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TEACHERS' OPINIONS ON INTERACTIVE WHITE BOARD AND ITS USE: A CASE STUDY

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Abstract

As an example of qualitative study, this study aimed at portraying the teachers' opinions about the use of Interactive Boards in their classrooms. The data were collected in individual interviews with 13 teachers working in two high schools located in Yenice, Çanakkale. The results in the study suggested that training on the use of the IWBs played a significant role in the teachers' using them effectively in their classrooms. The trained teachers had a clear understanding of how to use the IWBs effectively. The results also indicated that while using the IWBs in the classrooms, the teacher made of use the presentation method for teaching. They mainly used the IWBs for showing videos, for listening to the music or for presenting visual materials according to the lesson content. This study also showed that the technological advancement started with the IWBs in Turkey still remained incomplete from the point of Yenice, Çanakkale

Keywords: Interactive Whiteboards, case study, qualitative study.

ÖĞRETMENLERİN ETKİLEŞİMLİ TAHTA VE KULLANIMINA İLİŞKİN GÖRÜŞLERİ: BİR DURUM ÇALIŞMASI

Öz

Bir nitel araştırma örneği olan bu çalışma öğretmenlerin sınıflarındaki etkileşimli tahta kullanımı ile ilgili görüşlerini ortaya koymayı amaçlamıştır. Çanakkale ili, Yenice ilçesindeki iki lisede görev yapan toplam 13 öğretmenle yarı-yapılandırılmış görüşmeler gerçekleştirerek veriler toplanmıştır. Araştırmada ortaya çıkan bulgulara göre öğretmenlerin etkileşimli tahta konusunda eğitilmesi etkileşimli tahtanın etkili kullanılmasında önemli bir yer tutmaktadır. Hizmet içi eğitim almış öğretmenler temel olarak etkileşimli tahta programlarını nasıl kullanacaklarını bilmektedirler. Araştırmadaki diğer bir bulgu, öğretmenlerin sınıflarında etkileşimli tahtayı kullanırken genellikle sunuş yoluyla öğretim yaklaşımının kullandıklarını göstermiştir. Öğretmenler etkileşimli tahtayı ders içeriklerine göre videolar, dinleme materyalleri veya görseller için kullanmaktadırlar. Bu çalışmayla birlikte Türkiye'de etkileşimli tahta ile başlayan teknolojik ilerlemelerin Çanakkale ili, Yenice ilçesi açısından henüz tamamlanmadığı ortaya konulmuştur.

Anahtar Sözcükler: Etkileşimli tahta, durum çalışması, nitel çalışma.

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1. Introduction

This is a study about Interactive Whiteboards (IWB). More specifically it is about teachers' opinions about using the IWBs in their classrooms. The starting point for our work here was rooted in a personal observation in a regular elementary classroom. As teachers in Turkey, no matter in what degree or what subject they teach, almost all of the classrooms are equipped with a big screen computer fixed to the wall where traditional black/white boards were placed. Despite this massive rapid shift from the black/white boards to the IWBs, teachers have been faced with adapting themselves into using the highly technological tool in their classes. Finding this challenge as our topic, we particularly looked at what teachers thought in using those IWBs in their classrooms.

The term, Interactive Whiteboards, is most commonly defined as large, touch-sensitive boards controlling a computer connected to a digital projector (Smith et al., 2005: 91). However, different from this definition, the IWBs in Turkish classrooms are mounted on the wall with a LCD panel. The IWBs in Turkey have a large touch-sensitive LCD panel with which the teachers and students in the classrooms can write remarks, type words, watch videos, draw pictures, solve math problems and do many other activities. They are almost always mounted on the walls facing the classroom where traditional white/black boards used to be placed.

The studies done on the use of IWBs in the teaching and learning settings can be grouped under certain headings. There are some studies investigating the students' perspective on the IWBs in the classrooms (see Bidaki & Mobasheri, 2013; Halls & Higgins, 2005; Kyriakou & Higgins, 2016; Torff & Tirotta, 2010; Smith et al. 2005; Wall et al., 2005 and see Akdemir & Yaşaroğlu, 2013; Çelik & Gündüz, 2015; Sünkür et al., 2012 for the studies done in Turkey), some studies focusing on the pedagogic practices (see Comi et al., 2017; Gillen et al., 2007; Glover et al., 2007; Mercer et al., 2010; Reedy, 2008; Wood & Ashfield, 2008; Zevenbergen & Lerman, 2008), some focusing on teachers' perspectives on the use of IWBs in the classrooms (see Jewitt, et al., 2007; Türel & Johnson, 2012; Tondeur, et al., 2013; Smith et al., 2006; Sweeney, 2013 and see Aktaş et al., 2014; Banoğlu et al., 2014; Birişçi & Uzun, 2014; Demircioğlu & Yadigaroğlu, 2014; Gursul & Tozmaz, 2010; Gülcü, 2014; Keleş & Turan, 2015; Koştur & Türkoğlu, 2017; Saltan & Arslan, 2013 for the studies done in Turkey), on the teacher in-service training (Lai, 2010; Tatlı & Kılıç, 2013; Vural & Ceylan, 2014), on teacher's ICT (Information and Communication Technologies) skills (see Mama & Hennessy, 2010; Morris, 2010,), some looking for the prospective teachers' perspective (see Akyüz at al., 2014; İncik & Akay 2015; Tekinarslan et al., 2015; Toptaş, 2016; Sarı & Güven, 2013), some

investigating administrators' perspectives (see Dursu et al., 2013; Görhan & Öncü, 2015; Koğu & Kış, 2016), and some studies investigating the interactivity level with the IWBs (see Beauchamp, 2004; Beauchamp & Kennewell, 2010).

According to Halls and Higgins (2005: 106-107), Wall et al. (2005: 863-859) and Smith et al. (2005: 92), students like versatility, multi-media, fun and games about the IWBs but complain about the technical problems (such as freezing and crashing), monitor brightness, sunlight shining when they are used in the classrooms. Different from those findings, Elaziz (2008) reports that for the students IWBs are technically effective and the use of IWB in their classrooms motivates them. Similar to this, the studies done by Gillen et al. (2007) and Birişçi and Uzun (2014) show that the IWBs affect the students' willingness about taking part in the classroom activities and their eagerness to use the IWBs while answering the questions. According to Gursul and Tozmaz (2010)'s study on teachers' opinions about the IWBs, the smart boards help the students keep their attention to the abstract subjects for a longer time. Similar to this, the study by Birişçi and Uzun (2014) with the high school mathematic teachers in Artvin and the study Koştur and Türkoğlu (2017) with the secondary school mathematic teachers show that the IWBs visualize and embody abstract subjects for the students.

