# AN INVESTIGATION OF THE PREDICTORS OF PRE-SERVICE TEACHERS' BEHAVIORAL INTENTIONS AND PERCEIVED ENABLERS AND BARRIERS PERTAINING THE USE OF INTERACTIVE WHITEBOARD IN EDUCATION

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## ABSTRACT

# AN INVESTIGATION OF THE PREDICTORS OF PRE-SERVICE TEACHERS' BEHAVIORAL INTENTIONS AND PERCEIVED ENABLERS AND BARRIERS PERTAINING THE USE OF INTERACTIVE WHITEBOARD IN EDUCATION

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As the technology advances and becomes a part of our daily lives, the integration of technology into education becomes necessary. This study aims to investigate the predictors of pre-service teachers' behavioral intention to use interactive whiteboards within the framework of Unified Theory of Acceptance and Use of Technology and their perceptions about the enablers and barriers pertaining to the use of interactive whiteboards. There were two instruments that were used to collect data for the study: interactive whiteboard (smart board) questionnaire consisting of a demographic part and a main part including adapted survey questions along with an interview guide. The data for the survey were collected at the spring semester of 2014-2015 academic year from 153 pre-service teachers enrolled in six departments under the Faculty of Education at a state university. Qualitative data were collected through interviews from 10 pre-service teachers. The results indicated that attitude toward using technology, social influence, performance expectancy and effect expectancy were the predictors of

pre-service teachers' intention to use interactive whiteboards. In addition, qualitative analysis of data revealed that pre-service teachers use interactive whiteboards because it attracts attention, provides students' active involvement, efficiency, enhanced visuality and interactivity, acts as an additional resource, and provide efficiency. Also, recommendation of faculty members and intention for future use considering a balanced use of boards along with traditional methods have an influence on their intention to use this technology. However, there were still some barriers that should be taken into consideration. These were found to be underutilizing and misusing the technology, confrontation with problems, reluctance to use and feeling of insufficiency with regards to intention to use. In addition, availability, training, additional supplementary resources, technical support and concerns about the differences between logistics of the public and private schools were the main barriers or concerns stated by the pre-service teachers. It was concluded that pre-service teachers are expected to utilize this technology into their classrooms provided that their designated concerns are taken into consideration.

**Keywords:** Technology in education, interactive whiteboard use, intention to use interactive whiteboard

# ÖZ

## ÖĞRETMEN ADAYLARININ DAVRANIŞSAL TUTUMLARININ YORDAYICILARININ VE AKILLI TAHTA KULLANIMINA YÖNELİK SAĞLAYACILARIN VE ENGELLEYİCİLERİN BELİRLENMESİ

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Günümüzde teknolji ilerledikçe ve hayatımızda daha fazla yer edindikçe eğitimde teknoloji kullanımı da daha fazla önem arz etmeye başlamıştır. Bu çalışma Teknoloji Kabul ve Kullanım Birleştirilmiş Modeli çerçevesinde öğretmen adaylarının eğitimde akıllı tahta kullanımlarına yönelik niyetlerini yordayıcı faktörleri ve kullanımlarına sebeb olan ya da engel olan nedenleri açıklamaya yönelik bir tarama çalışmasıdır. Çalışmada anket ve mülakat soruları kullanılarak veri toplamak için iki araç kullanılmıştır. Nicel veriler 2014-2015 yaz akademik döneminde bir devlet üniversitesinde okuyan ve eğitim fakültesinde kaytlı altı bölümde kayıtlı olan 153 öğretmen adayından toplanmıştır. Nitel veri yine aynı dönemde 10 öğretmen adayından mülakatlar ile toplanmıştır. Çalışma sonucunda teknoloji kullanımına yönelik tutum, sosyal etki, performans ve çaba beklentileri, öğretmen adaylarının akıllı tahta kullanımlarındaki niyetlerini yordayıcı ya da belirleyen faktörler olmuştur. Buna ek olarak çalışmadaki nitel veri analizi, öğretmen adaylarının akıllı tahtayı ilgi çekmek, aktif katılım, gelişmiş görsellik ve interaktiflik, ek kaynak sağlaması ve etkin

olması nedenlerinden dolayı kullandıklarını ortaya çıkarmıştır. Ayrıca, öğretim üyelerinin tavsiyesi, gelecekte kullanma isteği ve teknoloji ile geleneksel öğretim yöntemlerini dengeli kullanma da onların akıllı tahta kullanımlarını destekleyen öğeler olarak belirtilmiştir. Bununla birlikte, dikkate alınması gereken bazı hususlar da ortaya çıkmıştır. Bunlar bu teknolojinin doğru şekilde ve amacına uygun kullanılmaması, yanlış kullanılması ve suistimal edilmesi, çeşitli problemlerle karşılaşma, kullanmak istememe, kendini kullanım konusunda yetersiz görme şeklinde bulunmuştur. Buna ek olarak, öğretmen adaylarının; teknolojinin mevcut olması, verilen eğitim ve destekleyici ek kaynaklar, teknik destek ve özel okul-devlet okulu arasındaki lojistik farklar gibi kaygıları konu ile ilgili olan engeller olarak nitelendirmiştir. Sonuç olarak öğretmen adaylarının bu teknolojiyi gelecekte kullanmaları muhtemel olup dikkate alınması gereken bazı konuların olduğu göz ardı edilmemelidir.

**Anahtar Kelimeler:** Eğitimde teknoloji kullanımı, akıllı tahta kullanımı, akıllı tahta kullanımına yönelik tutum

To My Lovely Wife

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# LIST OF ABBREVIATIONS

## ABBREVIATIONS

**SB:** Smart Board

**IWB:** Interactive Whiteboard

**UTAUT:** Unified Theory of Acceptance and Use of Technology

**PE:** Performance Expectancy

**EE:** Effort Expectancy

**SI:** Social Influence

**FC:** Facilitating Conditions

**BI:** Behavioral Intention

**ANX:** Anxiety

**ATUT:** Attitude toward Using Technology

**SE:** Self-Efficacy

**FATIH:** Movement of Enhancing Opportunities and Improving Technology (**F**ırsatları **A**rttırma ve **T**eknolojiyi **İ**yileştirme **H**areketi Projesi)

# CHAPTER 1

# INTRODUCTION

This introductory chapter provides information about the background of the current study, statement of the research problem along with the pursued research questions, the reasons behind in the significance of the study, and the main purpose of the study. This chapter will also provide the definitions of the terms used throughout the study.

## 1.1 Background of the Study

Technology began to occupy education with its ease and facilitation such as distance education, online courses or programs, online certifications etc. In the same manner, the use of technology and its integration to the education has become prominent for the last few decades. Using interactive whiteboards rather than the traditional blackboards, tablet PCs and other handheld devices to write down notes in the classroom has become common. Still, despite the variety of technology available in schools, as of today many teachers do not utilize technology effectively or use it to its full potential within the classroom (Rakes, Flowers, Casey, & Santana, 2006). There is a gap between the actual use and anticipated use of technology within the classroom. All over the world, there are many projects aimed to enhance the quality of learning and education. Thus, to ease and facilitate learning in schools and universities, countries planned ICT projects to integrate technology into educational setting (Selwyn, 2013). These plans are listed in Table 2.1 for each country with their projects.

**Table 2.1** ICT Projects of Countries (Trucano, 2010)

| **Countries** | **ICT Plans** |
|---|---|
| Australia | Anytime Anywhere Learning Foundation |
| Austria | Netbooks in Education |
| Colombia | OLPC (One Laptop Per Child) Colombia |
| European Schoolnet | EUN-Acer Netbook Project |
| Israel | Time to Know |
| Nepal | OLE Nepal (Open Learning Exchange) |
| Paraguay | Paraguay Educa (OLPC) |
| Peru | OLPC Peru |
| Rwanda | OLPC Rwanda |
| South Korea | Digital Textbook & u-Learning (KERIS) |
| United Kingdom | Becta Home Access |
| United States | Maine Laptop Technology Initiative |
| Uruguay | Plan Ceibal |

Although Turkey is not included in the list, she is trying to integrate ICT technologies into education with the "Fırsatları Arttırma ve Teknolojiyi İyileştirme Hareketi" (Movement of Enhancing Opportunities and Improving Technology) in Turkey (FATIH, 2012). With this project, it is aimed to accommodate tools (interactive whiteboard (IWB) and tablet devices) used for Information and Communication of Technology (ICT) in educational processes. It is indicated that there are 42,000 schools and 570,000 classes and for the equal opportunities in education for all students. It can be said that 570,000 interactive whiteboards along with millions of tablet devices will be distributed to schools. Although it was announced in 2010, there are several researchers focusing on FATIH project. Still there are some considerations that should be considered. Demirer, Saban, Küçük and Şahin (2011) indicated that 78.9% of information system pre-service teachers are not informed about the scope of FATIH project and stated that pre-service teachers think that the project was not introduced effectively. Pre-service teachers think that they have difficulties in applying this project because of adaptation problems, having inadequate technical information, underutilization of the technologies by teachers and students, harming these

technologies, technical problems and improper infrastructure, need for software programs.

Then again, accomplishment of such aim might only be feasible with the fulfillment of pre-service teachers' needs for use and possession of the requirements for adoption of using such devices. For that reason, teacher should be educated or trained about the new or possible technologies that may face with. For that reason, training for the teacher is crucial (Morrison, 2007; Sze, 2008). Likewise, it is explained that teachers should know both how to use technology and how to integrate it into their educational environment (Dooley, 1999; Hutinger, Bell, Daytner, & Johanson, 2006). Moreover, teachers need to be assisted how to use technology to facilitate learning in a meaningful way (Ertmer & Ottenbreit-Leftwich, 2010) since teachers guide students for reaching out the knowledge (Ozan & Ulaş, 2010). However, in Turkey educating teachers about the technology is a problematic issue, Artan and Uyanık-Balat (2003) stated that ICT training for the teachers is not sufficient. Thus, there is a need for training starting from the beginning so that the next generation of the teachers would use the technology. The fulfillment of such need is only possible if the pre-service teachers do not possess any resistance or reservations toward the technology in the first place. Moreover, educating young teachers is easier as they are accustomed to use different technologies than the teachers who had years of experience in teaching with blackboard (Seferoğlu, Akbıyık, & Bulut, 2008).

Schmid (2010) states that to use interactive whiteboards (IWBs) teachers need to have several competencies; such as: i) the ability to design lecture materials to be used in classroom with whiteboard that enhances the interaction of the students, ii) the management of the interactive whiteboard so that all students have the equal chance of interacting with it and iii) establishing a balance between the traditional way of teaching & using technology in classroom (p.170). Teachers need to have the necessary set of competencies to utilize such technology. It is possible that some problems may arise that teachers need to handle during their interaction with IWBs. For instance, Preston and Mowbay (2008) list the technical set up of classroom along with other technical issues, the distraction of students' attention and the process of finding appropriate activities to use are the main problems that Abbotsleigh Junior

School teachers face for the last eight years. As a result, the possible problems and the ways to solve these problems should be available for teachers.

## 1.2 Statement of the Problem

With its integration, technology has changed educational settings and brought a new perspective (Tor & Erden, 2004). With this perspective, the traditional education environment is enriched with the technological tools or devices that assist the learning and teaching. With the FATIH project, schools are being equipped with tablet PCs and smart boards along with necessary infrastructure (MEB, 2015). The aim of this project is for teachers to utilize technology in the classroom while creating a learning environment including up-to-date technology.

Employing the necessary devices and technology is not adequate alone for successful technology integration. According to Ulucan and Pehlivan (2010), technology is used in different institutions but how it should be integrated in designing educational programs along with the actual use in education stands as a major problem. It is informed that teachers in schools utilize technologies for other purposes rather than using for instruction (Nelson, Palonsky, & McCarthy, 2007).

For solving this problem, some issues should be taken into consideration, among which, teachers' attitudes and competencies are the most important factors in technology usage in educational settings (Aktaş-Arnas, 2005; Hew& Brush, 2007; Yüksel & Kavanoz, 2011) along with their knowledge in this technology use (Hutinger, Bell, Daytner, & Johanson, 2006). It is indicated that "identification of factors explaining computer use might give an answer to while some teachers embrace the use of computers and others do not" (Hermans, Tondeur, Van Brak, & Valcke, 2008). Thus, as the interactive whiteboards forced its way into the classroom, there is a need to investigate teacher candidates' actual behaviors and its origins as well as their opinions for the use of interactive whiteboards. Therefore, the current study aims to investigate pre-service teachers' behavioral intention to use IWB in the classroom along with their perceptions on the use of IWBs. For this purpose, Unified theory of acceptance and use of technology (UTAUT) is selected as the theoretical framework

for the study, since UTAUT is the common technology acceptance model, which aims to predict the actual behavior and its origins. (Venkatesh, Morris, Davis, & Davis, 2003). Thus this study aims to specifically examine how the factors of UTAUT predict pre-service teachers' behavioral intention to use the technology of interactive whiteboards and what they think about enablers and barriers pertaining the use of interactive whiteboard in education.

### 1.3 Significance of the study

According to MEB (2015), all schools constituting an amount of 570 000 classrooms will have their interactive whiteboards by the early of 2016. As a result of such radical change in the classroom setting, teachers' interactive whiteboard integration into teaching and the relevant and necessary skills into their teaching profession competencies become essential. Oigara and Keengwe (2011) state that schools invest an incredible amount of money on technology resources despite the fact that the teachers do not have the adequate training to use or the means necessary to prepare materials with those technologies in classroom. In line with their statement, educating or training pre-service teachers is necessary since they will need to use IWBs technology in the classrooms once they graduate from the school. Thus, there is an apparent need for teachers to learn how they can use these devices effectively in their teaching. In line with this, Bauer and Kenton (2005) asserted that if time were to be allocated to learning or training in new technologies, it will increase the possibility of use in the classroom. Such training will also provide teachers with set of competencies they need to use IWBs such as the ability to design lecture materials, management for an equal chance of interaction with others and balancing the traditional way of teaching with using technology in classroom (Schmid E. C., 2010). These studies imply that seamless technology integration and effective use of technology are more important than purchasing technology by spending vast amounts of money and not using them in the classroom.

On the other hand, due to some limitations of teacher education programs, teacher candidates may have hardly any interest or opportunity for such integration into their teaching. Moreover, they need to be familiar with such technologies and their attitude

and/or acceptance of such technology is important. Aktaş-Arnas (2005) showed that there is a relationship between software selection, teacher attitude and competency. If teachers' attitude towards using IWBs in classroom is negative, it would affect students' performance and achievement negatively. Thus, teachers' acceptance becomes an important factor for technology integration into classroom.

Educating or training pre-service teachers is necessary since they will need to use IWBs technology in the classrooms once they graduate from the school. Since educating young teachers is easier as they are accustomed to use different technologies than the teachers who had years of teaching with blackboard (Seferoğlu, Akbıyık, & Bulut, 2008).

Furthermore, as FATIH project moves on the next stages of distribution and interactive whiteboard is taking its place in classrooms. If the faculty of education model for the technology use, pre-service teacher can obtain a chance to learn and use new application and through experimenting they can learn how they can use this technology for their teaching in schools (Blue & Tirotta, 2011). As a result, as they are the teachers of next generation, their intentions toward using interactive whiteboard and enablers and barriers for its implementation into classroom settings should be investigated. This study provides an insight about the factors that predict pre-service teachers' intention toward using interactive whiteboards along with the information about what motivates or encourages them to use interactive whiteboards and what discourages them to use interactive whiteboards. Hence, the current study might provide an insight about pre-service teachers for both practitioners and professionals along with policy makers in the teacher education field.

### 1.4 Purpose of the study

The purpose of this study was to investigate the determinants of pre-service teachers' behavioral intention to use interactive whiteboards. For that purpose, the relationship between the factors of UTAUT, Performance Expectancy (PE), Effort Expectancy (EE), Facilitating Conditions (FC), Social Influence (SI), Anxiety (ANX), Self-Efficacy (SE), Attitude towards Using Technology (ATUT) and Behavioral Intention

to Use (BIU) were investigated via a questionnaire including survey questions. Accordingly, how well these factors predict pre-service teachers' behavioral intention to use interactive whiteboards was examined. To have a broader perspective about pre-service teachers' opinions about enablers and barriers towards the use of interactive whiteboards were further investigated via interviews.

## 1.5 Research Questions

In line with the problem statement and the purpose of the study, the following research questions directed the current study:

1) What is the nature of relationship between performance expectancy, effort expectancy, social influence, facilitating conditions, anxiety, self-efficacy, attitude toward using technology and behavioral intention to use?

2) To which extend do the factors performance expectancy, effort expectancy, social influence, facilitating conditions, anxiety, self-efficacy and attitude toward using technology predict pre-service teachers' behavioral intention to use interactive whiteboards?

3) What are the pre-service teachers' enablers and barriers pertaining to the use of interactive whiteboards?

The first research question aims to explain the strength and direction of the relationship with the factors or variables that will be included in the analyses aimed to explain pre-service teachers' intention to use interactive whiteboards. The second question aims to investigate how well the factors predict intention to use. To find out answer for the given two question qualitative data; survey was used. To investigate the perceived or pre-service teachers' opinions about the enablers and barriers about the use of interactive whiteboard, qualitative data were collected through the means of interviews.

