to each theme were obtained in this way. Finally, the necessary editing was realized by controlling again the themes formed by encoding the data obtained from the questionnaire form and interviews.

The students participated in the study were encoded as “S1, S2, S3...” The sample statements expressing the thoughts of the students were given in “quotation marks”.

The encoding of the survey data was made by means of QSR Nvivo 10.0 qualitative data analysis program. Since the students gave more than one answer to the questions, the frequency number of some themes was more than the number of the students in in the analysis of the qualitative data.

Validity and Reliability

Validity in qualitative research means the researcher observes the fact in it is and impartially as much as possible (Kirk & Miller, 1986). In order to ensure the internal validity of the research, a theoretical framework about the subject matter of the research was formed investigating the related literature especially in the process of developing the questionnaire form. Attention was paid to the suitability of the obtained data with the theoretical frame, and care was given to the integrity of the codes belonging to the themes. All of the codes representing the themes are indicated in the findings section. In order to increase the external validity of the research, research model, study group, data collection tool, data collection process, analysis and the interpretation of the data are presented in detail.

In order to secure the internal reliability of the study, the themes determined and the convenience of the codes belonging to these themes were controlled by two professors who are specialists in qualitative research field and working in the same university. The reliability of the study was calculated by using the following formula by Miles and Huberman (1994, p.64),

$$\text{Percentage of Agreement} = \frac{\text{Agreement}}{(\text{Disagreement} + \text{Agreement})} * 100$$

and the reliability was found to be 0.93. Since 80% or over is sufficient, the reliability from the point of data analysis was achieved (Büyüköztürk et al., 2008).

In order to increase the external reliability of the study, what were carried out in the processes of data collection, processing, analyzing, interpretation and reaching the results were given in detail. Besides the raw data comprising the study are kept by the researcher with the thought that they can be inspected later.



Findings

In this study in which the intentions of students in using WEBVP in math classes, the data were analyzed under three titles comprising of the classifications as behavioral belief, normative belief and control belief. Eight sub-themes related to the behavioral belief, two sub-themes related to the normative belief and sixteen sub-themes related to the control belief appeared from the data obtained from the semi-structured interviews. The views of the students concerning their intentions for using WEBVP in math class were tried to be investigated by means of the interviews in detail.

The views of students related with their behavioral beliefs about using webvp in math classes

Table 2 shows the views of students related with their behavioral beliefs about using WEBVP in math classes. It is a matter of fact that the behaviors believed to achieve a positive result in behavioral belief, the individual has whether to perform a behavior or not, should be supported (Ajzen, 1991). Taking the views of the students on this point into account, four themes as “Learning”, “Motivation”, “ Technological Literacy” and “Rich Content” were formed. Under the theme of “Learning”, three themes as “ Convenience to individual learning”, “ Enhancing the eagerness to learn”, “Repeatability” were formed.

It is seen that especially the frequencies of the views “convenience to individual learning” and “repeatability” under the theme of learning are high. 52.7% of the students think that one of the most important advantages of video podcasts is “convenience to individual learning”.

“ I try to solve the problems myself. Whenever I want, pausing the record, I solve up to the problem. It is very good to have the solutions to the problems at the end of the podcasts!” (S5)

“It is necessary for me to repeat the podcasts for a few times whenever I don’t understand the subject. This is a very good application. Thank you.” (S1)

Some students underlined the positive contribution of audio-visual materials in distance education.

“Whenever I follow podcasts, I feel as if the teacher were beside me.” (S20)

“I feel like I were in the classroom.” (S6)

“It is as if the teacher were narrating only to me.” (S8)

When the views under theme of motivation is investigated, the subthemes “attention” and “confidence” appear. The statements of students about their views on this theme are as follows:

“Now I believe that I can manage mathematics.” (S1)

“ I try to solve the problems in the podcast carefully. In the case that I can’t I try again. I think that I can manage this with a persistent and attentive manner.” (S4)

“Normally I abstain from asking questions in the class. I suppose such applications will be beneficial for the students like me. I follow the podcasts many times. I took my heart.” (S6)

“By following the podcasts again and again, you can catch the points you have missed. This leads to following the podcasts more attentively and curiously every time.” (S3)

“ I understood that I should be more conscious and attentive while following the podcasts. I realised that I follow the teacher more carefully. I think this is the contribution of

the podcasts which I follow minute by minute, again and again and when necessary I take time to think by pausing .” (S12)

“I am so careful while following the solutions to the problems that I can't concentrate on so much while reading a book .” (S11)

“Advanced technology usage” sub-theme was formed under the theme “Technology literacy”. 54.5 % of the students indicated that it is a necessity of digital age to use podcasts in math classes and that they adopt the use of advanced technology in all classes.