The study by Gillen et al. (2007) suggests that the students lose their attention and eagerness when only one student in the classroom uses the IWB to answer a question and takes time to think the answer. Also, Bidaki and Mobasheri (2013) state that searching for the information using the IWB can take more class time and reduce the time for learning activities Supporting this finding, one of the teachers in the study by Keleş and Turan (2015) says that while searching the data from the Internet using the IWB, they come across unwanted contents. Also, another teacher in the same study states that the IWB's light affects some of his pupils with special needs and that he has to use a black/white board instead. In the study by Elaziz (2008), some teachers state that the dark classrooms due to the use of IWBs make students disinterested in the class work. Likewise, according to Gursul and Tozmaz (2010), technical problem (such as calibration) and the lack of technical personnel to maintain the IWBs in the classrooms are the main problems about the IWBs.

The study by Saltan and Arslan (2013) with the teachers in a primary school suggests that the teachers perceive the IWBs as a useful tool for teaching but not an effective tool for in-service training. In Türel and Johnson (2012)'s study, the teachers believe that the collaboration with colleagues, the training about effective instructional strategies using IWB and more teachers using the IWBs to improve the IWB-related competency can be the key factors to improve learning and teaching. In Lai (2010)'s study, the results show that training workshops

are good at icebreaking with the IWBs, teaching how to use interactive feature of the IWB and sharing experienced teacher's experiences. Glover and Miller (2007)'s study suggests that being a team is really important to gain and enhance technological and pedagogical competences while getting used to using the IWBs in class activities. From this point, for Bidaki and Mobasheri (2013), to be an effective IWB user, all teachers need continuing professional development about how to use IWB. Similarly, Reedy (2008) without taking in-service training, teachers cannot regard themselves as efficient IWB or technology users.

Akcaoğlu et al. (2015) tells that during FATIH project (Gateway to the Future in Education), the teachers took in-service training and the training covered entirely technical issues about the use of IWBs in the classrooms. However, the pedagogical use of the IWB was ignored in the trainings and after in-service training, teachers did not know how to integrate the IWB technology to their lessons. Similar to that study, the study by Banoğlu, et al. (2014) with the three pilot schools in the FATIH Project in Eskişehir reports that the teachers criticize in-service training duration and also state that the teachers' eagerness on learning technologic issues affects the success of the in-service training. Also, supporting these findings, Birişçi and Uzun (2014) indicate that teachers demand in-service training on their branch and their subjects.

Morris (2010) suggests that the knowledge of use of digital tools is the main obstacle for using ICT in the classrooms. According to Wall et al. (2005), the IWBs affect teachers whilst using IWBs in a positive or negative way pertaining to pupils' implications. Mercer et al. (2010) supports the idea by saying that the effective use of the IWBs is connected with the teachers. According to Mama and Hennessy (2010), the perception of the ICT in class from teachers' point of view affects the use of the technology. Likewise, Akcaoğlu et al. (2015)'s study in a FATIH project pilot school about the teachers' opinions on the IWBs and tablet PCs suggests that the frequency of technology in teachers' regular life affects their technology readiness in terms of getting used to using the IWBs with or without help or support. The study by Tondeur et al. (2013) on the teachers' stimulated recall of classroom observations shows that most of the teachers' personal interest to the technology leads them to use the technology in their classrooms. Also, Elaziz (2008) finds that the affinity about using the IWBs and spending time to use the IWBs are correlated in a positive way.

According to the study by Smith et al. (2006), the IWBs have some impact on pedagogy used in the classrooms to teach. The lessons with the IWBs have a faster pace (see Gülce, 2014 as well) and decrease the time spending on group work but these lessons do not change the fundamentals of pedagogy used in the classrooms. Likewise, the study by Jewitt et al. (2007) shows that the IWBs are perceived as a new use of old pedagogic applications with new

technology. According to Sweeney (2013), from the perspective of a specialist service teacher's use of an IWB, the IWB technology does not have the power in itself, but the IWB gets its real power with the help of pedagogy that teachers bring.

The study by Bidaki and Mobasheri (2013)'s on the teachers' views on the IWBs suggests that the IWB has changed the pedagogy which teachers use for teaching. Comi et al. (2017) also states that the widespread contents associated with teaching materials, which is available for ICT, can help teachers to make their lessons customized to their students and in regard to customization of lessons, teachers can prepare attentive, detailed and effective lesson plans. It can enhance students' progress by developing student's aliveness in terms of ICT use, the power of discernment about required and essential information. From Banoğlu et al. (2014), Birişçi and Uzun (2014), and Gulce (2014)'s perspectives, the teachers think that finding or preparing course materials is a challenge. As a result, for Demircioğlu & Yadigaroğlu (2014), the teachers say that with the help of the technology, their workload decreases.

Wood and Ashfield (2008) and Jewitt et al. (2007) tell that the increased pace of the lessons does not mean to procure higher order thinking. In Zevenbergen and Lerman (2008)'s study, the IWBs' pedagogical uses in math classes do not show the expected good effects, unlike Comi et al. (2017), from the aspects of problem based curriculum, knowledge integration, description, academic engagement, self-regulation, explicit criteria and social support. According to Kyriakou and Higgins (2016) systematic review study, the IWBs do not increase students' achievement according to test results. The study by Beauchamp and Kennewell (2010), the interactivity in the classroom by using the IWBs is influenced by the students, and when the students' engagements with the IWBs change from viewer to active user, the students can improve their higher order thinking skills by using IWBs as efficient tools for orchestrating the interaction and lesson.

Beauchamp (2004) puts forward that the teachers' ability of using the IWBs reveals five different user types, and these user types range from beginner to expert. In the beginner phase, a teacher does not know how to use the IWB properly but in the expert phase the teacher knows, understands and applies the possibilities and opportunities of the IWBs and uses interactive function of the IWB. According to D. Glover et al. (2007), the teachers' using of the IWBs according to level of interactivity has three different phases: supported didactic, interactive and enhanced interactive. In the supported didactic phase, teachers use the IWBs as visual support. In the interactive phase, the teachers use the IWBs as a stimulator and for projection. And in the enhanced interactive phase, teachers use the IWBs as to be the initiator of the lesson, to express

the issues related to the lesson, to enhance students' knowledge and comprehension and to evaluate the issues related to the lesson.