## 1.6 Definitions of terms

This section presents definitions of terms that were used in this study. Definitions were given by how they were considered or used in the study.

**Pre-service teachers, student-teachers, prospective teachers:** Undergraduate students enrolled in educational programs for becoming a teacher in the Faculty of Education.

**Interactive Whiteboards (IWB)**: An interactive whiteboard is a large screen displayed either connected to a computer or a built-in or stand-alone device in which computer is included within the device. However, pre-service teachers often refer to IWB as "smart board" which was used in the instruments for the sake of obtaining clarity and understanding.

**Unified Theory of Acceptance and Use of Technology (UTAUT):** "A method to assess the likelihood of success for new technology introductions and helps them to understand drivers of acceptance." (Venkatesh, Morris, Davis, & Davis, 2003)

**Performance Expectancy:** Performance expectancy is defined as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al., 2003).

**Effort Expectancy:** Effort expectancy is defined as "the degree of ease associated with the use of the system" (Venkatesh et al., 2003).

**Attitude toward Using Technology:** Attitude toward using technology is defined as "an individual's overall affective reaction to using a system "(Venkatesh et al., 2003).

**Facilitating Conditions:** Facilitating conditions are defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al., 2003).

**Social Influence:** Social Influence is defined as "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003).

**Anxiety**: Anxiety is explained as "the fear experienced when interacting with a computer or anticipating an interaction" (McDonald, 2002) and in this study anxiety is the fear of making mistakes during interaction with the interactive whiteboard.

**Self-Efficacy**: Self-efficacy is explained as "beliefs about ones' capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (Bandura, 1994).

**Behavioral Intention:** It reflects an individual's willingness to try and motivation to perform a behavior (Ajzen, 1991). For this study, it is considered as pre-service teachers' willingness, motivation or intention towards using interactive whiteboards for their teaching.

# CHAPTER 2

# LITERATURE REVIEW

This chapter presents the literature review about the current study. It contains reviews about technology integration in education, unified theory of acceptance and the use of technology along with its components, strengths and limitations, interactive whiteboard in education, interactive white board acceptance and use. It concludes with a brief summary of the review.

## 2.1 Technology Integration in Education

In educational practice, teachers' role is the center of all actions. Teacher decides on the way lecture flows and decide how the information will be delivered. In traditional methods, books are what teachers use to deliver information. However, with the vast advances in technology role of the teacher shifts to a mediator or a facilitator rather than being in the center. According to a study, interactive whiteboards increase the attention of the students and reduce the role of teachers, which can increase the tools used in classroom (Bidaki & Mobasheri, 2013). As a result, there is a need for teachers to learn and get accustomed to technologies, which can be used in education (Bacanak, Karamustafaoğlu, & Köse, 2003). Moreover, in today's world, the use of smart phones, tablet PCs and laptops along with the Internet, information could be searched, discovered and reached without the constraints of time and place. Moreover, since schools and universities employ computer laboratories with the Internet connection, it becomes easier for the students to reach out the information that might change the type of education they receive with the integration of technology.

In the digital world we live in, children who are born in this technological world can adapt and get used to this technologies easily (Amy, 2005). It can be said that children can learn rapidly and easily. Moreover, it is stated that if the technology literacy is increased with proper integration of the technology, individuals can make use of technological advances to make their lives easier (Bacanak et al., 2003). As cited in Yılmaz, Ulucan and Pehlivan (2010), despite the widespread use of technology in other institutions, how to integrate technology while designing educational programs along with the actual use in education still stands as a major problem. Apart from this problem for technology integration and adoption there are some other problems and barriers.

For instance, Buabeng-Andoh (2012) defines that there are three main factors that influence technology integration. First, teachers' attitudes, ICT competence, self-efficacy, experience and teacher workload are described as personal characteristics or factors. In fact, lack of competence and confidence in ICT, lack of training and following up new technology or being up-to-date, lack of variation in training programs are the teacher level barriers or personal barriers. Second, professional development, accessibility, technical support, leadership support are described as institutional characteristics or factors. The absence of infrastructure, poor maintenance, lack of educational software, limited access, limited experience and encouragement are the problems in the facilities or schools. The last one was the technological characteristics including the structure of traditional education systems and assessment along with restricted curriculum and organizational structure. These three barriers hinder or prevent ICT technologies from being integrated into education. Similarly, Ertmer (1999) described, there are two types of barriers for technology integration: one includes lack of accessibility and availability, insufficient planning along with inadequate administrative and technical support and the other includes beliefs about technology, reluctance to change and established classroom practices that are being used for many years.

To sum up, technological devices such as computer, tablet PCs, interactive whiteboards etc. are being used widely in many fields including education. Although, integration of these technologies into education is advantageous there are some

concerns. Technology alone is not enough for successful integration and thus, teachers, schools and the organization should be included in the process to remove or diminish the barriers. To understand how technology can be used, investigation of attitudes and technology acceptance along with the enablers and barriers can provide an explanation on the technology use.

## 2.2 Unified Theory of Acceptance and Use of Technology

Unified Theory of Acceptance and Use of Technology (UTAUT) is a theory where eight different theories are reviewed to find out the differences and similarities to assess the current information state of an individual toward the use of new technologies (Venkatesh et al., 2003). These eight models and theories are 1-Technology Acceptance Model (TAM) to predict individual's acceptance and usage (Davis F. , 1989), 2-Theory of Reasoned Action (TRA) for predicting human behaviors (Fishbein & Ajzen, 1975), 3-Motivational Model (MM) to predict individual's motivation toward use (Davis, Bagozzi, & Warshaw, 1992), 4-Theory of Planned Behavior (TPB) extended from TRA to predict intention and behavior (Ajzen, 1991), 5-Combined TAM & TPB (C-TAM & TPB) to provide a hybrid model by combining TAM and TPB (Taylor & Todd, 1995), 6-Model of PC Utilization (MPCU) to predict PC utilization (Thompson, Higgins, & Howell, 1991), 7-Innovation Diffusion Theory (IDT) with the help of characteristics of the innovation to predict use and acceptance (Moore & Benbasat, 1991), 8-Social Cognitive Theory (SCT) (Bandura, 1986). Initially, the aim was to explain the actual use of information technology with the analysis of individual's reactions to use technology along with their intention to use information technology (See Figure 2.1).

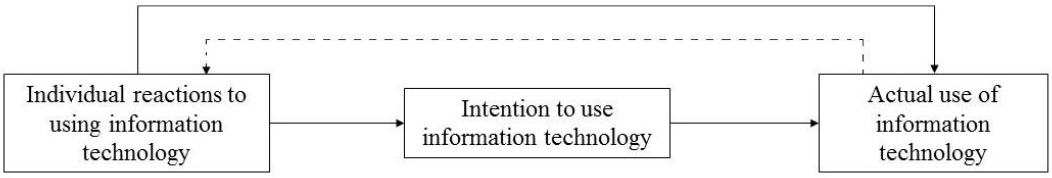


**Figure 2.1** Basic Concept Underlying User Acceptance Models (Venkatesh et al., 2003)

### 2.2.1 Components of UTAUT

Having included items and combined and contrasted eight different models, UTAUT is experimentally tested and results indicated that the model explains 70% of the technology use and acceptance. The model includes performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating conditions (FC) as the four constructs trying to understand the behavioral intention to use (BIU) and use behavior of an individual's technology acceptance. Also there are four moderators that effect acceptance and use directly: gender, age, experience and voluntariness of use. Moreover, there are three indirect constructs that affect the use behavior and acceptance of an individual. These are attitude toward using technology (ATUT), self-efficacy (SE) and anxiety (ANX) (Venkatesh et al., 2003).

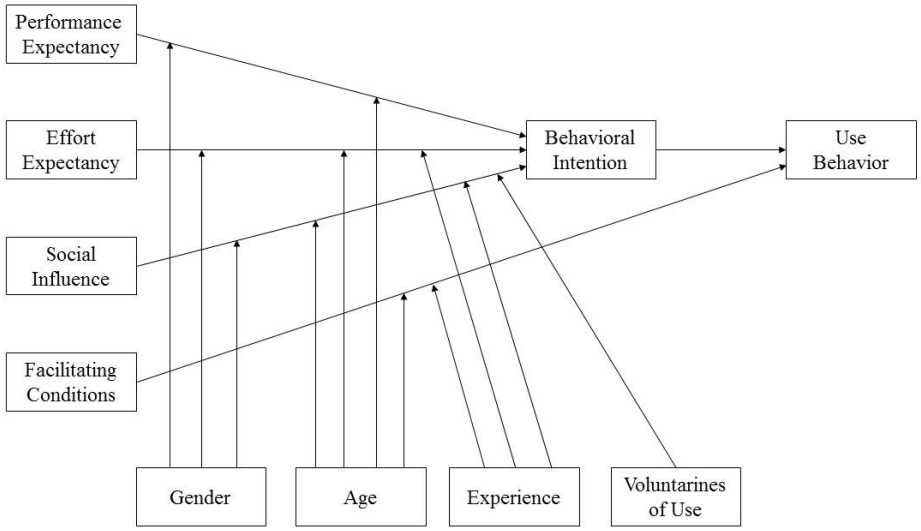


**Figure 2.2** Unified Theory of Acceptance and Use of Technology Model (Venkatesh et al., 2003)

*Performance expectancy* is one's expectance toward using a technology, which they think that using the technology will contribute to their performance. *Effort expectancy* is one's belief or expectance toward using a technology about the ease of use. *Facilitating conditions* is the presence of technical support, ones' ability and knowledge to use a system or a technology. *Social influence* is one's perception of

others who recommends the use of a technology or a system. For the indirect constructs, *attitude toward using technology* is one's reaction to use a system. *Self-efficacy* is ones' belief about his own capability to perform the necessary performance. *Anxiety* can be defined as feeling of nervousness, apprehensiveness, fear and uneasiness towards using technology. These seven constructs can be considered the independent variables or predictors that assist to explain one's *behavioral intention* to use a technology.

### 2.2.2 Strength and Limitations of UTAUT

Unlike TAM, which explains 40% of the variance in intention to use and behavior of an individual for organizational setting, UTAUT can explain 70% of the variance in the behavioral intention to use technology and use behavior (Venkatesh, 2003). Although TAM lacks outer variables that affect user's intention to use technology (Legris, Ingham, & Collerette, 2003), UTAUT include seven constructs covering the possible outer variables. Voluntariness of use and facilitating conditions were included in UTAUT along with a differentiation between adapting and determining factors as gender and experience.

Even though mostly used as a research model in information systems, there are still many different fields that need to be studied by the researchers, like the remaining gap of 30% in the behavioral intention to use and use behavior (Baron, Patterson, & Harris, 2006).

## 2.3 Interactive Whiteboard in Education

Interactive Whiteboards (IWBs) are touch-sensitive boards controlled with the help of a computer connected to it (Saltan & Arslan, 2009). Unlike IWBs (the large panel and a separate computer) similarity to the combination of projection device and computer, interactive whiteboard or smart board is a device in which both computer and the large-touchable screen is attached together in a single device and controlled by the touch screen or keyboard and mouse attached to it. It can be said that it is a large tablet-like device with an operating system.

According to Turel and Johnson (2012), interactive whiteboards (IWB) are one of the important instructional technologies for education. Moreover, it can be utilized to facilitate learning and teaching if the following conditions are met: 1-getting peer assistance, 2- training sessions to integrate IWB and 3-regular use to increase competence. In other words, to make IWB usage common, teachers should be trained, get support from their peers and use it regularly to increase familiarity and usage. In addition to this, Miller and Glover (2007) also emphasized the importance of regular use of IWBs and encouraging teachers so that teachers can adopt and integrate IWB into their teaching environment and have a positive attitude toward using IWB as an effective tool for their teaching process.

For increasing usage of IWBs in learning environments, teachers should be informed about possible benefits of that device. Likewise, Wong, Teo and Russo (2013) stated that teacher candidates only involve themselves when they see IWB technology is beneficial and worth to use. For that reason, there is a need for a role model and the instructors in the university should show why it is necessary to use IWB and how it should be integrated into the classroom. Lecturers and instructors can influence students' behavioral intention to use technology (as cited in Raman, Don, Khalid, Fauzi, Mohd Sofian & Ghani., 2014). Moreover, new appointed teachers can also be role models for in-service teacher because they will be close to the in-service teachers, prospective teachers who have just started working as a teacher can make a contribution to their colleagues (in service teachers). To achieve such a contribution, these student-teachers or pre-service teachers should be trained and equipped with competence and knowledge about information technologies in their computer related lectures at faculty of education (Seferoğlu, Akbıyık, & Bulut, 2008). In addition to role models, there is also a need for resources integrated with the curriculum so that teachers can use IWB and know how it's embedded into lesson before instruction. Learning with IWB is more effective than traditional learning and students who have learned through IWBs have more positive perceptions than those within the traditional group (Yang, Wang, & Kao, 2012). Using IWB for delivering information and learning of other students' information as a tool to teach students, helps them learn better by making images more visible and increasing their attention to the task (Mechling, Gast,

& Krupa, 2007). Students' motivations are positively related to combination of virtual learning environments and IWBs (Heemskerk, Kuipert, & Meijer, 2014). It is stated that young learners want to use IWB more often after being taught with IWB (Yáñez & Coyle, 2011). In educational systems it is recommended that there is a need for funding ICT mentors (technical support) to assist teachers to overcome immediate needs quickly (Jones & Vincent, 2010). Overall, teachers need to be assisted, educated and trained to use IWBs to integrate in education.

Although there are many appealing sides of interactive whiteboard and its use in education, IWBs are not being used quite enough. It is said that 87% of the instructors do not utilize these technologies in universities (Çağıltay, et al., 2007). Although having interactive whiteboard readily available in their classes, instructors in the universities do not use these technologies (Smith L. , 2008). As instructors do not utilize these technologies, teacher candidates might be affected negatively and there is a need to assess pre-service teachers' intention to use and use behaviors of toward the use of IWBs to draw a conclusion about the current state.

Gursul and Tozmaz (2010) informed that there are several problems concerning the interactive whiteboard use. Lack of technical competency and pedagogical competency about the integration of IWB into classroom activities and lack of school plan are found to be reasons for IWBs ending up as not being utilized. According to Somyürek, Atasoy and Özdemir (2009), there are also several more reasons for this non-utilization of IWBs in schools, it is stated that lack of adequate training, lack of digital materials to be used in lessons, lack of assistance and maintenance and lack of administrative concerns such as inadequate encouragement, insufficient planning and lack of monitoring, were found to be some other reasons that lead teachers to not utilize or use the technology of IWB into classroom. Rather than focusing on the appealing sides of interactive whiteboard, it would be better to focus on both its limitations and affordances and think about how this technology can be integrated into educational practice or how learners can get benefitted from using this technology. For that reason, the attitudes or the acceptance of pre-service teachers toward using IWB becomes an important issue if the future is considered.

## 2.4 Interactive Whiteboard Acceptance and Use

There were several studies that were found to be related to the current study and these studies were explained briefly for the purpose of providing a rough picture about the IWB acceptance and use. Although, there were many other studies about interactive whiteboard, only the ones related to the acceptance were included as related studies.

In a study, Tosuntaş, Karadağ and Orhan (2015) aimed to identify factors that affect teachers', educating in high schools, use of IWB based on UTAUT. After collecting data from 158 teachers they analyzed the data with simple and multiple regressions and structural equation modelling. It was found that performance expectancy, effort expectancy and social influence had positive effects on behavioral intention while facilitating conditions and behavioral intention was found to affect the usage time of IWB positively. Similart to this study, Wong, Russo and McDowall (2015) employed UTAUT to find out early childhood student-teachers' acceptance and use of IWB. Having collected data from 112 participants they found that performance expectancy and effort expectancy have a significant effect on behavioral intention. However, this study did not find the effect of social influence on behavioral intention to use.

In another study, Wong, Teo and Goh (2014) developed and conducted a scale about IWB acceptance from 149 student-teachers studying in three departments. The scale consisted of four-point Likert scale and there were five factors in the measurement model that was tested through confirmatory factor analysis and structural equation modelling. Therefore, there were five factors that affect the IWB acceptance of the student-teachers and these factors were performance expectancy, effort expectancy, facilitating conditions, social influence, and self-efficacy. This study found that there were five constructs that influence behavioral intention to use contrary to the studies of Tosuntaş et al. (2015) and Wong et al. (2015).

Another study conducted by Wong, Teo and Russo (2013) studied whether UTAUT model is applicable to an educational practice and aimed to explain the predictors that affect student-teacher' intention to use IWBs. They included five constructs of UTAUT with 159 student-teachers and it was found that preformance expectancy and

effort expectancy and users' experiences were found to be significantly different in IWB adoption. Moreover, Turel and Johnson (2012) aimed to evaluate teachers' perceptions and use of IWBs in their education. They included 174 teachers who has already used IWB from different areas or subject domains and found that teachers can use IWB under with several conditions which are peer collaboration, training with effective instructional strategies and frequent use to enhance competency.