When we look at the frequency of rich content, it is seen that the most of the students think it as one of the most important contributions of video podcast applications. They stated their views as follows:

“Video podcasts are better than I think. Plenty of questions and step by step solutions. The presentation of the problems, photographs and pictures about the problems. Very interesting and intriguing. Thank you.” (S8)

“Lots of the problems in the podcasts are about daily life. That's why I want to solve the problems. The examples are very interesting.” (S7)

In my opinion, it is a very good idea to use internet for the purpose of education. Person may encounter very interesting materials in the process of learning. Podcasts are very efficient in this respect. Especially the visual presentations. Even the colours you used attracted my attention. Very creative.”(S1)

“The problems you solve are almost the same as the students'. In a way it is impossible for us not to solve the problems. In addition, it is very great to solve the student's problem after you solve yours. We can check our answers.” (S25)

“For me it is the most helpful part in podcasts. ‘Your problem’ part. It is incredibly effective to solve the problem and then compare with your solution. I couldn't have learnt so much from the book.”(S1)

Table 2. The views of students related to their behavioural belief about their intentions to use WEBVP in math classes.

Themes	Subthemes	f (n=110)	%
Learning	<i>Convenience to individual learning</i>	58	52.7
	<i>Whet the learning</i>	47	42.7
	<i>Repeatability</i>	77	67.3
Motivation	<i>Confidence</i>	38	34.5
	<i>Attention</i>	42	38.2
Technology Literacy	<i>Using advanced technology</i>	60	54.5
Rich Content	<i>Audio visual elements</i>	45	41
	<i>Plenty solved problems</i>	51	46.3

The views of students related to their normative belief about their intentions to use WEBVP in math classes

Normative belief refers to the social pressure that an individual perceives whether to realize a behavior (Ajzen, 1991). The views of students related to their normative belief about their intentions to use WEBVP in math classes are seen in Table 2. When the Table 3 is investigated, it is seen that the views of students related to their normative belief about their intentions to use WEBVP in math classes are collected under the themes “friends”, “teacher” and “family”.

Table 3. The views of students related to their normative belief about their intentions to use WEBVP in math classes

Themes	Subthemes	f (n=110)	%
Friends	Social support	75	68.1
Teacher	Teacher's expectations	58	52.7
Family			

“Social support” theme was formed under the theme of “ Friends” . Some students to study in groups after following the podcasts. For this reason, it was inevitable for the students in groups to follow the podcasts. The following are the views of students related to “Friends”;

“We solve the problems similar to ones in podcasts with friends. We participate the groups as audience in cases we can't follow the podcasts.” (S14)

“I don't want to miss the podcasts. We solved a lot of problems with the group. If we went on in this way, I wouldn't leave unsolved problems especially in trigonometry.” (S8)

“I made an offer to the friends: ‘Let's follow the podcasts together. Everybody should solve ‘Your problem’ by themselves. Then we can ask problems to each other.’ This offer wasn't accepted. It was thought it would be more suitable to follow at home. In this way we could solve more problems when we came together.” (S16)

Some students indicated that they followed the podcasts because of being effected by the students who followed the podcasts.

“A lot of friends in the class mention about the podcasts. Friends whose succes were low in math said that they could understand the subjects better and solve problems by themselves. I followed the podcasts with the influence of my friends mostly.” (S9)

When the views under the theme ‘ Teacher’ investigated, it is seen that the frequency of subtheme ‘Teacher's expectations’ is high. The views of the students related to this subtheme are as follows:

“I could not follow some podcasts. Does it affect the grade of the exam? I wonder.” (S18)

“ I think the access dates and system life cycle of the students CMS (Course Management System) are registered. This should also be obligatory like class attendance in my opinion.” (S20)

“The teacher can see who are following the podcasts. In fact this situation is an advantage for the students like me. I have never missed the classes and podcasts so far. It is important for me that this is documented and noticed by the teacher.” (S24)

The views of the students related to their control beliefs about their intentions to use webvp in math classes

Control belief describes how difficult or easy a person finds to perform an action (Ajzen,1991).The views of the students related to their control beliefs about their intentions to use WEBVP in math classes are given in Table 4.

Table 4. Views of the students related to control beliefs about their intentions to use WEBVP in math classes.