For Wood and Ashfield (2008), teachers should be not only the consumers of ICT but also the developers of ICT. Teachers should have the power of modifying the programs and solve the problems such as technical, pace of the lesson, motivation or preparedness of students. Similarly, for Mama and Hennessy (2010), the programs selected for achieving lesson aims in terms of technology use should be compatible with the preparedness of students, the objectives of the lessons, and the pedagogy used for teaching and learning. Tondeur et al. (2013) say the grade level affects the type of technology use in the classrooms and the technology use in most cases helps teachers to make their lessons more learner-centered.

According to Kyriakou and Higgins (2016), an example of systematic review study, the use of the IWBs changes depending on the subject taught, the ages of pupils and the particular types of use. The study by Wood and Ashfield (2008) indicates that the creative teaching and learning are affected by the decisions, which are taken by teachers' choice about programs and their use. The study by Jewitt et al (2007) shows that the pace, interactivity and multimodality of the text used in the class should be arranged according to the aim of the lesson. And the three of these facilities of the IWBs should be considered in concert.

Somyürek et al. (2009: 370-373) argues that the integration of the IWBs to the class use needs in service training, the technical and software support, the curriculum revision and managerial issues. Without any of them, the integration process cannot be accomplished. Similar to this finding, the studies by Aktaş et al. (2014), Birişçi and Uzun (2014), Demircioğlu and Yadigaroğlu (2014), Gülce (2014), and Keleş and Turan (2015) report that the teachers pay attention to the lack of infrastructure and its negative effects on the project's operation. In Birişçi and Uzun (2014) study, the difficulties related to the IWBs use derive from the infrastructure deficiencies Demircioğlu & Yadigaroğlu (2014) also state that the teachers want EBA and Vitamin material to be enriched. Akcaoğlu et al. (2015) tells that the FATIH project has restrictions on hardware and software. Thus, the teachers or students cannot load their files prepared at home without connecting to their schools' network.

Being formed from this literature our main and sub-questions are listed;

Main Question: What are teachers' opinions on Interactive White Board and its use?

Sub-Question 1: How did their experience with the IWBs start?

Sub-Question 2: How do they use the IWBs in the classroom?

Sub-Question 3: How do their students use the IWBs in the classroom?

Sub-Question 4: How do their students want you to use the IWBs in the classroom?

Sub-Question 5: How do they reach the sources related to the IWBs?

Sub-Question 6: What sort of challenges do they experience while using the IWBs in your classroom?

Sub-Question 7: What do they think about the effects of the IWBs on your lesson?

Sub-Question 8: How do they interpret the IWBs' situation in your classroom in terms of benefits and challenges?

Sub-Question 9: What can be done to enhance the effectiveness of the IWBs in terms of their course?

2. Method

This study is an example of qualitative case study research. A case study can be defined as an intensive analysis of an individual unit (as a person or community) stressing developmental factors in relation to environment (Yıldırım & Şimşek, 2016). The case study and survey sometimes are misunderstood. Both methods are used to collect data but the key difference between two methods is that the case study reveals descriptive data but the survey reveals statistically significant data (Christensen, Johnson & Turner, 2014). Our primary aim in this study is to find out what teachers think about using the IWBs in their classrooms. To make our aim real, we chose two of three high schools in Yenice, Çanakkale. From this point of view, we wanted to find out the factors affecting and affected by the environment, individuals, events and processes. In order to collect data, semi-structured interview are held during one semester with 13 teachers from two high schools in Yenice, Çanakkale.

2. 1. Participants and Location

The participants in the study were 13 high school teachers working in two high schools in Yenice, Çanakkale and data were collected between November 2016 and December 2016. We selected the participants using the convenience sampling method. Convenience sampling, as described in Yıldırım and Şimşek (2016: 123), giving the researcher pace and practicability, is used when the researcher has no possibility to use other sampling methods." Six participants were working at School A, and the other seven teachers working at School B. Seven participants had some training about the IWBs while six teachers did not have any training using the IWBs in their classrooms (see Table 1 for the details of the participants).

Table 1: Participants

PARTICIPANT NO	BRANCH	EXPERIENCE	GENDER	TRAINING
P1	Math	4 years	Female	No
P2	Literature	6 years	Female	No
P3	Literature	4 years	Male	No
P4	Information Techno.	4 years	Male	No
P5	English	5 years	Female	Yes
P6	English	7 years	Female	Yes
P7	Furniture Techno.	1 year	Male	No
P8	Math	7 years	Female	Yes
P9	Math	4 years	Female	Yes
P10	Geography	12 years	Male	No
P11	Literature	7 years	Male	Yes
P12	English	7 years	Female	Yes
P13	Religious Studies	7 years	Male	Yes

Yenice, with a downtown population of 6900, is a relatively small town located in Çanakkale. School A which is a vocational and technical education center and approximately has one hundred ninety students and B which is an Anatolian high school and has two hundred students are located in this small town.

2. 2. Data Collection

Two interviewers, who one of them was the researcher and the other was a teacher from school B, collected the data, using a semi-structured question list, between November 2016 and December 2016. Before doing the individual interviews, a pilot interview was conducted with a volunteered teacher. After the feedback from the pilot interview and modifying the questions in our list, the individual interviews with the thirteen teachers were conducted. The teacher interviewer was trained by the researcher on research questions and how to elaborate the interview. To achieve this aim, the researcher gave lessons about IWBs' literature and programs. The teacher interviewer was held because of accessing the school B's teachers. The questions in the interview were compiled from the ones used in the previous studies in the IWB field. The main criteria for selecting them were whether those questions aimed at exploring the teachers' perspectives about what happened in the classrooms when the teachers used the IWBs.

The interviews were held off the working hours and most of them in school A and B's teachers' room with the verbal permission of the school principals and some of them in teachers' own houses. The interviews lasted from seven minutes to fourteen minutes and there was no any incoherent situation during the interviews.