Apart from the related studies conducted in the field of IWB acceptance, there are several studies conducted to explain the enablers and barriers pertaining the use of IWBs.

In a study, Gursul and Tozmaz (2010) defined that grabbing attention with increased visuality, providing active participation and retention of learning, enabling recording lesson, making lessons enjoyable and ease of use were the affordances of IWB. Similarly, as cited in Al-Qirim (2012), Slay, Siebörger and Hodgkinson-Williams (2008) and Smith, Higgins, Wall and Miller (2005) stated that because of being versatile, flexible, efficient, interactive and providing participation, collaboration and ability to save and post anything drawn on it, makes the IWB advantageous to be used. Meanwhile, Schmid (2008) informed that IWB acts as a multimedia platform, enhances interaction among devices, support and facilitate learning and provide time efficiency. These studies provided a rough information about the affordances or enablers of the IWB. These studies can provide an initial drawing about why pre-service teachers want to utilize those techologies before asking them about the enablers.

There are also several studies aimed to identify, organize or categorize the barriers that hinder or prevent the IWB use. Somyürek, Atasoy and Özdemir (2009) list the problems as teachers lack of competeny, pedagocial knowledge on integration the technology, planning and lack of technical support and maintenance. Additionally, Barak (2007) defined fear of losing contact with students and lack of familarity may be the problems with IWB use. Furthermore, Gursul and Tozmaz (2010) indicated that lack of educational materials and virus problems lead to inefficient use of IWB. In

addition, Slay et al. (2008) indicated cost, technical reliability, motivation, classroom control were the issues that prevent or hinder the use of IWBs.

## 2.5 Summary

This chapter aimed to provide a brief review of literature about the integration of the technology in to education and its possible concerns about why the technology should be integrated into education. After that the change in teachers' role, the ease of accessibility in reaching out the information, ease of adaptation for children and learners were mentioned. Next, why the integration of the technology is problematic was explained. Then, information about the barriers related to personal, institutional, technological along with intrinsic and extrinsic barriers were given.

The second part of the chapter defined and explained the framework used for the current study, namely, UTAUT, which was composed of eight constructs, in detail. Next, strengths and limitations for the employed framework in the study were explained briefly.

Having provided information about the framework, the information about the practice and the technology use of the interactive whiteboards were laid out. There were two main categorizations in that part. Initially, affordances or advantages of interactive whiteboard, starting from its definition, utilization, benefits, and effects on educational practice were mentioned. Following its affordances, the barriers and problems about the interactive whiteboard use were given.

The related studies for the current research were given and there were several researchers working on the field of interactive whiteboard acceptance or adoption. Also, there were several studies listing or highlighting the enablers and barriers about the use of interactive whiteboard.

Finally, the related studies for the acceptance and use of interactive whiteboard scales (IWBS) were compiled and several studies from researchers working on the field of interactive whiteboard acceptance were synthesized. Moreover, studies listing or

highlighting the enablers and barriers about the use of interactive whiteboard were also included in the interactive white board acceptance and use.

# CHAPTER 3

# METHODOLOGY

In this chapter, detailed information about the methodology of this study were covered. This chapter included the design of the study including the type of research design employed in the study, detailed information about characteristics and demographics of the participants, data collection instruments with its descriptions, quality of the data, data collection procedures, data analysis, researchers role, assumptions and limitations of the study.

## 3.1 Design of the Study

In a correlational research design, researcher use the correlation to explain and measure the degree of relationship between two or more variables (Creswell, 2012). The reason for choosing correlational study is that it is used to find out whether two or more variables are related and influence one another enabling the researcher to predict an outcome as described in Creswell (2012). This study utilized survey to investigate how well the factors (Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), Anxiety (ANX), Self-Efficacy (SE) and Attitude Toward Using Technology (ATUT)) of Unified Theory of Acceptance and Use of Technology (UTAUT) predicts the behavioral intention to use (BIU) interactive whiteboards. By doing so, this study may provide an in-depth understanding about pre-service teachers' intention to use interactive whiteboards in their education.

A correlation as Creswell (2012) defines it, is a test "to determine the tendency or pattern for two or more variables or two sets of data to vary consistently" (p.338). In

this study, there were eight variables to be investigated in order to find the pattern. For this case, performance expectancy, effort expectancy, facilitating conditions, social influence, anxiety, self-efficacy and attitude toward using technology were used as predictors of pre-service teachers' behavioral intention to use interactive whiteboards. The current study included two data collection phases. In the first phase, data were collected through surveys constituted from the items in UTAUT (Venkatesh et al., 2003) while in the second phase paricipants were interviewed. In the survey, there were three items for PE, four items for EE, two items for SI, two items for FC, two items for ANX, four items for SE, four items ATUT and three items for BIU where the items were measured on a five point Likert type questions. Thus, necessary statistical analyses were conducted accordingly and research questions 1 and 2 were aimed to be answered.

As the data were collected for the quantitative methods through survey, it was followed by qualitative data collection through the means of interviews. The interviews were conducted to explore pre-service teachers' perceptions about enablers, what drives them, and barriers, what hinders them, towards the use of interactive whiteboards. It was considered that with the help of qualitative data gathered from pre-service teachers about their experiences, researcher can have a broader perspective about issues such as various difficulties pre-service teachers may face with, opinions on effectiveness and when & how to use it. It is a fact that these aspects can also be included in the questionnaire as a part of quantitative data collection; however, doing so will only limit the potential responses that pre-service teachers have about using interactive whiteboards. In the interview, participants might talk about different types of problems or aspects in a daily spoken language without any constraints or biases that researcher might impose unintentionally in the questionnaire. Having collected and analyzed both data from quantitative and qualitative methods, the researcher aimed to answer the research questions and explain the pre-service teachers' behavioral intetion to use and the enablers and barriers for the use of interactive whiteboards. The data collection and types of data from quantitative and qualitative methods are given in Table 3.1 below.

**Table 3.1** Data Collection and Types of Data

| **Quantitative Research** | | **Qualitative Research** | |
|---|---|---|---|
| **Data Collection Method** | **Data** | **Data Collection Method** | **Data** |
| Questionnaire, Survey | Numeric Scores | Semi-structured Interviews | Text data and codes from transcribed interviews |

## 3.2 Participants of the Study

As stated earlier, the study utilized two phases of data collection. In the quantitative phase, participants for this study were the senior undergraduate students enrolled in the Faculty of Education at a public university in Turkey. In the faculty, there were seven departments that are expected to become teachers of the next generation. For that reason, criteria sampling was used to select the participants, teacher candidates from these seven departments. These departments were;

i. Computer Education and Instructional Technology (CEIT)
ii. Early Childhood Education (ECE)
iii. Elementary Science Education (ESE)
iv. Foreign Language Education (FLE)
v. Elementary Mathematics Education (EME)
vi. Physics Education (PHYS)
vii. Chemistry Education (CHEM)

The reason for selecting participants from senior students was that their curriculum involves two types of internship that they have to work in schools to learn more about teaching and practice it. They are expected to have knowledge about interactive whiteboards since most of the schools in Ankara have readily available interactive whiteboards for their use. In the first semester of their last year, they are required to take the lecture named "School Experience" in which they go to public and private schools chosen by their instructors to learn how teaching takes place in a classroom environment. This course helps these teacher candidates to learn and discuss and give them opportunity to observe teaching. They face different aspects of teaching in action

and actively observe professional teachers at work enabling them to become familiar with the tasks and activities carried out by the teacher. Having observed how teaching occurs from the teachers at work, pre-service teachers are expected to enroll the second lecture called “Practice Teaching” in which they are required to learn field experience which includes observation, planning, and arrangements to adjust and become more accustomed to classroom environment. In this lecture, they are expected to teach in the schools they attend and learn more about teaching as hands on practice.

There were 153 pre-service teachers who have participated in the quantitative part of this study. The number of female pre-service teachers was 125 (81.7%) and was much higher than the number of the male pre-service teachers, which was only 28 (18.3%). Table 3.2 provides the frequency and percentage of the gender distribution among participants.

**Table 3.2** Gender of the Participants

| **Gender** | **Frequency** | **Percentage** |
|---|---|---|
| Male | 28 | 18.3 |
| Female | 125 | 81.7 |
| Total | 153 | 100.0 |

The departments of the participants were varied but there were no participants from the Chemistry Education department. Out of 153 pre-service teachers, there were 22 (14.4%) from Computer Education and Instructional Technology (CEIT), 26 (17.0%) from Early Childhood Education (ECE), 18 (11.8%) from Elementary Science Education (ESE), 61 (39.9%) from Foreign Language Education (FLE), 20 (13.1%) from Elementary Mathematics Education (EME) and 6 (3.9%) from Physics Education (PHYS). Overall, the number of participants from FLE was higher than ECE, CEIT, EME, ESE and PHYS. Table 3.3 provides the frequency and percentage of the departments of the pre-service teachers who have participated in the study.

**Table 3.3** Departments of the Participants

| **Departments** | **Frequency** | **Percentage** |
|---|---|---|
| Computer Edu. & Inst. Technology | 22 | 14.4 |
| Early Childhood Education | 26 | 17.0 |
| Elementary Science Education | 18 | 11.8 |
| Foreign Language Education | 61 | 39.9 |
| Elementary Mathematics Education | 20 | 13.1 |
| Physics Education | 6 | 3.9 |
| Total | 153 | 100.0 |

The GPA of the participants were ranged from 2.00 to 4.00 and were mainly between 2.50 and 3.50. Considering the maximum GPA as 4.00, it can be said that 91 (63.4%) of the participants had a GPA over 3.00. Table 3.4 provides frequency and percentage about the GPA of the pre-service teachers.

**Table 3.4** GPA of the Participants

| **GPA** | **Frequency** | **Percentage** |
|---|---|---|
| Less than 2.00 | 0 | 0.0 |
| 2.00 – 2.49 | 10 | 6.5 |
| 2.50 – 2.99 | 46 | 30.1 |
| 3.00 – 3.49 | 58 | 37.9 |
| More than 3.50 | 39 | 25.5 |
| Total | 153 | 100.0 |

The age of participants generally loaded on the 20-25 interval and there were 151 (98.7%) participants whose ages are between 20-25, 2 participants (1.3%) between 26 and 30. The frequency and percentage of participants' ages are given in Table 3.5.

**Table 3.5** Age of the Participants

| Age | Frequency | Percentage |
|---|---|---|
| Less than 20 | 0 | 0.0 |
| 20 – 25 | 151 | 98.7 |
| 26 – 30 | 2 | 1.3 |
| More than 30 | 0 | 0.0 |
| Total | 153 | 100.0 |

Participants were asked to indicated their daily computer use duration and in terms of usage, 15 (9.8%) of the participants indicated their computer use duration as 0-1 hours a day, 54 (35.3%) indicated 2-3 hours, 47 (30.7%) indicated 4-5 hours and 37 (24.2%) indicated that they use computers more than 6 hours a day. Table 3.6 shows the computer use of the participants per day.

**Table 3.6** Computer Use of the Participants

| Computer Usage | Frequency | Percentage |
|---|---|---|
| 0-1 Hours | 15 | 9.8 |
| 2-3 Hours | 54 | 35.3 |
| 4-5 Hours | 47 | 30.7 |
| More Than 6 Hours | 37 | 24.2 |

Participants were asked to indicate whether they have access to internet or not and 151 (98.7) informed that they have access to the internet. Table 3.7 shows the Internet access of the participants.

**Table 3.7** Internet Access of the Participants

| Internet Access | Frequency | Percentage |
|---|---|---|
| Yes | 151 | 98.7 |
| No | 2 | 1.3 |

Participants were asked about how many hours a day they use internet and 7(4.6%) of the participants use internet 0-1 hours a day, 46(30.1%) 2-3 hours, 56(36.6%) indicated 4-5 hours and 44(28.8%) indicated that they use the Internet for more than 6 hours a day. The Internet usage of the participants is given in Table 3.8.

**Table 3.8** Internet Usage of the Participants

| Internet Usage | Frequency | Percentage |
|---|---|---|
| 0-1 Hours | 7 | 4.6 |
| 2-3 Hours | 46 | 30.1 |
| 4-5 Hours | 56 | 36.6 |
| More Than 6 Hours | 44 | 28.8 |

Participants were asked to indicate whether they have used smart board in their prospective teaching and results showed that 136(88.9%) of the participants used smart board in their teaching. Table 3.9 shows the smart board use of the participants.

**Table 3.9** Smart Board Use of the Participants

| Smart Board Use | Frequency | Percentage |
|---|---|---|
| Yes | 136 | 88.9 |
| No | 17 | 11.1 |

They were also asked how many hours in total have they used smart board in their teaching. Results indicated that a majority of the participants 69(45.1%)) indicated that they used smart board 0-1 hours, 57(37.3%) indicated 2-3 hours, 11(7.2%) indicated 4-5 hours and 16 (10.5%) indicated that they used smart board more than 6 hours in their teaching. Table 3.10 shows the smart board usage of the participants.

**Table 3.10** Smart Board Usage of the Participants

| Smart Board Usage | Frequency | Percentage |
|---|---|---|
| 0-1 Hours | 69 | 45.1 |
| 2-3 Hours | 57 | 37.3 |
| 4-5 Hours | 11 | 7.2 |
| More Than 6 Hours | 16 | 10.5 |

Participants were asked about the electronic devices they use in their daily life. Regarding mobile phones 150 (98.0%) of the pre-service teachers informed that they use mobile phones and only 3 (2.0%) of them do not use a mobile or smart phone. 90 (58.8%) of the participants do not use tablets while 63(41.2%) of them use tablet devices. 147 (96.1%) of the participants use PCs or notebooks while 6 (3.9%) of them

do not use in their lives. 147 (96.1%) of the participants use e-Readers while 6 (3.9%) of the participants do not use e-Readers. 24 (15.7%) of the participants use portable DVD or CD players while the majority of them 129 (84.3%) do not use them. 71 (46.4%) participants stated that they use cameras in their lives while a larger amount of participants 82(53.6%) indicated that they do not use cameras in their lives. Lastly, 64 (41.9%) of the participants indicated that they use mp3, mp4 and other digital audio devices while 89 (58.1%) of them do not. Table 3.11 shows electronic device use of the participants.

**Table 3.11** Electronic Device Use of the Participants

| **Electronic Device Use** | **Yes** | **No** |
|---|---|---|
| Mobile Phones / Smartphones | 150 (98.0%) | 3 (2.0%) |
| Tablet | 63 (41.2%) | 90 (58.8%) |
| PCs/Notebooks | 147 (96.1%) | 6 (3.9%) |
| e-Readers | 6 (3.9%) | 147 (96.1%) |
| Portable Dvd / Cd Players | 24 (15.7%) | 129 (84.3%) |
| Cameras | 71 (46.4%) | 82 (53.6%) |
| Digital Audio /Mp3/4 Devices | 64 (41.9%) | 89(58.1%) |

The pre-service teachers were asked how good they think they are at using in these devices. Their answers indicated that they believe that they are in pretty good shape for using these devices. 11(7.2%) of the participants informed that they are fair, 63(41.2%) of participants are good, 64 (41.8%) of participants are very good and 15 (9.8%) of the participants think that they are excellent at using these devices. Table 3.12 shows electronic device competencies of the participants by their own perceptions.

**Table 3.12** Electronic Device Usage of the Participants

| Electronic Device Competency | Frequency | Percentage |
|---|---|---|
| Poor | 0 | 0.0 |
| Fair | 11 | 7.2 |
| Good | 63 | 41.2 |
| Very Good | 64 | 41.8 |
| Excellent | 15 | 9.8 |

For the second phase of the study, qualitative phase, interviewees were also selected among the participants enrolled in one of the seven departments in faculty of education. Similarly, the participants were senior students who have already taken the training courses of teaching and school experience that make them quite knowledgeable about technology and interactive whiteboard use in education. The participant were selected based on convenience and there were three CEIT, two FLE, two ECE, two CHEME, one EME students who are about to graduate and become teachers in the interview part. Overall, the qualitative data were gathered from 10 pre-service teachers enrolled in five departments to understand the enablers and barriers for the use of interactive whiteboards in education.

## 3.3 Data Collection Instruments

This study includes a two-part data collection process in which an Interactive Whiteboard Survey as the data collection instrument for the quantitative phase and an interview guide was used as the part of qualitative phase. The data collection procedure and the instruments have been approved by Human Subjects Ethics Committee (HSEC). The approval of the HSEC is included in Appendix A-Forms and Permissions: A.2 Human Subjects Ethics Committee Permission.

### 3.3.1 Interactive Whiteboard Survey (IWBS)

This study seeks to investigate the relationship among the factors of UTAUT and how well these factors predict pre-service teachers' behavioral intention to use interactive whiteboards. There were two parts in the survey; in the first part there were 12 items for demographic information and in the second part there were 24 items adapted from

UTAUT (developed by Venkatesh to explain 70% of the variance in use behavior and intention to use) for the purpose of getting information about interactive whiteboards and these questions correspond to eight constructs or dimensions.