Themes	Subthemes	f (n=110)	%
Convenience to theoretical lessons	Conceptual structure of math	48	43.3
Technical problems	Internet Access	28	25.5
Social obstacles	Lack of interaction	45	41
	Lack of communication	38	34.5
Learning disabilities	Delayed communication	55	50
	Individual learning differences	64	58.1
	Writing skill deficit	32	29.1
	Take more responsibility	45	41
	Lack of affective behavior	43	39.1
Technological dependence	Dependence to comm. techno.	35	31.8
Prerequisite skills	Technical competence	17	15.5
	Academic competence	59	53.6
Access to information	Opportunity to reach information	77	70
Economic	Saving of time	58	52.7
	Low cost	44	40
Opportunity equality	Elasticity of time and place	65	59.1

As seen from the table, nine themes related to control beliefs were formed. When we look at the table 3, it is seen that ‘convenience to theoretical lesson’, ‘social obstacles’ and ‘learning disabilities’ themes have the highest frequencies whereas ‘technical problems’ and ‘pre-requisite’ themes have the lowest frequencies.

When we look at the views under the theme of ‘convenience to theoretical lessons’, the sub-theme ‘conceptual structure of math’ comes forth with the highest frequency. Some of the students participating the study think that math is a difficult course and as a result the problems and exercises in podcasts should be given in face to face classroom environments. When the social obstacles were added to these difficulties in conceptual structure, lots of students indicated that they had to get help from outside after following the podcasts. In this respect, the students stressed that they had difficulties both from the point of academic competence and social obstacles in their statements “I can understand up to a point when I follow the solutions to the problems. But I can’t get help when I am exhausted. There were many times that I followed the video from the beginning. Even so, I couldn’t solve by myself.” (S23)

The students indicated in their interviews that in spite of the difficulties in the conceptual structure of mathematics, it is very effective to learn the concepts meaningfully due to the existence of detailed explanations and solutions of the problems in WEBVPs. Some students even put forward that they could learn the concepts and relations, which they could not learn in the class, better through podcasts:

“I comprehend better through the step by step solutions of the problems about the subjects which I could not understand fully in the class.” (S19)

“Explanations are very good. I can understand better.” (S25)



When the views under the themes of 'technical problems' and 'pre-requisite skills' are taken into account, the subthemes of 'lack of technical assistance', 'technical competence' and 'academic competence' come into forth. The views related to these themes are as follows:

"Freezing, slowdown and interruptions in internet links occur. In such cases, I shut down the computer and turn on the following day." (S10)

"Slowdowns occurs frequently. Sometimes I cannot open the podcasts." (S17)

"I am unfamiliar to these sites since I do not use internet for education purposes." (S13)

"We stay on the computer for this course for a long time. This affects me negatively." (S23)

"I need assistance to access the podcasts. I have no opinion about CMS." (S9)

"Students should learn the subject very well first so that problem based podcasts can achieve their goals." (S14)

When the views under the theme of 'social obstacles' are investigated, the sub-themes of 'Lack of communication' and 'lack of interaction' appear. The statements of the students about their views related to 'social obstacles' and 'learning disabilities' are given below:

"Going to classroom, sitting on my desk and listening to the lesson.... This is what I want." (S17)

"I prefer solving the problems with my friend in the class. How can I get help in the subjects I could not understand." (S25)

"I can't get an answer immediately. Can an application of 'instantaneous replying' not be applied?" (S4)

"A careful presentation of formulas and rules have been made. But I realized that I wrote the formulas uncomplete and didn't memorize them." (S22)

"Sometimes I don't know where to begin. Do I have to read the subject first or follow the podcast? Or start with memorizing the formulas? I have difficulties." (S13)

In the investigation of 'economic' theme, 'saving of time' and 'low cost' subthemes appear. 52.7 % of the students attracted attention to the time saving of podcasts and 40% to the low cost of podcasts.

When the table 3 is examined, it is seen that the frequency of 'opportunity to reach information' under the theme of 'Access to information' is high. The statements of the students about their views on 'Access to information' are given below:

"I don't need any other materials. There are many questions and satisfactory explanations. Video podcasts are very good." (S19)

"I couldn't learn so much even from the books." (S1)

The sub-theme 'elasticity of time and place' under the theme of 'opportunity equality' has one of the highest frequencies. It is seen that this application is especially favourable for the students who are working anywhere. The views of the students about the theme 'opportunity equality' are as follows:

"It is a very good application for those who are working and cannot attend the classes. I am a half-time employee. Sometimes when I am very tired after leaving work, I cannot come

to school. I think I learn better after the application of podcasts. I sometimes follow even at work when I find time. I am very contented.” (S11)

“I participate the lesson without leaving home! This is the greatest benefit of the application in my opinion.” (S18)

Discussion, implications, and limitations

The findings of the research revealed that the intentions to use WEBVP of students in mathematics are affected by the behavioral, normative and control beliefs. This result is in conformity with the findings of Sadaf, Newby and Ertmer (2012) and Teo and Tan (2012). In addition, it can be said that the findings obtained are partly in conformity with the findings of Teo and Lee (2010).