Starting with the teachers' experience with the IWBs in their classrooms, our questions were listed as: (1) How did your experience with the IWBs start? (2) How do you use the IWBs in the classroom? (3) How do your students use the IWBs in the classroom? (4) How do your students want you to use the IWBs in the classroom? (5) How do you reach the sources related

to the IWBs? (6) What sort of challenges do you experience while using the IWBs in your classroom? (7) What do you think about the effects of the IWBs on your lesson? (8) How do you interpret the IWBs' situation in your classroom in terms of benefits and challenges? (9) What can be done to enhance the effectiveness of the IWBs in terms of your course?

2. 3. Validity and Reliability

According to Yıldırım & Şimşek (as cited in Lincoln and Guba, 1985), in a qualitative research, validity and reliability are the concepts which are different from a quantitative research. "Credibility", "transferability", "dependability" and "confirmability" are the alternative concepts for validity and reliability in a qualitative research (2016: 277). For credibility of our study, expersation is used and a domain expert on qualitative researches examined the study. For transferability, detailed description is used and a reorganized version of raw material with descriptive codes and themes is presented. For dependability, the study examined from an external perspective by the domain expert. And last for confirmability, researchers compared the raw data and conclusions. Conclusions were confirmed when leading to raw data.

3. Findings

The data collected from the interviews were subjected to content analysis. Content analysis involves searching for meaningful points in the data, assigning them descriptive codes and exploring their relations to arrive at themes and to describe the data as a meaningful whole (Miles & Huberman, 1994; Spradley, 1979). The researchers first read through all of the data from the interviews to identify meaningful units based on the research questions and assigned descriptive codes to these units. Second, the descriptive codes which fit together meaningfully were grouped under some categories such as: training, the teachers' use of the IWBs, the IWB use by the students, the access to the materials, technical problems, discipline problems, the effects on the lesson and improving the IWB effectiveness. In first phase of the coding, matching of the codes percentage was about %70 but in the second phase, the researchers terminated incompatible codes and put the agreeable ones.

3. 1. Training

The first theme that the participants were stressing in the interviews was the training, more specifically the lack of appropriate effective training on how to use the IWBs in the classroom. Six participants did not have any previous training about using the IWBs in the classrooms, except for one participant who took one-day introductory lesson. Two participants said that they took help from their coworkers, e.g. the other teachers in the school. One of the

participants told that he made use of his profession as a technology teacher. The other also told that she learned how to use the IWBs on her own, e.g. experimenting. Finally, another teacher told us how she learned using the IWBs by observing the students with trial and error (see Table 2 for the summary).

Table 2: Summary for training

THEME	CODES	INTERVIEWEE NO
Training	Co-worker help	7-10
	Observing from the students	1
	Trial and Error	
	Introductory Meeting	3
	Professional help	4
	On her own	2

Seven participants had the training on using the IWBs in the classrooms. Three participants expressed that after using the IWBs for some time, they took the IWB training while one participant started using the IWB after the training. Another participant told us that while taking the training, he started using the IWBs whereas the other started using it after she was assigned as a teacher in the school.

3. 2. The IWB Use in the Classroom

The second theme in our research was the teachers' use of IWBs in their classrooms. According to their remarks in the interviews, nine participants used the IWBs for presentation, seven for watching the movies, animation and video for educational purposes, five for listening materials and two for playing educational games (see Table 3 for the summary). As an example of presentation, white board and visuals, Teacher 7 said "I usually use the IWB for drawing lesson. For example there is a furniture drawing lesson". Also Teacher 10 said " I use the IWB for two purposes. First for presentation… Second for videos related to the subject…".

Table 3: Summary for the teachers' use of IWBs in their classrooms

THEME	CODES	INTERVIEWEE NO
Teacher use	Presentation	7,10,2,4,5,6,10,11,13
	White Board	7,10,8
	Movie/Animation/Video	10,2,3,6,10,11,13
	Listening	5,6,12,13
	Visuals	7,10,8,12
	Games	1,8

3. 3. The IWB Use by the Students

The third theme that originated in the teachers' remarks in the interviews was the IWB use by the students in the classrooms. When we had a closer look at the teachers' answers about what the students did with the IWBs, it turned out that the students preferred using the IWBs for entertainment purposes. Eight participants told that their students wanted to watch movies or short videos on the IWBs, or to listen to music, or to play games. While the students in one

teacher's class did not demand anything special, three said their students wanted to use the IWBs for visual activities such as drawing geometrical shapes or for Googling or searching on Wikipedia. In addition to these, two teachers told us that their students wanted to use the IWBs to prepare their presentations. While the students in two teachers' classes did not know how to use the IWBs, the students in a teacher's class made use of the IWBs as a tool for dancing (see Table 4 for the summary). By way of presentation, video / movie, music, Teacher 12 said " Our students use the IWB for presentation too often… They want extracurricular activities. Especially watching movies and listening to music." For games, visuals and drawing Teacher 8 said "… in EBA there is a smart mathematical instruments program… The students can solve the lessons (she means problems)… …diagrammatizing becomes easier on the IWB…".

Table 4: The IWB use by the students

THEME	CODES	INTERVIEWEE NO
Usage by students	No request	2
	Video / Movie	3,4,7,1,10,12,5,6
	Music	7,1,10,12,5,6
	Games	9,1,8
	Visuals	4,8
	Drawing	8
	Search from net	10
	Presentation	11,12,6
	Not conscious about IWBs	7,13
	Dance with music	6

3. 4. The Access to the Materials

The fourth theme in our research was the teachers' access to the materials; e.g. what kind of resources they used to use on the IWBs, and how they reached it. Ten teachers stated that they had the access to the materials through Education Information Network (EBA). Nine said that they were supposed to create their own materials for the IWBs. Four downloaded the materials from the Internet, one teacher from the social media, and one from the students' assignments (see Table 5 for the summary). For the access to the materials, Teacher 6 said "… I try to use shared materials in listening section in EBA… …there are annual homework (projects) which our students have to do it… after researching, some of them prepare short videos or presentations… for instance I use this PowerPoint presentations' best ones after correcting them as a teaching material in my lessons… …there are the ones which I downloaded from Youtube…".