The factors and their corresponding number of items in the survey are given in Table 3.13. The survey is also included in the Appendix: INSTRUMENTS FOR THE STUDY. The items were measured with a 5-point Likert type scale, including "1-Strongly Disagree", "2-Disagree", "3-Undecided", "4-Agree" and "5-Strongly Agree" options. In the preparation of the scale, an instructor has been consulted so that it is grammatically correct and students can understand what is meant.

**Table 3.13** Distribution of factors with number of items in IWBS

| **Factors** | **Items** (24 items) |
|---|---|
| 1- Performance Expectancy (PE) | 3 |
| 2- Effort Expectancy (EE) | 4 |
| 3- Attitude toward Using Technology (ATUT) | 4 |
| 4- Social Influence (SI) | 2 |
| 5- Facilitating Conditions (FC) | 2 |
| 6- Self-Efficacy (SE) | 4 |
| 7- Anxiety (ANX) | 2 |
| 8- Behavioral Intention to Use (BIU) | 3 |

The information about the reliability and validity of the survey is given in detail in the Quality of Research.

### 3.3.2 Description of Variables in the Survey

Multiple regression analyses were used in order to address research questions 1 and 2. These analyses were performed to examine the degree to which PE, EE, SI, FC, ATUT, SE and ANX predicted pre-service teachers' behavioral intention to use interactive whiteboards for education. There were 24 items that were included in the study and these variables correspond to eight constructs or variables. Thus, the items were summed and averaged to get a single, composite score for each of PE, EE, SI, FC, ATUT, SE, ANX and BIU. The scale and the corresponding items were included in

Appendix B- B.2 Interactive (Smart) Board Scale. The item-total or the scores for each scale were calculated by averaging their corresponding items in the survey gathered from 153 participants. For performance expectancy, there were three items: (PE1) "I would find smart board useful in my job", (PE2) "Using smart board enables me to accomplish tasks more quickly", (PE3) "Using smart board increases my productivity". Cronbach's alpha value was calculated for the performance expectancy ($\alpha$=0.77) to measure overall reliability for the corresponding items. Table 3.14 provides means and standard deviations for the items of performance expectancy.

**Table 3.14** Performance Expectancy Items ($N$=153)

| Variable | Mean | SD | Cronbach's Alpha if Item Deleted |
|---|---|---|---|
| PE1 | 4.29 | .56 | .73 |
| PE2 | 4.10 | .69 | .67 |
| PE3 | 3.98 | .76 | .66 |

For effort expectancy, there were four items: (EE1) "My interaction with smart board would be clear and understandable", (EE2) "It would be easy for me to become competent (or skillful) at using smart board", (EE3) "Learning to operate smart board is easy for me" and (EE4) "I would find smart board easy to use". Cronbach's alpha value was calculated for the effort expectancy ($\alpha$=0.80) to measure overall reliability for the items. Table 3.15 provides means and standard deviations for the items of effort expectancy.

**Table 3.15** Effort Expectancy Items ($N$=153)

| Variable | Mean | SD | Cronbach's Alpha if Item Deleted |
|---|---|---|---|
| EE1 | 3.97 | .61 | .78 |
| EE2 | 4.04 | .62 | .73 |
| EE3 | 3.89 | .77 | .75 |
| EE4 | 3.88 | .65 | .74 |

For social influence, there were two items: (SI1) "People who influence my behavior think that I should use smart board", (SI2) "People who are important to me think that I should use smart board". Cronbach's alpha value was calculated for the social

influence (α=0.74) to measure overall reliability for the corresponding items. Table 3.16 provides means and standard deviations for the items of social influence.

**Table 3.16** Social Influence Items (*N*=153)

| Variable | Mean | SD | Cronbach's Alpha if Item Deleted |
|---|---|---|---|
| SI1 | 3.23 | .85 | NA* |
| SI2 | 3.20 | .88 | NA |

*NA indicates a construct of a factor consist of only two survey items and the value for the calculation of Cronbach's alpha if Item Deleted was not available.

For facilitating conditions, there were two items: (FC1) "I have the knowledge necessary to use smart board" and (FC3) "I have the resources necessary to use smart board". Cronbach's alpha value was calculated for the facilitating conditions (α=0.61) to measure overall reliability for the corresponding items. Table 3.17 provides means and standard deviations for the items of facilitating conditions.

**Table 3.17** Facilitating Conditions Items (*N*=153)

| Variable | Mean | SD | Cronbach's Alpha if Item Deleted |
|---|---|---|---|
| FC1 | 3.75 | .83 | NA* |
| FC3 | 3.25 | .93 | NA |

*NA indicates a construct of a factor consist of only two survey items and the value for the calculation of Cronbach's alpha if Item Deleted was not available.

For attitude toward using technology, there were four items: (ATUT1) "Using smart board is a bad idea", (ATUT2) "Working with smart board is fun", (ATUT3) "I like working with smart board" and (ATUT4) "Smart board makes the work more interesting". Cronbach's alpha value was calculated for attitude toward using technology (α=0.81) to measure overall reliability for the corresponding items. Table 3.18 provides means and standard deviations for the items of attitude toward using technology.

**Table 3.18** Attitude toward Using Technology Items (*N*=153)

| Variable | Mean | SD | Cronbach's Alpha if Item Deleted |
|---|---|---|---|
| ATUT1 | 4.25 | .62 | .80 |
| ATUT2 | 3.99 | .64 | .73 |
| ATUT3 | 3.89 | .68 | .71 |
| ATUT4 | 4.16 | .70 | .80 |

For self-efficacy, there were four items: (SE1) "I could complete a job or task using smart board, if there was no one around to tell me what to do as I try", (SE2) "I could complete a job or task using smart board, if I could call someone for help if I got stuck", (SE3) "I could complete a job or task using smart board, if I had a lot of time to complete the job for which the software was provided" and (SE4) "I could complete a job or task using smart board, if I had just the built-in help facility for assistance.". Cronbach's alpha value was calculated for self-efficacy (α=0.57) to measure overall reliability for the corresponding items. Table 3.19 provides means and standard deviations for the items of self-efficacy.

**Table 3.19** Self-Efficacy Items (*N*=153)

| Variable | Mean | SD | Cronbach's Alpha if Item Deleted |
|---|---|---|---|
| SE1 | 3.55 | .82 | .566 |
| SE2 | 3.71 | .76 | .504 |
| SE3 | 3.68 | .72 | .457 |
| SE4 | 3.67 | .72 | .469 |

For anxiety, there were two items: (ANX2) "It scares me to think that I could lose a lot of information using smart board by touching the wrong button", (ANX3) "I hesitate to use smart board for the fear of making mistakes I cannot correct". Cronbach's alpha value was calculated for the anxiety (α=0.83) to measure overall reliability for the corresponding items. Table 3.20 provides means and standard deviations for the items of anxiety.

**Table 3.20** Anxiety Items (*N*=153)

| Variable | Mean | SD | Cronbach's Alpha if Item Deleted |
|---|---|---|---|
| ANX2 | 2.38 | 1.08 | NA* |
| ANX3 | 2.57 | 1.01 | NA |

*NA indicates a construct of a factor consist of only two survey items and the value for the calculation of Cronbach's alpha if Item Deleted was not available.

For behavioral intention to use, there were three items: (BIU1) "I intend to use smart board in the future", (BIU2) "I predict I would use smart board after my graduation" and (BIU3) "I plan to use smart board in my teaching". Cronbach's alpha value was calculated for behavioral intention to use (α=0.75) to measure overall reliability for the corresponding items. Table 3.21 provides means and standard deviations for the items of behavioral intention to use.

**Table 3.21** Behavioral Intention to Use Items (*N*=153)

| Variable | Mean | SD | Cronbach's Alpha if Item Deleted |
|---|---|---|---|
| BIU1 | 4.03 | .75 | .68 |
| BIU2 | 3.95 | .67 | .67 |
| BIU3 | 4.08 | .64 | .66 |

### 3.3.3 Interview Guide

An interview was conducted with pre-service teachers (N = 10). The focus of these interviews was to explore and explain the enablers and barriers affecting pre-service teachers' use of interactive whiteboard. The interview questions were created together with the information gathered from the questionnaire. Thus, the interview consists of questions related to what motivates them, increases their performance to use, and what discourage or hinder them to use interactive whiteboards. The language of the interview was Turkish so that participants can feel a lot more comfortable while responding to the questions since it is their native language.

An interview guide for the interview was created by the researcher to obtain data based on previous studies in the literature about interactive whiteboards, education with interactive whiteboards and interactive whiteboard acceptance. The guide was in

Turkish and prepared according to the research questions of the study. While creating this interview guide, subject experts were consulted and the guide was examined whether it includes biases, leading questions or any other complications. An instructor and a PhD student in this field examined the interview guide and provided feedback. Moreover, two pre-service teachers were also included in the pilot study to get feedback so that the interview guide could be understandable and clear. The grammatical errors were checked and necessary changes were made. After revisions the guide, ready to be used, included three parts and these are introduction, body of questions and the closure. In the introduction part, the participants for the interview are being informed by the researcher about the aim of the study, number of questions, the amount of time it takes, the confidentiality of the information and the use of voice recorder for the interview. The second part, of the interview includes 10 questions and they focused on the pursued research questions along with two additional questions in the closure part: one for the experiences that participants had while using SB and the other was for the recommendations about what needs to be done for teachers to utilize this technology into classroom setting.

## 3.4 Quality of Research

### 3.4.1 Validity and Reliability of Survey

Content validity of the survey was addressed due the fact that the survey was an adaptation of a published instrument and as noted earlier it was developed by Venkatesh (2003). The survey was also reviewed by a PhD student and an instructor to ensure that the items included in the survey, were clear and accurate. The reliability of the instrument is always dependent upon the motivation and willingness of participants in the duration of responding items for the survey. Moreover, the assumptions of the survey is given in statistical assumptions of the study.

### 3.4.2 Trustworthiness of Interview

In terms of validity, Creswell's (2009) steps for qualitative data analysis was followed. To achieve validity, the data was coded with a PhD student studying in CEIT department. The separate codes were compared and the themes were generated and

contrasted to discuss over the parts that were not available in one of the rater's codes. As a result, there was around 75% of similarity between the codes from the researchers and the themes were enablers and barriers toward interactive whiteboard use. Raw data files of interview records, transcripts and file analyses were preserved for the purpose of confirmation.

## 3.5 Data Collection Procedures

### 3.5.1 Quantitative Part

The study was conducted at the end of spring term of 2015 with a total of 153 pre-service teachers enrolled in the Faculty of Education. For both questionnaire and interview necessary permissions were obtained from Human Subject Ethics Committee by the researcher (Appendix FORMS & PERMISSIONS). The survey for the study was employed through distribution of papers in the classroom with an attached consent form. They were informed that it is a voluntarily basis survey and if they disagree to participate they can return it without filling it out. The paper based scale which includes both demographic and survey questions took a duration of 10-15 minutes to complete.

### 3.5.2 Qualitative Part

While gathering the data researcher tried to make a comfortable environment for them so there were not any unnecessary environment changes in the moment of conducting the interview. The researcher talked with the participant so that they can express their opinions about the interactive whiteboard use freely. Before beginning, participants were given the Informed Consent form added in Appendix FORMS & PERMISSIONSand briefed about the importance of the study and how he or she will contribute into this study. Along with these, they were informed about the interview being voluntarily basis, having the right to quit from the interview any time they feel so and the suitability or the acceptance of the data for the study. Having signed the Informed Consent Form, the researcher began to interview. Interviews were conducted in a meeting room in Faculty of Education. Each interview lasted about 10-15 minutes and participants' experiences, problems and recommendations about interactive

whiteboards were recorded with digital media recorder. The interviews took around 20 minutes to transcribe. Raw data, transcription were kept for confirmation. The themes and codes for the interview is given in Appendix B B.4 Coding Schema for the Interview.

## 3.6 Data Analysis

Having gathered the data, researcher analyzed the quantitative data and conducted necessary statistical analyses. Afterwards, researcher moved to the second stage, which is, qualitative phase. In this phase of the study, researcher gathered data by interviewing with the participants. After interviews, researcher analyzed the data and interpreted according to the research questions.

### 3.6.1 Quantitative Data Analysis

Quantitative data were collected through paper based distribution and has been analyzed by using IBM SPSS Statistics 22 for Windows. Considering the research questions the researcher has performed necessary statistical data analyses and tried to answer those research questions.

In the initial part of this process, demographic information from pre-service teachers about gender, age, departments, amount of smart board usage, computer use, access to internet, electronic devices they use along with their perceived competency towards using those devices were calculated as descriptive statistics. After that the analysis of the scale was started, first, the missing data were checked and removed from the data then outliers were identified and also they have been removed from the main data. The frequencies and percentages of these 12 questions are given in the RESULTS. After that, the data gathered from IBS measured with 5-point-likert scale were entered the program for analysis. Frequencies, percentages, standard deviations along with multivariate analyses were calculated. Afterwards, correlation among variables were checked to see the direction and the strength of the relationship between variables. Finally, regression analyses were conducted to see how well factors predict the behavioral intention to use.

### 3.6.2 Qualitative Data Analysis

Research questions and themes gathered from the interview questions were used as the basis for the coding of the interview. According to Creswell (2009), there are six main steps for qualitative data analysis and these steps were followed by the researcher in the analysis part of the interview. The steps in qualitative data analysis were given in Table 3.22. First of all, researcher transcribed the data with the help of a program named as Listen N Write and prepared the data for analysis. The researcher read through all the data and got a sense of the data and tried to figure out the themes that can be generated from the data. Next, the researcher started to analyze the data into codes for all the interviews. Although there were 10 interviews, researcher coded them one by one. Then, the researcher segmented the important sentences into categories or themes for this case and included subthemes under them. Afterwards the researcher narrated these into the results section and provided interviewee quotations to support these themes and subthemes. Finally, the researcher interpreted the data in the discussion part after the results chapter. The interview questions along with themes and subthemes of the interview is added in Appendix.

**Table 3.22** Steps in Qualitative Data Analysis

| # | Steps |
|---|---|
| 1- | Organize and prepare the data for analysis |
| 2- | Read through all the data |
| 3- | Begin detailed analysis with a coding process |
| 4- | Use the coding process to generate categories or themes for analysis |
| 5- | Advance how the themes will be represented in the qualitative narrative |
| 6- | Making an interpretation or meaning of the data (Creswell, 2009, pp. 185-190) |

## 3.7 Researchers Role

For the study, researcher was the member of the technical support group in the Faculty of Education. As having an insider status, researcher provided participants with the necessary explanation about the purpose of the research, information on the questionnaire, when necessary. Researcher gave a seminar for the participants at the

beginning of the Fall Semester of 2014-2015 academic year, before they start their teacher training programs so that they can use IWBs without troubles in the schools they attend as teacher trainees.

### 3.8 Assumptions of the Study

This study was conducted on the basis of following assumptions given below. It is assumed that;

- The collection and analysis of the data were carried out appropriately.
- The participants answered to the questions honestly and attentively for both quantitative and qualitative data collection
- Pre-service teachers followed the instructions and took action accordingly.

### 3.9 Limitations of the Study

- The scope of the research was only limited to the single state university in Turkey.
- Not all the participants could be included (aimed to gather data from seven departments) in the study because of students' reluctance to participation and their absenteeism. As a result of which, despite collecting data from six departments, most of the data were gathered from foreign language education department.
- Some of the schools that these pre-service teachers attend as teacher trainees did not have any interactive whiteboards available or teachers were not using interactive whiteboards in classroom.
- The researcher was not with the participants in some of the quantitative data collection process because of the pre-service teachers' reluctance towards the researchers' data collection.

- Because of convenience sampling, and being a correlational survey study, the study cannot be generalized to the population.

- Originally, UTAUT model were used for longitudinal observational designs across industries, for the current study, the replication of UTAUT were employed differently and the moderators used in the framework were not accounted for in the current research.

# CHAPTER 4

# RESULTS

This chapter will be composed of the results that are obtained from both data collection methods; quantitative (survey) and qualitative (interview). Results will be indicated in detail in this chapter and will include results based on research questions. In the first part, the results about survey will be given including necessary statistical assumptions. Afterwards, to provide an answer about the relationship among variables to predict behavioral intention to use, description about the variables and correlations matrix among variables were given. At the end, regression analyses results were provided to draw a conclusion about the predictors of behavioral intention to use interactive whiteboards. Having provided the results for the survey, results for the interviews were included in this chapter of the study.

## 4.1 Interactive Whiteboard Survey

### 4.1.1 Statistical Assumptions

Multiple Regression is a statistical technique used to investigate the relationship among independent variables and dependent (outcome) variable. It was used to predict the percentage of variance about pre-service teachers' behavioral intention to use interactive whiteboards with the independent variables of UTAUT. There is a need to consider several assumptions. According to Field (2009), there are several assumptions that should be addressed;

**Variable type:** There should be at least two independent variables which should be measured on continuous (interval or ratio) or categorical (nominal or ordinal) scale. For the study, independent variables PE (3 items), EE (4 items), FC (2 items), SI (2 items), ANX (2 items), ATUT (4 items), SE (4 items) and the dependent variable BIU (3 items), a total of 24 items were measured by 5-point Likert type questions and therefore the variables are quantitative, continuous variables.