The results showed that the students believe the benefit of WEBVP in mathematics classes. It was determined that many students see this technology as a visual tool providing “a learning at his/her pace”. Besides, they believe that podcasts also increase the attention and concentration.

The interview data also revealed that the students see the podcasts as a “tool of motivation” (Sadaf, Newby, & Ertmer, 2012). They especially stressed that the carefully followed podcasts contribute to the development of “self-confidence” sense.

Findings suggest that the use of advanced technology is an important factor in using WEBVP. The students indicated that the use of podcasts in math is a necessity of the digital age and they want the use of such technologies in all classes. This result is in conformity with findings of Sadaf, Newby and Ertmer (2012). Sadaf and colleagues (2012) found out in their research that Web 2.0 technologies are the “suitable” learning medium for the students of digital age.

Furthermore, the students believed that the rich content of podcasts had a positive impact on their intentions to use these technologies. Especially the existence of many problems with solutions and audio-visual elements effected the intentions of using WEBVP. These results replicate the findings obtained by Kay (2014), who stated that students enjoyed working on the interactive student-problems. They also noted that video podcasts were interesting and better than using textbooks.

The students also believed that the social environment have an expectation of using WEBVP from them and these expectations effect their behaviors. It becomes an expected behavior among friend groups to follow the podcasts. This is a result in conformity with the findings of Chen, Yen and Hwang (2012) and Teo and Tan (2012). According to Chen, Yen and Hwang (2012), since Web 2.0 technologies are applications with a social content, the subjective norm is related with the continuous usage of these technologies.

The research findings showed that the intentions of students to use WEBVP in math are effected by their control beliefs. This result contradicts with the findings of Teo and Lee (2012). Teo and Lee (2012) found out that attitude and subjective norms effect the intentions of teacher candidates to use the technology, whereas the perceived behavior control has no effect on the intention.

The views of students related to their control beliefs about their intentions to use WEBVP in math suggest that they see mathematics as a difficult and complex course. However, due to the presentation of questions in detail and with solutions, the students intended to use this



technology as an effective tool in learning the concepts meaningfully. According to Clark and Mayer (2008), in case the presentation of problems are given step by step explanations and with meaningful pieces, it would be beneficial and important from the point of students. In this context, an interesting result of this study is that the students accept WEBVP as “an effective tool” in the learning of concepts meaningfully.

In addition, the flexibility of reaching podcats from anywhere and any time, saving time and opportunity to access information created a positive effect on the intentions of the students to use this technology.

On the other hand, the deficiency of communication, interaction and delayed communication have a negative effect on the intentions of students to use WEBVP. Some students believed that learning in mathematics classroom with their friends and under the control of the lecturer is more helpful. During the interviews, one student indicated that the application of “immediate answer” gets rid of the deficiency of communication and interaction a little and that the control will partly be in the hands of the lecturer. These obstacles encountered in using WEBVP are consistent with the findings of Muilenburg and Berge (2005) and Fung (2004). Muilenburg and Berge suggested that the social interaction effectiveness of online learning. Thus, it was stressed that the social interaction should be improved in online learning for a more effective and entertaining educational medium.

Some limitations to the research need to be pointed out. The findings obtained and the results achieved should be evaluated by taking the limitations of the study. Conducting the research on the first year students on the level of a two-year college and using a self-report assesment method can be assumed among the important limitations of the research.

Conclusion and recommendations

The findings of the research indicate that the intentions to use WEBVP of students in mathematics are affected by the behavioral, normative and control beliefs. The results suggest that the students believe that WEBVP as an effective tool in the learning of mathematical concepts due to the presentation of questions in detail and with solutions. Therefore, the integration of this technology in the mathematics classes appears to be an appropriate instructional approach.

The results indicate that the control beliefs in which conceptual structure of mathematics, academic proficiency and individual learning differences are determined to be forcing factors significantly affect the students’ intentions to use WEBVP. Reminding students prerequisite concepts, emphasizing the key elements of problems and highlighting each pieces of the solutions can have a positive influence on their intentions to use this technology in mathematics course. It is critically important that instructors use these important clues in design and implementation of podcasts.

Further studies are necessary to investigate how practitioners implement and utilize podcasts in mathematics course. More detailed studies on obstacles for using this technology in math classes are also needed. In addition, further research encouraging the factors of WEBVP use in math classes should be carried out intensively. A similiar study to this one can be carried out to investigate the intentions of teachers to use WEBVP in math classes and the data from the two studies can be compared from the point of results.

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