Table 5: Summary for the access to the materials

THEME	CODES	INTERVIEWEE NO
Materials	Education Information Network	1,2,7,9,8,10,11,12,13,6
	Making his/her own materials	2,4,7,9,10,11,13,5,8
	Download from internet	3,12,5,6
	Through social media	4
	From students' assignments	6

3. 5. Technical Problems

The next theme in the study was the technical problems that our teachers experiences when they were using the IWBs in their classrooms. The most common technical problem was the touch-screen sensitivity: when the teachers touched the screen, the IWBs did not detect their touch or misplaced the location. The USB port in one classroom was broken. Five participants told us that the connection between the teacher's and student's PC and the IWBs did not work. Five said that the Internet provided by Ministry of National Education had the restricted access. One talked about the loud speaker malfunction, one had the difficulty in uninstalling some programs on the IWBs, one had a trouble in moving some programs from one IWB to another, two experiences system crash, and one had a problem with the viruses (see Table 6 for the summary). For technical problems, Teacher 11 said "…ın the schools where teacher shifts (In Turkey most of the schools have no any self-contained classes for teachers so they change classes)… because boards continually are in the same classes, students can use them roughly…their technical adjustments can break constantly… their touching adjustment can change (break) or the demanded things can be deleted…"

Table 6: Summary for the technical problems

THEME	CODES	INTERVIEWEE NO
Technical problem	Not detect touch	2,3,5,6
	USB input malfunction	4
	Calibration	7,11
	Connection PCs and IWBs	9,8,11,13,6
	Restricted internet access	9,11,12,13,6
	Loud speaker malfunction	1
	Removal of required programs	11
	Moving programs	11
	IWBs system crash	13,6
	Virus	6
	Not state any idea	10

3. 6. Discipline Problems

The other theme that the teachers mentioned while they were talking about the IWBs in their classrooms was the discipline problems. The problem took place when more than one student wanted to use the IWBs at the same time, or when the students listened to the music loudly or accessed to the unauthorized materials at the breaks. Two participants told that if the teacher was not prepared to the lesson, the IWBs could create a problem, especially the noise by

the students (see Table 7 for the summary). For the discipline problems, Teacher 4 said "…. (It) happens at breaks…after teachers leaving, children listen to music loudly on their own. Then they can watch anything which is brought by them…".

Table 7: Summary for the discipline problems

THEME	CODES	INTERVIEWEE NO
Discipline Problem	More than one person intervene	1
	No encounter	2,3,9,8,12,5
	In breaks, loud music	4
	In breaks, uncontrolled content use	4,10
	Using knowledge level material, students get bored	7,6
	If you are not ready for the lesson, students make noise	7
	Not state any idea	11,13

3. 7. The Effects on the Lesson

The other theme in this study was the effects of the IWB use on the teachers' lessons. Firstly, six teachers indicated that the IWB use increased the student participation in the course content. Similarly, four said that the IWB use excited the students. Ten participants stressed the fact that the IWB attracted the students' attention to the class discussions. One told that it increased the pace of the lesson, five thought that the IWBs facilitated the lecture, helped the students focus on the topics, helped them visualize the content matter, prevented negative situations, and saved time for the teachers. However, for one teacher, the IWBs was the same with the data projector (see Table 8 for the summary). For the effect on the lesson, Teacher 3 said "… It prevents the negative situation(s)…it supports the lesson, embodying. (Students) become more motivated…when you diversify the visual materials… children become more interested…".

Table 8: Summary for the effects of IWBs on the lesson

THEME	CODES	INTERVIEWEE NO
The effects on the lesson	Raising the participation of the students to the lesson	3,9,2,5,6,8
	Provide excitement	7,6,13,8
	Draw students attention	7,9,2,3,6,8,12,13,5,10
	Raising the pace of the lesson	8
	Facilitating the lecturing	7,10,13
	Same as projection machine	11,
	Motivate the students	2,3,9,5,6,8,12
	Focus students mind on a topic	2
	Facilitate the adaption to the lesson	2
	Prevent negative situations	3
	Visualize the lesson	3,4,7,9,10,13,5,6,8
	Make students stagnate	4
	Saving time	8,12

3. 8. Improving the IWB Effectiveness

The last theme in our study resulted from the suggestion question in our interviews. When asked what could be done to improve the effectiveness of IWBs in the classrooms, eight participants said that the number and diversity of resources should be increased, and three stressed the improvement on the Internet and the Internet infrastructure. One of the participants suggested that the curriculum should be revised according to the use of IWBs in the classrooms. Three teachers told that more interactive software should be developed to improve effectiveness of the IWBs. One recommended training on the use of IWBs for teachers. Similarly, three offered the same training for the students. Three participants suggested that required licensed programs should be provided, and two stressed the training for those programs. Five of the participants indicated that the virtual class application (the application enabling the connection between the IWBs and PCs) should be implemented to improve effectiveness of the IWBs (see Table 9 for the summary).

Table 9: Summary for improving the IWB effectiveness

THEME	CODES	INTERVIEWEE NO
Improving the IWB effectiveness	Resources should be increased	1,5,6,7,10,11,12,13
	Curriculum must be revised in terms of IWBs	2
	Infrastructure works should be enhanced	2,8
	Internet should be provided	3,5,7
	More interactive packaged software should be developed	4,6,8
	Training should be provided for teachers	6
	Training should be provided for students	7,11,13
	Required licenced programmes should be provided	6,7,9
	Required programmes training should be provided	7,9
	Virtual Class application should be implemented	6,8,9,11,13

4. Discussion

This study reveals that somehow the teachers in this study learn about the IWB and teach their subjects at hands of the IWB gropely. According to the teacher 6, she took training for one week on IWB but not specifically on her field. All the data gathered from 13 participants have showed that the teachers use their own limited knowledge about the IWB and its usage on their own field. Also, the findings in our study suggest that the teacher training on the IWBs plays an important role in the effective use of the IWBs in the classrooms. The teachers with the IWB training know how to use the IWB programs such as Epic Pen and Antropi Teach. However, as put in the studies in Reedy (2008), Lai (2010) and Türel and Johnson (2012),

knowing how to use those basic IWB programs does not mean that every teacher with the training can use them effectively. Trained teacher in our study, likewise, could use standard programs only such as Microsoft Office Applications.