**Independence:** The data for the quantitative measurement were collected from separate entities and thus they are independent for the study data were collected from 153 participants.

**Non-zero variance:** The independent variables should have variance in their values. As shown in Table 4.1, the data for the study met with this assumption.

**Table 4.1** Variance values of the variables ($N$=153)

| Constructs | Variance |
|---|---|
| 1- Performance Expectancy (PE) | .31 |
| 2- Effort Expectancy (EE) | .27 |
| 3- Social Influence (SI) | .59 |
| 4- Facilitating Conditions (FC) | .55 |
| 5- Attitude toward Using Technology (ATUT) | .28 |
| 6- Self-Efficacy (SE) | .25 |
| 7- Anxiety (ANX) | .94 |
| 8- Behavioral Intention to Use (BIU) | .31 |

**No perfect multicollinearity:** It is indicated that the predictor variables should not have high correlation or linear relationship between two or more variables should not be perfect. The VIF (variance inflation factor) values for regression model should be less than 3.0 (Neter, Kutner, Nachtsheim, & Wasserman, 1996). For the study, the VIF values are given in Table 4.2 and as shown the values were ranged from 1.05 to 1.74 from the regression analysis.

**Table 4.2** VIF Values for the Predictors

| **Predictors** | **VIF** |
|---|---|
| 1- Performance Expectancy (PE) | 1.572 |
| 2- Effort Expectancy (EE) | 1.546 |
| 3- Facilitating Conditions (FC) | 1.179 |
| 4- Social Influence (SI) | 1.276 |
| 5- Attitude toward Using Technology (ATUT) | 1.736 |
| 6- Self-Efficacy (SE) | 1.050 |
| 7- Anxiety (ANX) | 1.150 |

**Independent errors:** For a regression analysis, residual terms (prediction errors) should not correlated or should be independent for observations. To test the assumption, Durbin-Watson test was used in which the values should be between 0 and 4. The value of 2 indicates neutrality and if the value is greater than 2.0 it means the correlation is negative, while if the value is less than 2.0, it indicates that the correlation is positive. The value for Durbin-Watson was found to be 2.026 for the analysis.

**Homoscedasticity:** It (also known as homogeneity of variance) refers that the dependent variable shows the same amount of variance for all independent variables. The variance distribution of performance expectancy, effort expectancy, and attitude toward using technology, social influence, facilitating conditions, self-efficacy and anxiety on the dependent variable behavioral intention to use were given in Appendix C C.1 Homoscedasticity graphics for variables.

**Normally distributed errors:** The difference between the model and observed data should be zero or close to zero in order to meet the requirement of this assumption. For that purpose, distributions of histograms were looked for (See Appendix C: C.2 Normal distribution histograms for variables).

**Linearity:** The change rate or the consistency in the amount of change should be stable or constant for the scores. The line graphs given in Appendix C: C.3 Linearity graphs for variables provide information about the linear relationships between independent variables and dependent variable in the current study.

### 4.1.2 Correlation among Variables

The first research question was about what is the nature of relationship among performance expectancy, effort expectancy, social influence, facilitating conditions, attitude toward using technology, self-efficacy, anxiety and behavioral intention to use interactive whiteboards or smart boards. To investigate and explain this relationship, Pearson's bivariate correlation analysis was conducted to explore the strength and direction of the relationship between PE, EE, SI, FC, ATUT, SE, ANX and BIU.

In order to examine correlations between variables that are aimed to be included in the regression, a Pearson correlation was utilized to obtain a correlation matrix based on the constructs. Pearson correlation indicated that performance expectancy was correlated with effort expectancy (r=0.381, p=0.000), social influence (r=0.385, p=0.000), facilitating conditions (r=0.227, p=0.005), attitude toward using technology (r=0.553, p=0.000) and behavioral intention to use (r=0.580, p=0.000) while performance expectancy had no significant correlation with self-efficacy (r=0.136, p=0.095) and anxiety (r=-0.100, p=0.220). Moreover, effort expectancy significantly correlated with social influence (r=0.200, p=0.013), facilitating conditions (r=0.289, p=0.000), attitude toward using technology (r=0.503, p=0.000), behavioral intention to use (r=0.227, p=0.005) and negative correlation with anxiety (r=-0.342, p=0.000) while it had no significant correlation with self-efficacy (r=0.145, p=0.073). Furthermore, social influence showed significant correlations with facilitating conditions (r=0.275, p=0.001), attitude toward using technology (r=0.345, p=0.000) and behavioral intention to use (r=0.457, p=0.000) whereas it did not show significant correlation with self-efficacy (r=0.153, p=0.060) and anxiety (r=-0.037, p=0.654). Also, facilitating conditions correlated positively with the attitude toward using technology (r=0.238, p=0.003), behavioral intention to use (r=0.256, p=0.001) and negative correlation with anxiety (r=-0.183, p=0.023) on the other hand it did not show significant correlation with self-efficacy (r=-0.001, p=0.991). For, attitude toward using technology, there were significant correlations with behavioral intention to use (r=0.652, p=0.000) and anxiety (r=-0.190, p=0.019) contrary to no-significant correlation with self-efficacy (r=0.156, p=0.055). Self-efficacy showed correlation with behavioral intention to use (r=0.165, p=0.042) but not for anxiety (r=-0.034,

p=0.673). Finally, anxiety showed no significant correlation with behavioral intention to use (r=-0.035, p=0.665). The results for Pearson correlation for the set of variables is given in Table 4.3.

**Table 4.3** Pearson Correlation among Variables

| | PE | EE | SI | FC | ATUT | SE | ANX | BIU |
|---|---|---|---|---|---|---|---|---|
| PE | 1 | | | | | | | |
| EE | .381** | 1 | | | | | | |
| SI | .385** | .200* | 1 | | | | | |
| FC | .227** | .289** | .275** | 1 | | | | |
| ATUT | .553** | .503** | .345** | .238** | 1 | | | |
| SE | .136 | .145 | .153 | -.001 | .156 | 1 | | |
| ANX | -.100 | -.342** | -.037 | -.183* | -.190* | -.034 | 1 | |
| BIU | .580** | .227** | .457** | .256** | .652** | .165* | -.035 | 1 |

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

### 4.1.3 Prediction of Behavioral Intention to Use

The second research question was "to which extend do the factors PE, EE, SI, FC, ANX, SE and ATUT predict pre-service teachers' behavioral intention to use (BIU) interactive whiteboards". To answer this question, multiple linear regression analyses were conducted in which behavioral intention to use is predicted by performance expectancy, effort expectancy, facilitating conditions, social influence, attitude toward using technology, self-efficacy and anxiety. The correlations among the variables to be used in the regression analyses were presented in Table 4.3. There were two analyses conducted to examine whether analyses provide a consistent result about the predictors of behavioral intention to use. First, the analysis was conducted with the four predictors: PE, EE, SI and FC. Results revealed that about 39% of the behavioral intention to use was accounted from the combination of performance expectancy and social influence F (4,148) = 25.390, MSE (mean square of error) =4.853, $p<0.001$, Adj. $R^2$ =0.391. Moreover, the values of *b*, β, t, $R^2$ and the adjusted $R^2$ resulted from the regression analysis are presented in Table 4.4.

**Table 4.4** Regression analysis with PE, EE, SI and FC

| Predictor | *b* | β | T | $R^2$ Adj. | $R^2$ change |
|---|---|---|---|---|---|
| Constant | 1.356 | | 4.111** | | |
| PE | .475 | .472 | 6.472** | | |
| EE | -.032 | -.030 | -.427 | | |
| FC | .066 | .087 | 1.275 | | |
| SI | .188 | .257 | 3.670** | .391 | .407 |

**p<0.001

Afterwards, attitude toward using technology, self-efficacy and anxiety were included in the regression analysis. Results revealed that approximately 54% of the behavioral intention to use was accounted from attitude toward using technology, performance expectancy, social influence and effort expectancy F (3,145) = 17.327, MSE=3.840, p<0.001, Adj. $R^2$ =.542. Moreover, the values of *b*, β, t, $R^2$ and the adjusted $R^2$ resulted from the regression analysis are presented in Table 4.5.

**Table 4.5** Regression analysis with PE, EE, SI, FC, ATUT, SE and ANX

| Predictor | *B* | β | t | $R^2$ Adj. | $R^2$ change |
|---|---|---|---|---|---|
| Constant | .528 | | 1.370 | | |
| PE | .279 | .277 | 4.030** | | |
| EE | -.201 | -.188 | -2.759* | | |
| FC | .064 | .084 | 1.417 | | |
| SI | .133 | .182 | 2.944* | | |
| ATUT | .545 | .512 | 7.086** | | |
| SE | .054 | .049 | .864 | | |
| ANX | .028 | .049 | .832 | .542 | .156 |

**p<0.001, *p<0.05

As a result, it was found that facilitating conditions, self-efficacy and anxiety did not show any significant results from the regression analysis contrary to performance expectancy, effort expectancy, social influence and attitude toward using technology.

## 4.2 Opinions about Interactive Whiteboards

The researcher conducted interviews with volunteer pre-service teachers ($N$=10) enrolled in the spring of 2014-2015. The participants (3 CEIT, 2 FLE, 2 ECE, 2 CHEME and 1 EME) were also senior students who are about to graduate from faculty of education. There were 10 questions in the interview. To explore the enablers and barriers related to pre-service teachers' intention to use interactive whiteboard, there were 10 questions in the interview guide, which is included in Appendix B-B.3 Interview Questions (in Turkish). From their responses including their experiences, opinions and beliefs on these questions, two main themes were revealed; "enablers" that encourages or assists pre-service teachers to use interactive whiteboards, and "barriers" that hinder, discourage or prevent them from using interactive whiteboards. The themes and subthemes generated from the transcription of the interviews are shown in the Table 4.6.

**Table 4.6** Themes and Subthemes for the Interview

| Themes | Subthemes |
|---|---|
| Enablers | Attract Attention & Interest |
| | Active Involvement |
| | Enhanced Visuality |
| | Enhanced Interactivity |
| | Additional Resources |
| | Efficiency |
| | Social Influence |
| | Excitement |
| | Future Use |
| | Balanced Use |
| Barriers | Underuse |
| | Misuse |
| | Time Consuming |
| | Problematic to use |
| | Reluctance to Use |
| | Feeling Insufficient |
| | Obligation to Use |
| | Availability |
| | Training |
| | Supplementary Resources |
| | Technical Support |
| | Private and State Schools |

### 4.2.1 Enablers for Using Interactive Whiteboard

Pre-service teachers were asked to answer what they think about the effects that using interactive whiteboard or commonly known as smart board in classroom and whether using smart board affect their performance and creativity, who recommended them, or affected them about the use of smart board. More questions about what makes them to use smart board were asked. Overall, pre-service teachers are eager to use interactive

whiteboards because of certain reasons. These reasons were given as subthemes and explained individually.

*Attract Attention & Interest*

Four pre-service teachers ($N$=4) emphasized that using smart board in classroom is interesting for students and attract their attention. Pre-service teachers think that in this technological age that we live in, touchable devices like smartphones and tablets are readily available and using smart board attract their attention.

One of the pre-service teachers said that:

"Of course it is more comfortable than teaching with normal, classical method. Very practical and open to application and I used (this device) in my teaching with programs similar to power point and it is much more interesting (for students)."

"Tabiki de çok kolay çok daha rahat oluyor normal klasik yöntemde anlatmaktan. Cok pratik ve uygulamaya açık ben bütün derslerimde powerpoint tarzı şeylerde anlattım çok daha ilgi çekici olur."

Another pre-service teacher stated that:

"I think it will affect if the teacher is trained because smart board attracts students' attention much more and teacher can use the colors more creatively."

"Etkileyeceğini düşünüyorum eğer öğretmen eğitimini alırsa çünkü akıllı tahta çocukların daha çok ilgisini çekiyor renkleri daha yaratıcı kullanır öğretmen."

*Active Involvement*

The qualitative data results showed that there were two pre-service teachers ($N$=2) who stated that using smart board in classroom makes students more active and helps participation of the students if supported with activities.

One of the participants stated that:

“Absolutely I think it would be advantageous for the teacher in any case I mean teacher can teach more effectively and reach students faster by using games (or activities) more frequently to increase the participation and comprehension of the students by smart board.”

“Kesinlikle öğretmen açısından çok avantajlı olacağını düşünüyorum her açıdan yani öğretmen dersi daha etkili işleyebilir öğrenciye daha çabuk ulaşır oyun vs. gibi şeyleri daha sık yaparak öğrencinin anlamasına daha çok katılımı artırabilir akıllı tahta ile.”

*Enhanced Visuality*

Apart from these, results revealed that enhanced visuality is another enabler of the smart board. Four participants ($N$=5) indicated the importance of the enhanced visuality aspect.

A participant said that:

“Visuality is important for children and if I am talking about a story the visuals in the book is too small however by using smart board together with the book it affects students much more.”

“Çocuklar için görsellik çok önemli ve ben bir konuyu anlatıyorsam hikayeyi anlatıyorsam kitabın görselleri çok küçük kalıyor ama akıllı tahtayı kullanarak kitabı orada kullanırsam gösterirsem çocuklarda daha büyük etkiler yaratıyor.”

Another participant said that:

“For example, we can see a place we cannot go or we do not have the opportunity, it (smart board) makes it more abstract and effective. I think that students learn better when they are demonstrated visually with smart board.”

“Mesela o an imkanımızın olmadığı birşeyler yapabiliriz mesela bir yere gidemiyoruz ama onu orada görebiliyoruz daha iyi bir şeyler daha çok somutlaştırıyor ve bu onu daha etkili yapıyor. Öğrencilerin bir şeyleri görerek görsel halde daha iyi öğrendiğini düşünüyorum akıllı tahtayla.”

*Enhanced Interactivity*

In addition, according to interview results, four participants ($N$=4) indicated that using smart board makes lessons more interactive.

One of the participants informed that:

"We visited one of the 3D museum (by using smart board) and we toured around by touching however I cannot provide this (feeling, interactivity) with a printed picture and since the quality of the visuals were good it was very good."

"3 boyutlu ona girip müzenin içini gezmiştik herkes dokunarak dolaşmıştık ama ben kendim resim çıktısı alıp gelip sağlayamam bunu bir de görüntünün netliği iyiydi tahtada o yüzden baya iyi oldu."

Another interviewee stated that:

"My reason to choose smart board is that I can (make students) use it for example we are going to draw geometrical shapes and we can make students draw those so that makes it interactive for the students."

"Akıllı tahtayı tercih etme nedenim orada şey için de kullanabilirim mesela çocuklara geometrik şekil çizdirecez mesela çocukları kaldırıp kendilerine çizdirebiliriz onlar içinde interaktif bir şey olmuş oluyor."

*Additional Resources*

There were three interviewees ($N$=3) who emphasized that smart board provides more options.

One of the participants stated that:

"Absolutely, there can be many options in front of you if the smart board is involved and you get out of the classic system and feel the need to prepare something for the students something they can actively participate so it has a great impact in the lesson."

“Kesinlikle, önünüzde opsiyon yapabileceğiniz seylerin opsiyonunu fazla akıllı tahta işin içine girince o şeyden çıkıyorsunuz klasik sistemden ve öğrencilere yönelik birşeyler hazırlama gereği hissediyorsunuz daha doğrusu onlarında aktif katılabileceği birşey o yüzden büyük bir etkisi var dersin içinde.”

Another interviewee informed that:

“For example I taught students the Olympics and I showed them how the fire is burnt by the videos and prezi presentations.”

“Mesela olimpiyaları anlatmıştım çocuklara orada da olimpiyat ateşinin yanışını filan videolarla göstermiştim prezi sunumları ile filan.”

*Efficiency*

Participants (*N*=2) thought that efficiency is another enabler of the smart board. Using smart board is easier than using projection and computer combination.

The participant said that:

“On the other hand, it provides easy in which you can access to internet and show videos and rather than opening two machines it is a lot easier to show them through one machine.”

“diğer yandan da kolaylık sağlar internete de erişebiliyorsunuz video filan izletmet konusunda projeksiyon da iki makineyi açana kadar bu tek makinede izletmek çocuklara daha kolay olur.”

*Social Influence*

Analysis of the pre-service teacher’s responses to the question “Is there anybody who affected you in using smart board?” showed that they learned to use this device from their instructors. While more than half of the pre-service teachers (*N*=6) indicated that their instructors and teachers recommended them to use smart board.

A participant indicated that:

“Last year when I was 3rd year student in the microteaching lecture, we started to use a similar technology to smart board (interactive whiteboard). Similar to projection device it has a software where you can develop application and use that application for the use of students”

“Geçen sene 3. sınıfta microteaching dersinde akıllı tahtaya benzer bir teknoloji kullandık. Projeksiyon cihazı gibi ama bunun bir şeyi var softwarei var bununla uygulama geliştirebiliyoruz ve bu uygulamayı öğrencilere kullandırabiliyoruz.”

Another participant stated that:

“In my university education I faced with smart board more before my internship, and were expected to develop an application directly for the interactive whiteboard which was a first step toward the use of smart board with the help of our instructors”

“Üniversite eğitimimde daha çok karşılaştık staj dersimiz öncesi ve 3. Sınıfta aldığımız derslerde direk olarak akıllı tahtaya yönelik uygulama geliştirmemiz bekleniyordu bizden o yüzden onlar önayak oldu bana kullanım konusunda hocalarımızın desteğiyle…”

*Feeling Excited*

Participants stated that smart board use attracts them and they are excited to use smart board in their teaching ($N$=3).

A participant informed that:

“Yeah, it is (attractive) in fact when I think that I attracts students’ attention, using smart board makes me feel excited about it”

“Geliyor şöyle öğrencilerin dikkatini çektiğini düşündükçe hani akıllı tahtayı kullanmak benide heyecanlandırıyor.”

Another participant said that:

“I have the skills that I need to develop like when I touch the machine (SB) it may lead to elsewhere or I may not perform what I aimed to but for things like this or in terms of usage I am eager to develop (or train) myself”

“Geliştirmem gereken yönlerim illaki var ama ne bileyim dokunduğum anda makine yanlış bir yere gidebilir ya da istediğimi yapamayabilirim ama bu tarz şeyleri yani kullanım açısından kendimi geliştirmeye hevesliyim”

*Balanced Use*

Prospective teachers informed that rather than blindly using only smart board there should be a balance between the traditional use and smart board. For that reason, participants ($N$=2) agreed on that opinion of using smart board for certain cases or activities.

One of the participants said that:

“If the lesson needs active participation, in terms of content I would absolutely use smart board to support (the lesson). However, for some lessons, you really need to teach only and notes should be taken and for these cases it is used as normal board.”

“Ders eğer aktif katılım gerektiriyorsa içerik açısından bunu mutlaka akıllı tahta ile desteklemeyi düşünürüm ama bazı dersler var gerçekten sadece anlatmanız ve not alınması gereken onlarda da zaten normal tahta olarak kullanılıyor.”

Another participant gave the opinion that:

“From time to time it (using smart board) feels attractive because it makes things for some cases better but completely holding onto it is not right. For some cases we should (hold on to it), for some cases normal methods should be used.”

“Zaman zaman çekici geliyor çünkü gerçekten bazı şeyleri gayet iyi hale getiriyor bazı şeyleri ama tamamen ona bağlı kalmak bence doğru değil. Bazı kısımlarında bağlı olmamız lazım bazen normal yöntemleri kullanmak gerekir.”

*Future use*

Participants were asked whether they think they will use smart board in the future in their classes. Most of the participants (*N*=6) informed that they will use smart board in their teaching.

One of the participants informed that:

"I would definitely use in fact I would use smart board in all my classes because I am a computer teacher and I would use it if I am provided with this opportunity."

"Kesinlikle kullanırım hatta bütün derslerimde akıllı tahtayı kullanırım çünkü sonuçta bilgisayar öğretmeniyim illaki kullanırım fakat olanaklar sağlanırsa."

Another participant said that:

"If I have it readily available in my classroom, I think I will use."

"Sınıfımda olursa inşallah kullanmayı düşünüyorum."

A pre-service teacher informed that:

I am not familiar with a different teaching method but still even with the method I know it (smart board) can be used and I would prefer to use it.

"Ben farklı bir öğretim methoduna hakim değilim bildiğim yöntemle de gayet kullanılabilir bir şey kullanmayı da tercih ederim."

### 4.2.2 Barriers for Using Interactive Whiteboard

To identify barriers or constraints to use smart board, the researcher asked questions related to how did smart board affected their teaching and what kinds of difficulties did you encounter while using smart board? More detailed questions were asked to explore the barriers toward the use of interactive whiteboards. Additional problems and underlying codes were pointed out during the transcription process of the interviews. At the end, several sub-themes came forth from the transcription. These are given as subthemes of the barriers for using interactive whiteboard.

*Underuse*

Prospective teachers informed that smart boards are being underused. In fact they use smart board just like projection machine without using its features. It is only used for reading slides, seen just like projection device and some of them use it when projection device does not work. There were three participants ($N$=3) involving with the underuse of smart board.

One of the participants informed that:

"When the projection device does not work, since it is old it does not work from time to time if bothers teachers and when teachers are obliged to they use smart boards to show slides."

"Projeksiyon aleti çalışmayınca çok eski olduğundan bazen çalışmıyor sıkıntı çıkarıyor hocalar o yüzden mecbur kalınca kullanıyor hocalar. Slayt göstermek için."

Another participant said that:

"Teachers are (who are) using smart boards in any case but some of them only use to read slides."

"Hocalar her şekilde kullanıyorlar bazıları sadece slayt okumak için kullanıyorlar."

*Misuse*

Prospective teachers said that smart boards are being misused too. In fact they use smart board to open cartoons for early childhood education ($N$=2) or not think smart board as a necessary medium to use ($N$=1).

One participant said that:

"When they (teachers) do not want to attend to children, they open a cartoon and let them watch. I think it is a bad side for teachers."

"Çocuklar ile uğraşmak istemedikleri zaman çizgi film açıp izletiyorlar onu bence bu negatif yanı ama öğretmen açısından."

One interviewee informed that:

“I do not think it assists (school). Even though these technologies are available, teachers still try to use projection and computer. They do not think of it as a requirement.”

“Pek destek olduğunu düşünmüyorum hocalar genelde bu teknolojiler olmasına rağmen projeksiyon ve bilgisayarı kullanmaya çalışıyor.İhtiyaç olarak görmüyorlar galiba.”

*Time Consuming*

Prospective teachers stated that smart boards are time consuming ($N$=1). In fact, it affects badly if it takes a large amount of time from recovering from mistakes.

The participant stated that:

“I think it will contribute (to teachers performance) depending on what type of school you work (private or state) and if you make a mistake and to while rectifying it if the classroom falls apart it affects negatively.”

“Arttıracağını düşünüyorum simdi ne tip okulda çalıştığınız da önemli öğrenci seviyesi de önemli orada bir hata yaptığında onu toparlarken sınıf dağılacaksa bu negatif etkiler.”

*Problematic*

Pre-service teachers informed that using smart board comes with problems and if these problems are not being solved it becomes hard to teach in classroom. Only three out of ten participants informed that they did not encounter with a problem while using smart boards. Among participants there were color problem ($N$=1), pencil and eraser problem ($N$=2), electricity shortage ($N$=1), sound problem ($N$=1) and calibration problems. ($N$=2).

“While erasing the parts that we wrote the pencil was not seen directly and when eraser is pressed you cannot target the area you aimed to and page changes afterwards.”

“Yazdığınız kısımları silerken filan artı basarken kalemi direk görmemesi, silgiye basıyorsun silinmiyor bastığın yeri tutturamıyorsun sayfa değişiyor.”

Another participant pointed that:

“There was a problem like while watching the calibration was off and the pointer was shaking.”

“Bir sıkıntı ile şey vardı ben mesela birsey izlerken kalibrasyonunda sıkıntı vardı Mouse sallanıyordu arada”

*Reluctance to use*

It is stated that a pre-service teacher was reluctant to use interactive whiteboard for their education. The participant informed that:

“I did not think about it whether to use this technology. But I would not prefer it since I am kind of an old traditional teacher with board and marker.”

“Pek düşünmedim gelecekte bunu kullanırım diye ama pek tercih etmem heralde biraz eski kafalıyım bu konuda tahta kalem kullanarak.”

*Feeling Insufficient*

Prospective teachers ($N$=4) pointed out that they are feeling insufficient about the use of the smart board.

One of the participants said that:

“In fact I do not feel sufficient enough. I could not get used to with the system of the smart board.”

“Aslında kendimi pek yeterli görmüyorum. Akıllı tahtanın sistemine alışamadım.”

The other participant stated that:

“At the beginning I had trouble I mean learning took a large amount of time but now that I do not use it, I began to forget (the information I know about it).”

“İlk başlarda çok zorlanmıştım yani öğrenmek belli bir vaktimi almıştı suan kullanmadığım için tekrar unutmaya başladım.”

*Obligation to use*

Participants (*N*=2) indicated that smart board will not be used unless it is obligatory for teachers and educators.

A participant said that:

“If using smart board were to be obligatory, I think more creative lectures will come into existence. Otherwise, teachers will use the lecture notes that they are accustomed to for years and readily available for them.”

“Mesela bu tahtayı kullanmak zorunlu olsa bence daha yaratıcı dersler çıkar ortaya, diğer türlü öğretmenler yıllardır hazır olan hep anlatmaya alışkın olduğu ders notlarını kullanır.”

Another participant informed that:

“In-service trainings for teachers ends up with signing and leaving or signing for behalf of other teachers. If training (for smart board) were to be obligatory it may succeed. If teacher were to be obliged to learn, it will draw reaction but they will learn it feeling mandatory.”

“Hizmet içi eğitimler hocalar için imza atıp çıkma ya da yerine imza atma amacıyla yapılıyor. Bu zorunlu kılınırsa ancak bence başarılı olabilir. Mecbur bırakılırsa öğrenmeye zorunlu kılınırsa tepki çeker bu ama öğreniler kendilerini mecbur hissedip.”

*Availability*

Participants (*N*=5) indicated that for equal opportunity in all learning environments there is a need for availability of the equipment.

A participant informed that:

“I think teachers should learn and first above all the government should place these technologies to the schools”

“Bence öğretmenler nasıl kullanacağını öğrenmeliler en başta artı devlet okullarına da bu teknoloji sağlanmalı.”

Another participant said that:

“State schools are more crowded, and smart boards and electronic stuff attracts students’ attention because they are surrounded with them. But the main step that should be done is to place the technology into state schools since most of the schools do not have smart board.”

“Devlet okulları biraz daha kalabalık, çocukların ilgisini çekiyor akıllı tahtalar elektronik şeyler onlar dolu çevreleri. Ama yapılması gereken ana şey devlet okullarına bu teknolojiyi koymak olabilir çünkü çoğu okulda akıllı tahta yok.”

*Training/Education*

Participants ($N$=6) pointed out the necessity of training in teaching with smart board in classrooms and some asserted that it should be obligatory.

One of the participants said that:

“First of all, there is need for education and I do not think that giving distance education to all teachers with the “FATİH” project and expect it to be effective is going to work. I even though I used it, I do not think I have the competence to use it once I became a teacher. Learning everything one-to-one there is a need for training and it should be used mandatorily I used it but since it was not obligatory I forgot it in a year and if I am to use it I need to re-learn.”

“Öncelikle iyi bir eğitim verilmesi ve bütün hocalara uzaktan eğitim ya da öğretmenlere FATİH projesinde uzaktan eğitim verip daha etkin olmaları için öyle olacağını hiç sanmıyorum. Ben kendim kullanmış olmama rağmen öğretmen olursam kullanmaya yönelik yetkinliğe sahip olduğumu düşünmüyorum. Birebir herşeyini

öğrenmek için eğitim almak gerekiyor ve uygulamak gerekiyor yani zorunlu olması gerekiyor bence yani ben kullandım zorunlu olmadığı için unuttum gitti bir sene de sonra kullanmak zorunda olsam tekrar öğrenmem gerekecek."

Another participant stated that:

"In-service training should always be there and teachers should not come and go after they signed because I do not think that those (active) teachers had taken the lectures that we took in their undergraduate years and even if they took it, a lot of time may have passed."

"Hizmet içi eğitim daima olmalı ve hocalar imza atıp çıkmamalı çünkü hocaların bizim aldığımız dersleri lisans hayatlarında almadıklarını düşünüyorum aldılarsa da çok zaman geçmiş olabilir."

*Technical Support & Additional Resources*

Participants ($N$=2) stated that there should a technical support group readily available in case teachers need assistance. There is also a suggestion from the pre-service teachers ($N$=3) about the need for additional resources to assist learning.

A participant stated that:

"I did not actively use it alone when I was teaching but it should be used if support is provided."

"Pek aktif kullanmadım kendi başıma ders anlatırken ama kullanılması gerekiyor belli bir destek verilirse."

Another participant informed that:

"Simulations, experiments and animations should be created and I think teachers should use them along with the immediate support."

"Similasyonlar deneyler animasyonlar yapılmalı bence hocaların da bunları kullanması lazım ani destek verilerek."

One participant pointed out that:

“I mean more effective activities that can attract student’s attention can be created and these are not sufficient alone the programs should be used effectively.”

“...yani daha böyle daha etkili öğrencinin dikkatini çekecek aktiviteler oluşturabilir ama bunun için dediğim gibi tek başına yetmez tabi programların da etkili bir şekilde kullanılması lazım.”

Another participant stated that:

“The whole curriculum should be prepared with the smart board in mind and content should be created. Just like how questions and tests are created they should start to create content and create a content pool to be used.”

“Tamamen müfredat akıllı tahtayı göz önünde bulundurarak hazırlanmalı ve buna yönelik içerik üretilmeli. Nasılki soru ve testler üretiliyorsa o şekilde akıllı tahta içeriği üretilmeye başlanmalı ve büyük bir havuz oluşturulmalı kullanılması için.”

*Private & State Schools*

Participants ($N$=6) informed that smart board is commonly used in private schools for transmitting media while it was not being used in state schools. Moreover, for some schools that pre-service teachers attended for their teacher training programs smart boards were not even available.

A participant informed that:

“In Doga College (smart board) in general it (smart board) is actively used. Almost everything is shown on the smart board. Teacher uses smart board for readings, songs, videos and everything.”

“Doğa kolejinden genel bahsedersek çok aktif olarak kullanıyor neredeyse herşeyleri akıllı tahta üzerinden gidiyor. Öğretmen yapacağı sunumları kitap okumaları şarkıları videoları herşeyi akıllı tahta üzerinden kullanıyor.”

Another participants informed the use of the smart board and talked about the powerful technical side of the private schools:

“In the college, teacher cut and paste to solve when he or she finds something. Once there was a problem with the USB drive and some staff come in and go out in seconds after solving the problem. Smart board is used effectively in ARI College and teachers use it in almost every lesson and when they do they open books or other stuff which impressed me.”

“Kolejde hoca hemen birşey bulunca kesip yapıştırıyor çözmek için. Bir kere flash bellek ile ilgili bir problem olmuştu. Anında birileri geldi hemen halledip saniyeler içinde çözüp çıktılar problemi. Arı kolejinde çok etkin kullanıyorlar akıllı tahtayı özellikle hocalar hemen hemen her derste akıllı tahta kullanıyorlar ve anlatırken filan kitap filan açıyorlar orada çok etkilenmiştim.”

In the state schools participants emphasized on the unavailability of the smart board. A participant informed that:

“I have attended to state school (as teacher trainee) for two semesters and teacher could not even connect a USB disk to the computer and he was trying to get support from the 5$^{th}$ grade student telling that kids you know this can you connect this USB to computer to show something from the projection device. There was no smart board in Ahmet Barındırır.”

“Ben 2 dönem devlet okulunda yaptım orada hocalar flash bellek bile bağlayamıyordu. 5. Sınıftaki öğrenciden destek almaya çalışıyordu gel çocugum siz biliyorsunuz sunu baglayın diyordu bilgisayara flash bellek baglamak için projeksiyondan birşey göstermek için orada akıllı tahta bile yoktu.  Ahmet barındırırda.”

Another participant informed that

“However, there was just a computer in the state school. In that little screen students tighten up and sometimes they cannot even see anything. The teacher put it in there just to show some cartoons (for early childhood education). There was no smart board

in the state school but in private school there was smart board available but I do not think that it was given by the government."

"Ama devlet okulda sadece bilgisayar var. Küçük ekranda çocuklar sıkışıyorlar ve bazen göremiyorlar ve öğretmen bunu sadece çizgi film izleme olarak koymuş. Devlet okulunda sadece bilgisayar var akıllı tahta yok özel okulda ise var ama bunun devletin verdiğini düşünmüyorum."

### 4.3 Summary

This chapter provided information related to the both quantitative and qualitative analyses. Regarding the quantitative data that was collected through survey, statistical assumptions, description of variables, correlation among variables and prediction of behavioral intention to use were provided in the "Interactive Whiteboard Survey". Thus, results were reported to provide an explanation for the first and second research questions. Afterwards, the qualitative data results were given in "Opinions about Interactive whiteboard" in which data were collected from interviews. The results for the interviews were categorized into two main themes enablers and barriers for using interactive whiteboard. The subthemes for each of the themes were explained in detailed. At the end, results were shortly summarized. Following chapter present the discussion of the study.

# CHAPTER 5

# DISCUSSION & CONCLUSION

The findings obtained at the end of the data analysis showed both similarities and discrepancies with the reviewed literature. Thus, this chapter aims to present the discussion of the findings along with the reviewed literature that will lead to the conclusion of the study. Also, implication for the practice and recommendations for the further study were given for researchers and practitioners.