Similar to the findings in the studies by Hall and Higgins (2005), Wall et al. (2005), and Smith et al. (2005), this study shows that according to the teachers' remarks, the students like games, versatility and multimedia on the IWBs. However, as one teacher (Teacher 9) in the study puts it, "when we focus on a game, we cannot give up," the games do not always provide positive outcomes for the IWBs (Mama & Hennessy, 2010).

The use of the IWBs by the teachers shows that the expository teaching approach is the main approach used by the teachers (see Akcaoğlu et al., 2015). The teachers mainly use presentations, and depending their lesson and content, they use videos, listening materials or visuals. Nonetheless, none of them reveals the authentic aim of the IWBs. Similar to what Beauchamp (2004) and Glover et al. (2007) put forward in their studies, the teachers in our study also could not reach the expert or enhanced interactive phases.

In addition to this, the student engagement with the IWBs in the classrooms relies on the teacher permission. Like the use of the IWBs by the teachers, the students use the IBWs mainly for their presentations or the videos for the lesson (see Beauchamp & Kennewell, 2010). According to their study, the students should change their role from viewers to active users of the IWBs to enhance higher order thinking skills. Without using interactive feature of the IWBs, this cannot be possible. However, it is only during the break time in School B in our study that the students use the IWBs more interactively such as Googling or searching on Wikipedia.

The Trained teachers generally have access to their materials using the EBA. Teachers usually make use of the Internet resources for the materials. They prepare their lessons at home and carry it to the IWBs. This result suggests that the fundamentals of pedagogy remain unchanged, and the teachers are not the guides of their students but are the masters of the knowledge.

With the technological advancement, different from what Halls and Higgins (2005) study (2005) reported in their paper, the problems such as monitor brightness, sunlight or freezing are no longer perceived as technical problems. However, less sensitive touch screens, the Internet availability and restricted Internet are the contemporary technical problems for the teachers in the school. In school A, for example, the teachers want to have access to the Internet to show videos or to listen to a song on YouTube. Also, in school B, the teachers have access to the Internet, but because of the restrictions on the Internet, they complain about not finding the

necessary resources or materials. In school B, the students have PCs, but without network and appropriate application (virtual class) they are useless for class. As a result it can be said that the infrastructure works have not been completed yet (see Somyürek et al. (2009) for a similar discussion).

Almost every effect of the IWBs on the lessons is considered positive. Raising participation, drawing attention, providing excitement, raising the pace of the lesson, facilitating the lecture, motivating students, visualizing the lesson, saving time, focusing students' attention are the positive effects of IWBs on the lesson, similar to the findings reported in the studies by Elaziz (2008), Gillen et al. (2007), and Gursul and Tozmaz (2010).

To improve the effectiveness of the IWBs, most of the teachers want to grow their resources. For existing resources seem not adequate for the effectiveness. Also, for each lesson, the requests from the teachers vary. As a result, the curricula in the schools should be revised, modified or updated according to the technological advancements in the classrooms. Also, existing software on the IWBs does not satisfy the teacher expectations. The teachers demand for more effective, more specialized packaged programs for their lessons. Finally, with the use of IWBs only cannot satisfy the expectations. Without any connection between the IWBs and teacher and student PCs, this technological movement in the classroom will remain incomplete. The teachers' trainings about the IWB should be specialized on their own fields. The trainings should be constant.

In a further study on the same topic, the researchers can include more participants using maximum variation. Also, in order to validate the trustworthiness, they can make use of other data collection methods such as observation in the classrooms or teachers' diaries.

5. Assumptions and Limitations

This study only included the teachers from two high schools in Yenice. The participants were selected using convenience sampling, e.g. the researchers could reach them easily spending less time locating other possible participants. As a result, the sample size was limited to thirteen teachers and the data were collected only by an interview. All participants words are supposed to be true.

6. References

AKGÜN, M. & KORU, G. (2015). Akıllı Tahta Kullanımına Yönelik Öğrenci Tutumu ve Öğretmen Görüşlerinin İncelenmesi (Ankara İli Örneği). *Qualitative Studies*, (1), 1-12.

AKTAS, I., GÖKOĞLU, S., TURGUT, Y. E., & KARAL, H. (2014). Öğretmenlerin FATİH Projesine yönelik görüşleri: Farkındalık, öngörü ve beklentiler. *Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi*, 8(1).

AKYÜZ, H. İ., PEKTAŞ, M., KURNAZ, M. A., & MEMİŞ, E. K. (2014). Akıllı tahta kullanımlı mikro öğretim uygulamalarının fen bilgisi öğretmen adaylarının TBAP'larına ve akıllı tahta kullanıma yönelik algılarına etkisi. *Cumhuriyet International Journal of Education*, 3(1).

ALTIN, H. M. & KALELİOĞLU, F. (2015). FATİH Projesi ile ilgili öğrenci ve öğretmen görüşleri. *Başkent University Journal of Education*, 2(1).

BANOĞLU, K., MADENOĞLU, C., UYSAL, Ş. & DEDE, A. (2014). FATİH projesine yönelik öğretmen görüşlerinin incelenmesi (Eskişehir ili örneği). *Eğitim Bilimleri Araştırmaları Dergisi*, 4(1), 39-58.

BAŞIBÜYÜK, K., ERDEM, E., ŞAHİN, Ö., GÖKKURT, B. & SOYLU, Y. (2014). Matematik Derslerinde Akıllı Tahta Kullanımına İlişkin Öğretmen ve Öğrenci Görüşleri. *Adiyaman Üniversitesi Eğitim Bilimleri Dergisi*, 4(2), 72-97.

BEAUCHAMP, G. (2004). Teacher use of the interactive whiteboard in primary schools: Towards an effective transition framework. *Technology, Pedagogy and Education*, 13(3), 327-348.

BEAUCHAMP, G. & KENNEWELL, S. (2010). Interactivity in the Classroom and Its Impact on Learning. *Computers & Education*, 54(3), 759-766.

BIDAKI, M. Z. & MOBASHERI, N. (2013). Teachers' Views of the Effects of the Interactive White Board (IWB) on Teaching. *Procedia-Social and Behavioral Sciences*, 83, 140-144.

BIRIŞÇI, S. & UZUN, S. Ç. (2014). Matematik Öğretmenlerinin Derslerinde Etkileşimli Tahta Kullanımına Ilişkin Görüşleri: Artvin ili örneği. *İlköğretim Online*, 13(4).

CHRISTENSEN, L. B., JOHNSON, B. & TURNER, L. A. (2014). *Research methods, Design, and Analysis* (12th ed.), (*Çev.* AYPAY, A.). Ankara: Anı Yayıncılık.

COMI, S. L., ARGENTIN, G., GUI, M., ORIGO, F. & PAGANI, L. (2017). Is It the Way They Use It? Teachers, ICT and Student Achievement. *Economics of Education Review*, 56, 24-39.

ÇELIK, H. C. & GÜNDÜZ, S. (2015). Öğrencilerin Matematik Dersinde Akıllı Tahta Kullanımına Yönelik Tutumlarının Çeşitli Değişkenler Açısından İncelenmesi. *Dicle Üniversitesi Ziya Gökalp Eğitim Fakültesi Dergisi*, 25, 157-174.

ÇETINKAYA, L. & KESER, H. (2014). Öğretmen ve Öğrencilerin Tablet Bilgisayar Kullanımında Yaşadıkları Sorunlar ve Çözüm Önerileri. *Anadolu Journal of Educational Sciences International*, 4(1).

DEMIRCIOĞLU, G. & YADIGAROĞLU, M. (2014). Kimya Öğretmenlerinin Fatih Projesine İlişkin Görüşleri. *Eğitim ve Öğretim Araştırmaları Dergisi*, 3(2).

DINÇER, S. & YAVUZ, C. (2013). Eğitsel Ajan Kullanımının Öğrenci Başarısına Etkisi: Bir Meta-Analiz Çalışması. *International Journal of Human Sciences*, 10, 35-48.

DURSUN, Ö. Ö., KUZU, A., KURT, A. A., GÜLLÜPINAR, F. & GÜLTEKIN, M. (2013). Okul Yöneticilerinin FATİH Projesinin Pilot Uygulama Sürecine Ilişkin Görüşleri. *Trakya Üniversitesi Eğitim Fakültesi Dergisi*, 3(1).

ELAZIZ, M. F. (2008). *Attitudes of Students and Teachers Towards the Use of Interactive Whiteboards in EFL Classrooms.* Unpublished PhD Thesis, Ankara: Department of Educational Sciences, Bilkent University.

GILLEN, J., STAARMAN, J. K., LITTLETON, K., MERCER, N. & TWINER, A. (2007). A 'Learning Revolution'? Investigating Pedagogic Practice Around Interactive

Whiteboards in British Primary Classrooms 1. *Learning, Media and Technology*, 32(3), 243-256.

GLOVER, D., MILLER, D., AVERIS, D. & DOOR, V. (2007). The Evolution of an Effective Pedagogy for Teachers Using the Interactive Whiteboard in Mathematics and Modern Languages: An Empirical Analysis from the Secondary Sector. *Learning, Media and Technology*, 32(1), 5-20.

GÖRHAN, M. F. & ÖNCÜ, S. (2015). Öğretmen ve Idareci Gözünde Etkileşimli Tahta: Kullanım Kolaylığı ve Yarar Algısı Üzerine Bir Durum Çalışması. *Journal of Teacher Education and Educators*, 4(1), 53-77.

GURSUL, F. & TOZMAZ, G. B. (2010). Which One is Smarter? Teacher or Board. *Procedia-Social and Behavioral Sciences*, 2(2), 5731-5737.

GÜLCÜ, İ. (2014). Etkileşimli Tahta Kullanımının Avantajları ve Dezavantajlarına Yönelik Öğretmen Görüşleri. *XVI. Akademik Bilişim-AB*, 5-7.

HALL, I. & HIGGINS, S. (2005). Primary School Students' Perceptions of Interactive Whiteboards. *Journal of Computer Assisted Learning*, 21(2), 102-117.

İNCIK, E. Y. & AKAY, C. (2015). Mersin Üniversitesi Öğretmen Adaylarının FATIH Projesine Ilişkin Görüşleri. *International Online Journal of Educational Sciences*, 7(2), 142-154.

JEWITT, C., MOSS, G. & CARDINI, A. (2007). Pace, Interactivity and Multimodality in Teachers' Design of Texts for Interactive Whiteboards in the Secondary School Classroom. *Learning, Media and Technology*, 32(3), 303-317.

KELEŞ, E. & TURAN, E. (2015). Öğretmenlerin Fırsatları Arttırma ve Teknolojiyi Iyileştirme Hareketi (FATİH) Hakkındaki Görüşleri. *Turkish Journal of Education*, 4(2).

KESER, H. & ÇETINKAYA, L. (2013). Öğretmen ve Öğrencilerin Etkileşimli Tahta Kullanimina Yönelik Yaşamış Olduklari Sorunlar ve Çözüm Önerileri. *Electronic Turkish Studies*, 8(6).

KOĞU, T. & KIŞ, A. (2016). Ders Denetiminde Öğretmenlerin Etkileşimli Tahta Kullanımına İlişkin Müdür Algıları. *Inönü Üniversitesi Eğitim Bilimleri Enstitüsü Dergisi,* 3(5).

KOŞTUR, M. & TÜRKOĞLU, H. (2017). Ortaokul Matematik Öğretmenlerinin Matematik Derslerinde Akıllı Tahta Kullanımına İlişkin Görüşleri. *Başkent University Journal of Education*, 4(1).

KYRIAKOU, A. & HIGGINS, S. (2016). Systematic Review of the Studies Examining the Impact of the Interactive Whiteboard on Teaching and Learning: What We Do Learn and What We Do Not. *Preschool and Primary Education*, 4(2), 254-275.

LAI, H. J. (2010). Secondary School Teachers' Perceptions of Interactive Whiteboard Training Workshops: A Case Study from Taiwan. *Australasian journal of educational technology*, 26(4), 511-522.

LINCOLN, Y. S. & GUBA, E. G. (1985). *Naturalistic Inquiry* (Vol. 75). Sage.

MAMA, M. & HENNESSY, S. (2010). Level of Technology Integration by Primary Teachers in Cyprus and Student Engagement. *Technology, Pedagogy and Education*, 19(2), 269-275.

MERCER, N. HENNESSY, S. & WARWICK, P. (2010). Using Interactive Whiteboards to Orchestrate Classroom Dialogue. *Technology, Pedagogy and Education*, 19(2), 195-209.