## 5.1 Discussion & Conclusion

To explain the nature of the relationship between variables, it was noted earlier that Pearson correlation analysis was conducted. From the correlation of variables to be included in the regression for the current study, it was indicated that the factors of the Unified Theory of Acceptance and Use of Technology (UTAUT) (Performance Expectancy (PE), Effort Expectancy (EE), Facilitating Conditions (FC), Social Influence (SI), Anxiety (ANX), Self-Efficacy (SE), Attitude towards Using Technology (ATUT)) had significant correlations with pre-service teachers' behavioral intention to use (BIU) interactive whiteboards (IWBs) on the other hand anxiety had no correlation with BIU. Because of unveiling significant correlations, a more detailed analysis was conducted to investigate in detail to which extend do these factors could predict the behavioral intention, multiple regression analyses were conducted.

The regression results showed that attitude towards using technology, social influence, performance expectancy and effort expectancy significantly predict pre-service teachers' behavioral intention to use interactive whiteboards.

Similar to findings (Venkatesh et al., 2003; Wang & Shih, 2009; Venkatesh & Zhang, 2010; Wong, Teo, & Russo, 2013), where performance expectancy and effort expectancy as the predictor of behavioral intention to use, for the current study, it was found that performance expectancy was still a determinant for pre-service teachers' behavioral intention to use interactive whiteboards. If pre-service teachers think that interactive whiteboard is useful, helps them to accomplish their tasks easily and increase their productivity, they are inclined to use this technology. However, the main predictor of the pre-service teachers' behavioral intention to use interactive whiteboards was found to be attitude toward using technology. Although, it was included in UTAUT as an indirect determinant for behavioral intention to use (Venkatesh, 2003), for the current study, it was found that pre-service teachers' intentions were mainly predicted by their attitudes toward using technology. Literature supports this result ( Huang & Liaw, 2005; Teo T. , 2010). If they think that using interactive whiteboard is good, working with it is fun and like to work with it and using it makes their work more interesting, it is expected that they will use this technology for their education. Zhang (2007) stated that attitude toward behavior is strongly predicted intention and attitude toward object influenced intention indirectly for the use of ICT.

Social influence significantly predicts participants' or pre-service teachers' behavioral intention to use interactive whiteboards. This result was also supported with the literature since social influence predicts intention to use (Lo, Paul, & Chong, 2009; Yang K. , 2010; Zhou, Lu, & Wang, 2010; Chan, Thong, Venkatesh, Brown, Hu & Tam, 2010; Cheng, Wang, Stephen, Kinshuk, & Jun Peng, 2011). The reason for this result of the study might also be resulted from pre-service teachers' confrontation with interactive whiteboard could only happen in schools they attend as teacher trainee or in university. It is likely that they were influenced by their instructors or teachers. As cited in Raman et al., (2014) lecturers and instructors can influence students' behavioral intention to use technology.

Effort expectancy was found to be a predictor of pre-service teachers' behavioral intention to use interactive whiteboards. Similar to findings (Im, Kim, & Han, 2008; Schaik, 2009; Wong et al., 2013) effort expectancy was found to be correlated with behavioral intention and significantly predicted behavioral intention to use interactive whiteboards. If pre-service teachers think that their interaction with interactive whiteboard is clear and understandable, can easily become skillful at using it and learn to operate it easily or find it easy to use, they are inclined to use this technology.

Facilitating conditions was not found to be a predictor or a determinant for pre-service teachers' behavioral intention to use interactive whiteboards similar to the study of Wong et al. (2013). This was an expected result. Venkatesh (2000) indicated that in the model of UTAUT, the presence of effort expectancy makes facilitating conditions an insignificant predictor of behavioral intention because of the fact that effort expectancy becomes a mediating factor in the relationship between facilitating conditions and behavioral intention to use. Moreover, facilitating conditions is about ones' ability, knowledge and compatibility while behavioral intention is about the willingness and motivation towards using. The fact that around half of the pre-service teachers used interactive whiteboard less than an hour indicates that pre-service teachers were inexperienced with the use of interactive whiteboard (See Table 3.10), thus they might not believe in their abilities or knowledge.

Self-efficacy was not found to be a determinant for pre-service teachers' behavioral intention to use interactive whiteboards similar to predicting m-learning (Park, Min-Woo, & Cha, 2012) contrary to the research in which self-efficacy predicts behavioral intention to use e-learning (Park, 2009). Self-efficacy was referred as "ones' belief in his or her capacity to perform a task or a performance" (Bandura, 1994). Teachers feel insufficient and should be trained (Gursul & Tozmaz, 2010), as also noted earlier pre-service teachers were inexperienced considering their amount of time using interactive whiteboard as a result of which pre-service teachers might think that they lack the necessary capabilities and abilities for the use because of their inexperience. It was stated that self efficacy was influenced by mastery experiences (Bandura, 2002; Steyn & Mynhardt, 2008). This might be the reason for the insignificance of self-efficacy in

predicting behavioral intention to use considering the inexperience of pre-service teachers with regards to interactive whiteboard usage.

It was found from the results of the survey, that anxiety was not found to be a predictor in determining pre-service teachers' behavioral intention to use interactive whiteboards. Contrary to the literature where anxiety is one of the determinants for the computer usage **(**Tung & Chang, 2008**)**, for the current study pre-service teachers do not fear of making mistakes they cannot correct or scared to lose information by touching the wrong button. It was also theorized by Venkatesh et al. (2003) that anxiety and self-efficacy were not the direct predictors for the behavioral intention thus the result of self-efficacy and anxiety as not being a significant predictor for determining the behavioral intention of pre-service teachers toward using interactive whiteboards was an expected result.

To explore pre-service teachers' enablers and barriers pertaining to the use of smart boards or interactive whiteboards, interviews were conducted and from the interview, it was found that there are several reasons for pre-service teachers to use the interactive whiteboard while there are several that hinder or prevent them from using.

Qualitative results indicated that pre-service teachers use interactive whiteboards because it attracts attention and interest of the students. This result was supported with the literature as Gursul and Tozmaz (2010) state that teachers use interactive whiteboard since it draws attention of students by increasing visuality. It was found from the qualitative results that pre-service teachers use interactive whiteboards because it results in active involvement of participants as supported with the literature where it is indicated that interactive whiteboard assists students to actively participate into classroom (Gursul & Tozmaz, 2010). Results of the current study indicated that interactive whiteboard facilitates learning because of its enhanced visuality and interactivity, which was supported with the literature (Slay, Siebörger, & Hodgkinson-Williams, 2008; Schmid, 2008). Moreover, pre-service teachers indicated that interactive whiteboard can be used as an additional resource for the education. Similarly, Schmid (2008) indicated that interactive whiteboard can be used to support collaborative learning and provide teacher a multimedia platform which can be used

for different types of purposes for instruction. Furthermore, it was noted that interactive whiteboard is efficient for instructiona use, Schmid (2008) indicated that interactive whiteboard is efficient in several ways, it helps teacher to save time and facilitate learning. It was found also in the interview codes that pre-service teachers were influenced and were recommended for the use of interactive whiteboards by their teachers and instructors. It was found also in the literature that student-teachers are likely to be influenced by their lecturers (as cited Raman, et al., 2014). Qualitative results indicated that using interactive whiteboard excites the pre-service teachers and they want to include it in their teaching because it makes lessons more enjoyable for both students and teachers and this is supported with the literature since it is stated that IWB makes it easy to give a lesson for teachers **(**Gursul & Tozmaz, 2010). When pre-service teachers were asked about the future use, they informed that they are willing to use this technology in their teaching. However, the success of implementing this technology into educational practice is dependent upon the teachers' intention to use this technology, their willingness and perceptions about using it (Ajayi, 2009; Ishtaiwa, 2010). For a better use of technology and integration of interactive whiteboards, there should be a balance between interactve and traditional board use. López (2010) stated that rather than competing with the existing curriculum, innovative tecnologies like IWB should be used as a challenge to awaken teachers' abilities to use and figure out or come up a plan for its instructional practice.

It was inferred from the qualitative data that because of inadequate knowledge about how to properly use interactive whiteboards in educational practice, interactive whiteboards were being underused (using interactive whiteboard to show only slides or pdfs without using its other features) or misused (showing cartoons for early childhood education). Contrary to findings, in the literature it was stated that teacher have the ability to face toward students while teaching with interactive whiteboard resulting in teachers' to have class control (Slay et al., 2008). From the qualitative data, pre-service teachers informed that classroom management would be hard because of the time loss from recovering mistakes.

Since the technical reliability of the interactive whiteboard technology is a problematic issue (Slay et al., 2008), technical problems are expected to occur. According to

qualitative results, there are several problems that pre-service teachers had trouble in solving and felt that they were in need for assistance from a technical support group. The problems were related to screen related problems, pencil and eraser usage problems, sound, electricity shortage and calibration problems. To solve problems that might occur in the classroom there is a need for technical support. According to Gursul and Tozmaz (2010) lack of support and maintenance were found to be problems related to teachers interactive whiteboard use. As a result, a built-in technical support group should be available to provide assistance to the teachers and pre-service teachers in case they need help while teaching and this assistance should be immediate considering the time loss from the lecture. It was found in the qualitative results that pre-service teachers were reluctant to use interactive whiteboards and they informed that they do not use since they were not obliged to use or encouraged for the use of interactive whiteboards from the facilities. Pre-service teachers should be encouraged for the use of interactive whiteboards and they need to be recommended and demonstrated about its possible integration into classroom setting. Somyürek, Atasoy and Özdemir (2009) indicates that lack of measures to monitor IWB use, the lack of encouragement from administrotors about the use of IWB, schedule of this classrooms and sharing the materials with other teachers. Consequently, teachers fail to integrate these technologies. Although, it was reported that all interactive whiteboards would be distributed, from the study, it was found that for some schools the availability of the interactive whiteboard was problematic. Hence, intention to use interactive whiteboard could not be expected without the placement of the technology. It might be the reason that around half of pre-service teachers used interactive whiteboard an hour or less in their internship. It was found that supplementary resources such as content specific activities or additional applications for the use of pre-service teachers are necessary. According to Gursul and Tozmaz (2010) the lack of digital educational materials for the emphasis of affordance of the multimedia was another problem that should be taken into consideration. Furthermore, it was found that pre-service teachers were in need for training such training that should be included into their curriculum from their first year or lectures related to information technology should be given to them. Even for teachers there was found to be a lack in the training of teachers' on both pedagogic and technical content (Somyürek et al. 2009). Both in-service teachers and pre-service

teachers should be trained or educated accordingly. Teachers have the lack knowledge on the integration of interactive whiteboard into education (Somyürek et al. 2009) and they have the lack of familarity with the interactive whiteboard (Barak, 2007). As a result, an intensive training for how interactive whiteboard could be integrated together with its possible implementations, pre-service teachers should be trained in a way where they can organize what they can do and plan their instruction. From the qualitative data, there was found to be a difference between private and state schools with regards to interactive whiteboard usage.

## 5.2 Implications for practice

Since the data were collected from one faculty, six departments and 153 pre-service teachers who are about to graduate, one should be very careful in generalizing the result of the study because of this limitation of the study. The study contributes to the literature with regards to providing an understanding about teacher candidates' acceptances toward SB use and their opinions about using it.

The study aims to explain the use behavior of pre-service teachers' toward using interactive whiteboard. To give a rough explanation for the study, UTAUT was used with constructs as performance expectancy, effort expectancy, anxiety, attitude toward using technology and behavioral intention were analyzed along with the interviews. As a result of these two methods, smart board acceptances together with the opinions of the pre-service teachers' can make an inference to the study.

This study contributes to the field of technology integration in education and technology enhanced learning. By using and teaching with SB, teacher candidates became familiar with education with SB. This can also be used for different groups such as faculty staff, faculty administrations, and teachers for different purposes. Faculties from different universities can give a seminar for increasing the acceptances of their pre-service teachers.

Students have the awareness necessary towards using interactive whiteboard as they provided information that using interactive whiteboard enhances teachers' creativity and performance. Still, instructors can integrate applications, activities or programs

into education so that they can learn by experiencing over years. Technical support is an important aspect for pre-service teachers or even to teachers and instructors when they have problems there is a need to get immediate support from these facilities.

The interactive whiteboard is an expensive tool and there are not many educational applications based on teachers' needs. For this reason, teachers and instructors might have trouble using these technologies themselves, let alone pre-service teachers. Thus, Large ICT companies can deliver applications or development kits for the people so that they might develop applications and activities for free to the teachers or teacher candidates so that they can develop and extend their knowledge in the use of SB and might contribute to the SB use with more applications and activities.

## 5.3 Recommendation for Future Research

It is possible to provide some suggestions for the practitioners who would like to work on studies related to interactive whiteboard in education. Firstly, interactive whiteboard acceptance of pre-service teachers were analyzed with the framework of UTAUT along with their perceptions or opinions about using interactive whiteboard in education. Their resistance levels, readiness levels and instruction with the interactive whiteboard are in need for further study.

Secondly, the participants for the study were collected from all the teacher candidates from Faculty of Education of a state university. This study can be conducted with teacher candidates in other universities of Turkey since the language for the interviews are in Turkish. This might enable further comparison studies among the acceptance of pre-service teachers enrolled in Turkish universities.

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Thirdly, the data were collected from a must course that all pre-service teachers but the absenteeism of the students was high so not all the participants could be reached. The data can be collected from pre-service teachers when they are in their departmental only classes.

Fourthly, the study was conducted with pre-service teachers and their acceptance levels for interactive whiteboard use was identified. Another study can be made with instructors to analyze their acceptance, resistance or readiness levels in using interactive whiteboard. Since the acceptance level of interactive whiteboard of instructors can affect attitude or even acceptance levels of the students toward interactive whiteboard.

Lastly, although UTAUT model seem to be one of the frameworks widely used to determine the technology usage, it is not the absolute measurement model that can be used for predicting intention to use. To decide whether an item shows a correlation with a variable or a construct is dependent upon each context and may differ accordingly. It cannot be said that the model do not have any value but rather it provides a challenge for researchers to examine and explore the influences for factors that might influence the intention. The present study provided that there may be different predictors since it involves human behavior. Future studies might retest the model of UTAUT with its moderators because these factors might better predict the behavioral intention to use.

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# APPENDIX A

## FORMS & PERMISSIONS

### A.1 Informed Consent Form

Dear Participant,

This study investigates pre-service teachers' smart board acceptance levels in Faculty of Education in a state university. The information that you will provide with this questionnaire is valuable for us. The information collected through conducting this questionnaire will be kept confidential. Thank you for your participation and collaboration.

Orhan ASLAN
For contact: orhanaslan333@gmail.com
Faculty of Education, EF-21

*I am participating in this study totally on my own will and am aware that I can quit participating at any time I want/ I give my consent for the use of the information I provide for scientific purposes. (Please return this form to the data collector after you have filled it in and signed it).*

Name & Surname:

Date:

Signature:

## A.2 Human Subjects Ethics Committee Permission

UYGULAMALI ETİK ARAŞTIRMA MERKEZİ
APPLIED ETHICS RESEARCH CENTER

ORTA DOĞU TEKNİK ÜNİVERSİTESİ
MIDDLE EAST TECHNICAL UNIVERSITY

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Sayı: 28620816/ 135-279

18.03.2015

Gönderilen : Dr. Göknur Kaplan Akıllı
Bilgisayar Eğitimi ve Öğretim Teknolojileri

Gönderen : Prof. Dr. Canan Sümer
IAK Başkan Vekili

İlgi : Etik Onayı

Danışmanlığını yapmış olduğunuz Bilgisayar Eğitimi ve Öğretim Teknolojileri Bölümü öğrencisi Orhan Aslan'ın "Investigation of Pre-Service Teachers' Attitude Levels and their Opinions about Smart Board use in Classroom" isimli araştırması "İnsan Araştırmaları Komitesi" tarafından uygun görülerek gerekli onay verilmiştir.

Bilgilerinize saygılarımla sunarım.

Etik Komite Onayı

Uygundur

18/03/2015

Prof.Dr. Canan Sümer
Uygulamalı Etik Araştırma Merkezi
( UEAM ) Başkan Vekili
ODTÜ 06531 ANKARA

## APPENDIX B

## INSTRUMENTS FOR THE STUDY

### B.1 Background Information

1- Gender

☐Male ☐Female

2- Age

☐ <20 ☐ 20-25 ☐ 26-30 ☐ 30-35 ☐ >35

3- GPA

☐ <2.00 ☐ 2.00-2.49 ☐ 2.50-2.99 ☐ 3.00-3.49 ☐ >3.50

4- Semester(year)

☐ 1st year ☐ 2nd year ☐ 3rd year ☐ 4th year ☐ 5th year

5- Department

☐ Computer Education & Instructional Technology

☐ Early Childhood Education

☐ Elementary Science Education

☐ Foreign Language Education

☐ Elementary Mathematics Education

☐ Physics Education

☐ Chemistry Education

6- How many hours a day do you use computer?

☐ 0-1 ☐ 2-3 ☐ 4-5 ☐ 6+

7- Do you have access to the internet?