MILES, B. M. & HUBERMAN, A. M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook* (2nd ed.). Thousand Oaks, CA: Sage.

MILLER, D. & GLOVER, D. (2007). Into the Unknown: The Professional Development Induction Experience of Secondary Mathematics Teachers Using Interactive Whiteboard Technology. *Learning, Media and Technology*, 32(3), 319-331.

MORRIS, D. (2010). Are Teachers Technophobes? Investigating Professional Competency in the Use of ICT to Support Teaching and Learning. *Procedia-Social and Behavioral Sciences*, 2(2), 4010-4015.

PAMUK, S., ÇAKIR, R., ERGUN, M., YILMAZ, H. B. & AYAS, C. (2013). Öğretmen ve Öğrenci Bakış Açısıyla Tablet PC ve Etkileşimli Tahta Kullanımı: FATİH Projesi Değerlendirmesi. *Kuram ve Uygulamada Eğitim Bilimleri,* 13(3), 1799-1822

REEDY, G. B. (2008). PowerPoint, interactive whiteboards, and the visual culture of technology in schools. *Technology, Pedagogy and Education*, 17(2), 143-162.

SALTAN, F. & ARSLAN, K . (2012). Teachers' Perception of Interactive White Boards: a Case Study. *Mersin Üniversitesi Eğitim Fakültesi Dergisi*, 9 (2), 353-365.

SARI, U. & GÜVEN, G. B. (2013). Etkileşimli Tahta Destekli Sorgulamaya Dayalı Fizik Öğretiminin Başarı ve Motivasyona Etkisi ve Öğretmen Adaylarının Öğretime Yönelik Görüşleri. *Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi*, 7(2).

SMITH, F., HARDMAN, F. & HIGGINS, S. (2006). The Impact of Interactive Whiteboards on Teacher–Pupil Interaction in the National Literacy and Numeracy Strategies. *British Educational Research Journal*, 32(3), 443-457.

SMITH, H. J., HIGGINS, S., WALL, K. & MILLER, J. (2005). Interactive Whiteboards: Boon or Bandwagon? A Critical Review of the Literature. *Journal of Computer Assisted Learning*, 21(2), 91-101.

SPRADLEY, J. P. (1979). *The Ethnographic Interview*. New York: Holt, Rinehart, and Winston.

SÜNKÜR, M., ARABACI, İ. B. & ŞANLI, Ö. (2012). Akilli Tahta Uygulamalari Konusunda İlköğretim II. Kademe Öğrencilerinin Görüşleri (Malatya İli Örneği). *E-Journal of New World Sciences Academy*, 7(1), 1C0496.

SWEENEY, T. (2013). Understanding the Use of Interactive Whiteboards in Primary Science. *Australasian Journal of Educational Technology*, 29(2).

TATLI, C. & KILIÇ, E. (2013). Etkileşimli Tahtalarin Kullanimina Ilişkin Alinan Hizmetiçi Eğitimin Öğretmen Görüşleri Doğrultusunda Değerlendirilmesi. *Journal of Educational Sciences & Practices*, 12(24).

TAŞ U. E., ARICI Ö., OZARKAN H. B. & ÖZGÜRLÜK, B. (2016). *Uluslararası Öğrenci Değerlendirme Programı PISA 2015 Ulusal Raporu*. Türkiye Cumhuriyeti Milli Eğitim Bakanlığı Ölçme, Değerlendirme ve Sınav Hizmetleri Genel Müdürlüğü, Ankara.

TEKINARSLAN, E., TOP, E., GÜRER, M. D., YIKMIŞ, A., AYYILDIZ, M., KARABULUT, A. & SAVAŞ, Ö. (2015). Etkileşimli Tahtada Çoklu-Ortam Nesneleriyle Yapılan Öğretimin Öğretmen Adaylarinin Zenginleştirilmiş İçerikle Öğretime Yönelik Tutumlarina Etkisi. *Eğitim Teknolojisi Kuram ve Uygulama*, 5(2).

TONDEUR, J., KERSHAW, L. H., VANDERLINDE, R. R. & VAN BRAAK, J. (2013). Getting Inside the Black Box of Technology Integration in Education: Teachers'

Stimulated Recall of Classroom Observations. *Australasian Journal of Educational Technology*, 29(3).

TOPTAŞ, V. (2016). Sınıf Öğretmeni Adaylarının Etkileşimli Tahta Kullanımlarına İlişkin Görüşleri. *Kırıkkale Üniversitesi Sosyal Bilimler Dergisi*, 6(2).

TORFF, B. & TIROTTA, R. (2010). Interactive Whiteboards Produce Small Gains in Elementary Students' Self-Reported Motivation in Mathematics. *Computers & Education*, 54(2), 379-383.

TÜREL, Y. K. & JOHNSON, T. E. (2012). Teachers' Belief and Use of Interactive Whiteboards for Teaching and Learning. *Educational Technology & Society*, 15(1), 381-394.

UYGARER, R., UZUNBOYLU, H. & OZDAMLI, F. (2016). A Piece of Qualitative Study About Digital Natives. *Anthropologist*, 24(2), 623-629.

VURAL, A. R. & CEYLAN, V. K. (2014). *Fatih Projesi Eğitimde Teknoloji Kullanım Kursunun Öğretmen Görüşlerine Göre Değerlendirilmesi.* INET-TR'1419, Türkiye'de İnternet Konferansı, Yaşar Üniversitesi, İzmir.

WALL, K., HIGGINS, S. & SMITH, H. (2005). 'The Visual Helps Me Understand the Complicated Things': Pupil Views of Teaching and Learning With Interactive Whiteboards. *British journal of educational technology*, 36(5), 851-867.

WOOD, R. & ASHFIELD, J. (2008). The Use of the Interactive Whiteboard for Creative Teaching and Learning in Literacy and Mathematics: A Case Study. *British journal of educational technology*, 39(1), 84-96.

YILDIRIM, A. & ŞIMŞEK, H. (2016). *Sosyal Bilimlerde Nitel Araştırma Yöntemleri* (10. Ed.). Ankara: Seçkin Yayıncılık.

ZEVENBERGEN, R. & LERMAN, S. (2008). Learning Environments Using Interactive Whiteboards: New Learning Spaces or Reproduction of Old Technologies?. *Mathematics Education Research Journal*, 20(1), 108-126.