☐ Yes ☐ No

8- How many hours a day do you use internet?

☐ 0-1 ☐ 2-3 ☐ 4-5 ☐ 6+

9- Have you ever used Smart Board?

☐ Yes ☐ No

10- How many hours have you used Smart Board?

☐ 0-1 ☐ 2-3 ☐ 4-5 ☐ 6+

11- Which electronic devices do you use? (*You can select more than once.*)

☐ Mobile Phones / Smart Phones

☐ Tablet

☐ PCs or Laptops

☐ e-Readers

☐ Portable DVD / CD Players

☐ Cameras

☐ Digital Audio / MP3/4 Devices

12- How good do you think you are at using these devices?

☐ Poor ☐ Fair ☐ Good ☐ Very good ☐ Excellent

**B.2 Interactive (Smart) Board Scale**

SD: Strongly Disagree, D: Disagree, U: Undecided, A: Agree, SA: Strongly Agree

| # | Items | Statements | | SD | D | U | A | SA |
|---|---|---|---|---|---|---|---|---|
| **1** | PE1 | I would find smart board useful in my job. | | | | | | |
| **2** | PE2 | Using smart board enables me to accomplish tasks more quickly. | | | | | | |
| **3** | PE3 | Using smart board increases my productivity. | | | | | | |
| **4** | EE1 | My interaction with smart board would be clear and understandable. | | | | | | |
| **5** | EE2 | It would be easy for me to become competent (or skillful) at using smart board. | | | | | | |
| **6** | SI1 | People who influence my behavior think that I should use smart board. | | | | | | |
| **7** | EE3 | Learning to operate smart board is easy for me. | | | | | | |
| **8** | ATUT1 | Using smart board is a bad idea.* | | | | | | |
| **9** | ATUT2 | Working with smart board is fun. | | | | | | |
| **10** | ATUT3 | I like working with smart board. | | | | | | |
| **11** | EE4 | I would find smart board easy to use. | | | | | | |
| **12** | SI2 | People who are important to me think that I should use smart board. | | | | | | |
| **13** | BIU1 | I intend to use smart board in the future. | | | | | | |
| **14** | FC1 | I have the knowledge necessary to use a smart board. | | | | | | |
| **15** | BIU2 | I predict I would use smart board after my graduation. | | | | | | |
| **16** | SE1 | I could complete a job or task using smart board, | if there was no one around to tell me what to do as I try. | | | | | |
| **17** | SE2 | | if I could call someone for help if I got stuck | | | | | |
| **18** | SE3 | | if I had a lot of time to complete the job for which the software was provided. | | | | | |
| **19** | SE4 | | if I had just the built-in help facility for assistance. | | | | | |
| **20** | ATUT4 | Smart board makes work more interesting. | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **21** | ANX2 | It scares me to think that I could lose a lot of information using smart board by touching the wrong button. | | | | | |
| **22** | ANX3 | I hesitate to use smart board for fear of making mistakes I cannot correct. | | | | | |
| **23** | FC3 | I have the resources necessary to use a smart board. | | | | | |
| **24** | BIU3 | I plan to use smart board in my teaching. | | | | | |

*reverse coded item

### B.3 Interview Questions (in Turkish)

Görüşme Protokolü

Merhaba, öncelikle çalışmada katılımcı olarak yer aldığınız için teşekkür ediyorum. Bu çalışma Fatih projesi kapsamında alınan ve okullara yerleştirilen akıllı tahtalar ile ilgili bir çalışma üzerine sizinle görüşme yapacağız. Görüşme yaklaşık 15 dakika sürmektedir. Bu sorulara içtenlikle cevap vermeniz çalışmanın güvenilir ve geçerliliği açısından önem taşımaktadır. Görüşme sırasında cevaplar ses kayıt cihazı ile kaydedilecektir. Bu kayıtlar ve kimliğiniz gizli tutulup, hiçbir şekilde üçüncü bir şahıs ile paylaşım yapılamayacaktır. Eğer hazırsanız çalışmaya başlayabiliriz.

1- Akıllı tahtanın derslerde kullanımının nasıl etkileri olacağını düşünüyorsunuz? Pozitif ya da Negatif?

   a. Positif: Neden?

   b. Negatif: Neden?

2- Derslerde akıllı tahta kullanımının performansınızı ve yaratıcılığınızı etkileyeceğini düşünüyormusunuz?

   a. Evet: Nasıl?

   b. Hayır: Neden?

3- Çevrenizde akıllı tahta kullanımı konusunda sizi etkileyen biri oldu mu?

   a. Evet: Kimler etkiledi (ünvan: aile, arkadaş, öğretmen, öğretim üyesi) ? Nasıl etkiledi?

   b. Hayır: Akıllı tahtayı ilk nerede ve kimden gördünüz kullanım açısından ve bu sizi kullanmaya yönelik etkiledi mi?

4- Akıllı tahta kullanımı konusunda kendinizi yeterli görüyor musunuz? (bilgi, yetkinlik) Açıklayabilir misiniz?

5- Üniversitenizin (ODTÜ) (öğretim elemanları, teknik destek ve ekipman alanında vs.) eğitimde akıllı tahta kullanımı konusunda yeterli olduğunu düşünüyor musunuz?

   a. Evet: Neden açıklayabilir misiniz?

   b. Hayır: Yeterli bir konuma getirebilmek için neler yapılabilir?

6- Hangi okulda staj yaptınız? Staj yaptığınız okullarda eğitimde teknoloji kullanımı konusunda (öğretmen, ekipman, teknik destek vs.) durum nedir?

7- Akıllı tahtayı kullanmak ve akılı tahta kulanarak (araçlar, uygulamalar) ders anlatmak size çekici geliryor mu?

   a. Evet: Neden

   b. Hayır: Neden?

8- Mezun olduktan sonra ya da gelecekte derslerinizde akıllı tahtayı kullanmayı düşünüyor musunuz?

   a. Evet: Neden?

   b. Hayır: Neden?

9- Akıllı tahta ve uygulamalarını ne kadar süre ile kullandınız mı?

   a. Evet: Ne tür zorluklarla karşılaştınız?: Bu zorlukları nasıl çözdünüz ya da bu zorluklar nasıl çözülebilir?

   b. Hayır -

10- Sınıflarda akıllı tahtanın aktif olarak kullanılması konusunda sizce neler yapılmalıdır? Neden?

**B.4 Coding Schema for the Interview**

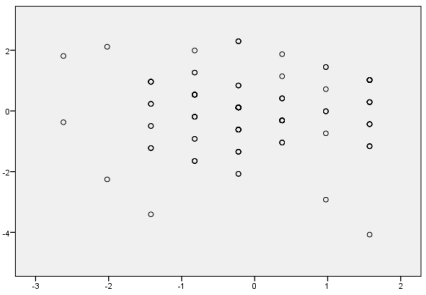
| Themes | Subthemes |
|---|---|
| Enablers | Attract Attention & Interest |
| | Active Involvement |
| | Enhanced Visuality |
| | Enhanced Interactivity |
| | Additional Resources |
| | Efficiency |
| | Social Influence |
| | Excitement |
| | Future Use |
| | Balanced Use |
| Barriers | Underuse |
| | Misuse |
| | Time Consuming |
| | Problematic to use |
| | Reluctance to Use |
| | Feeling Insufficient |
| | Obligation to Use |
| | Availability |
| | Training |
| | Supplementary Resources |
| | Technical Support |
| | Private and State Schools |

## APPENDIX C

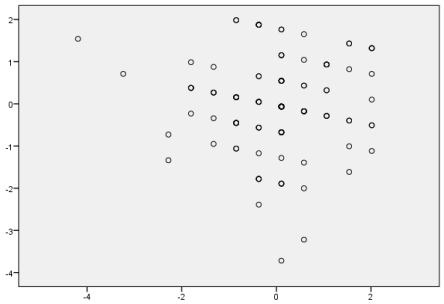
## ASSUMPTIONS FOR THE SURVEY

### C.1 Homoscedasticity graphics for variables

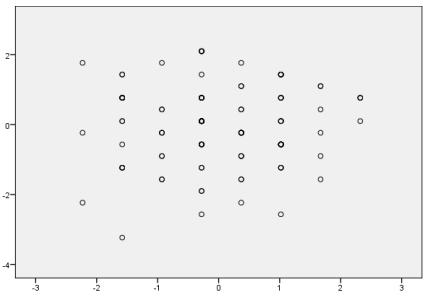
**Performance Expectancy**



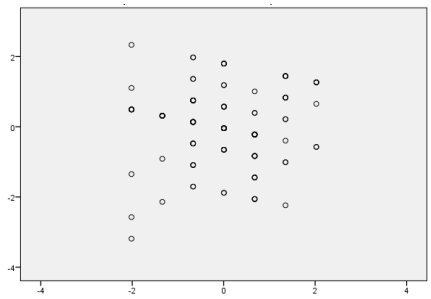
**Effort Expectancy**



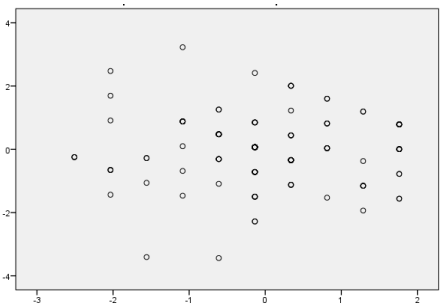
**Social Influence**



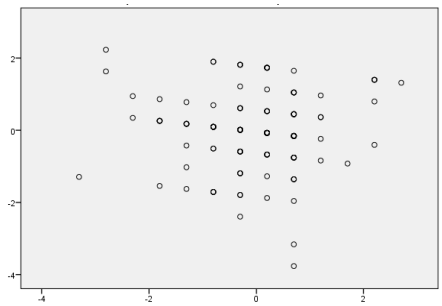
**Facilitating Conditions**



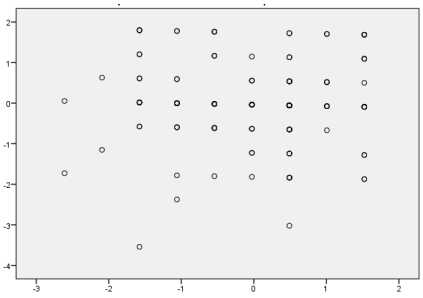
**Attitude toward Using Technology**



**Self-Efficacy**

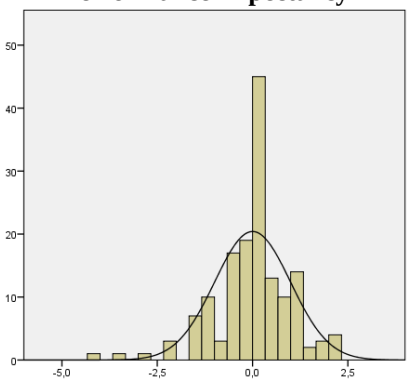


**Anxiety**

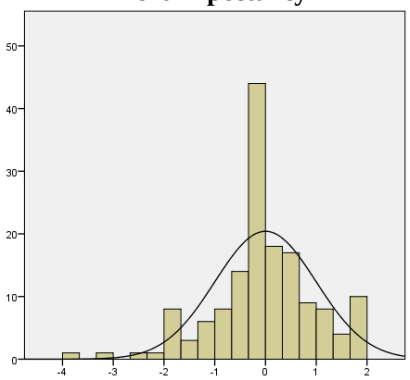


## C.2 Normal distribution histograms for variables

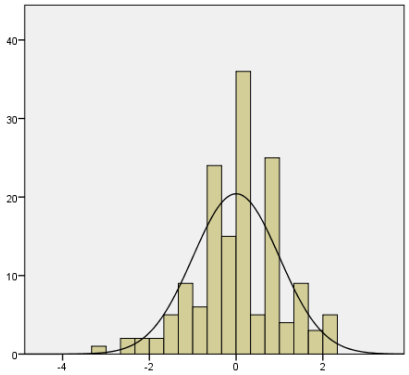
**Performance Expectancy**



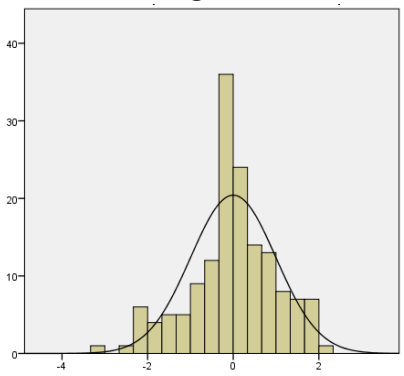
**Effort Expectancy**



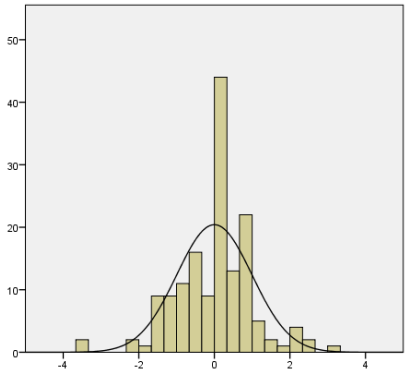
**Social Influence**



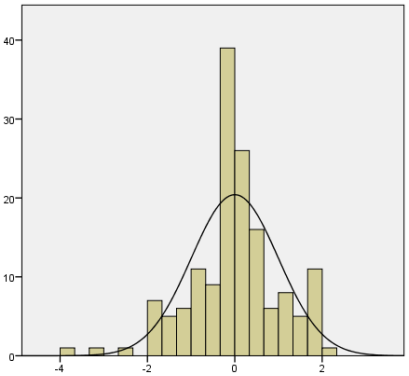
**Facilitating Conditions**



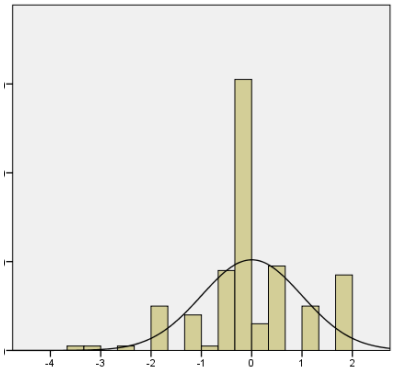
**Attitude toward Using Technology**



**Self-Efficacy**

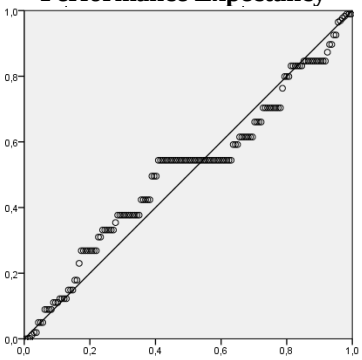


**Anxiety**

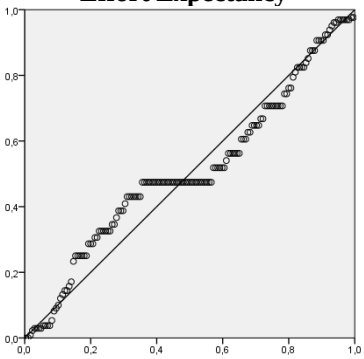



## C.3 Linearity graphs for variables

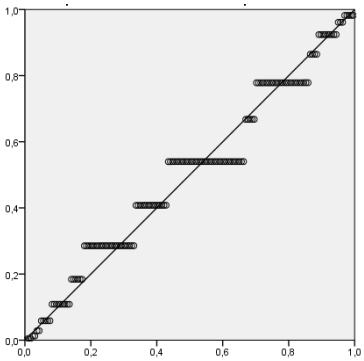
**Performance Expectancy**



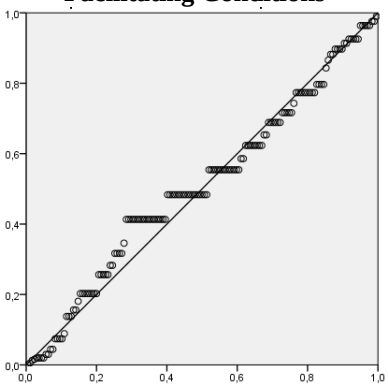

**Effort Expectancy**



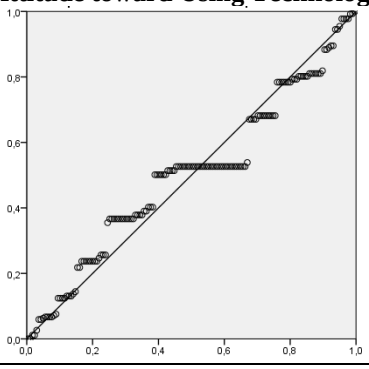

**Social Influence**



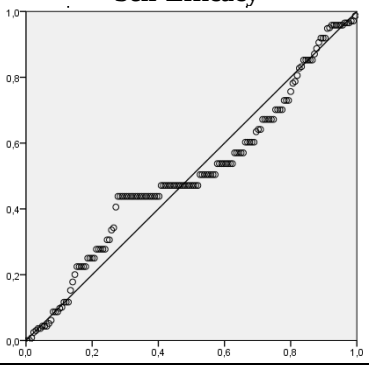

**Facilitating Conditions**




**Attitude toward Using Technology**




**Self-Efficacy**



**Anxiety**