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Understanding an Elementary School Teachers' Journey of Using Technology in the Classroom from Sand Table to Interactive Whiteboard

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Abstract

The aim of this study is to understand an elementary teachers' experiences about using interactive whiteboard (IWB) in the classroom. Narrative inquiry were adopted to conduct the study. The data were collected through semi-structured interviews with the teacher and analysed through narrative analysis. In the study, two major stories emerged. The first story was about the characteristics and difficulties of being an innovative and transformative teacher. In the second story, the use of technology in the classroom were cited. Second story consisted of such sub-stories as changing student profiles, teaching-learning process, measurement and evaluation process, infrastructural adequacy, stakeholder interaction, facilitator role of the technology and challenges of using IWB in the classroom. In all these stories, the examples and advantages of effective use of IWB in the classroom were explained. We can have the following suggestions from the words of the classroom teacher who has been using various technological tools in his classroom for about 40 years, including 10-year IWB use: Teachers should be open-minded for innovation in the sense of professional development, consider the interests of students, reduce the prejudice about the use of technology, utilize the processes that increase and facilitate the learning.

Keywords: Narrative research, Classroom teachers, Interactive whiteboard

Introduction

How and by whom the integration of information and communications technology (ICT) will be achieved is one of the priority issues in the field of education. The ways of using the ICT effectively is another important matter in this regard. This is because teachers are expected to both use the ICT effectively and teach students the ways of accessing

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information through the ICT. In this context, the increasing use of interactive whiteboards (IWBs) in the instructional process has attracted the attention to what teachers actually do in this process, what kind of problems they experience, how they deal with these problems and what the effective practices are.

The use of technologies like IWBs in the classroom can provide teachers and students convenience and variety. Lack of such technologies means that the quality and the benefit of the process cannot be observed (Tataroglu & Erduran, 2010). IWBs can be defined as new generation whiteboards that facilitate and support learning and teaching (Turel, 2011) In different countries, projects are implemented and large amounts of money are spent to ensure the technology integration in education, use technology effectively and make its use widespread (Ekici, 2008; Lai, 2010; Saltan, Arslan & Gok, 2010; Turel, 2011; 2012). In this regard, countries such as Australia, England, United States and South Africa have many projects and investment particularly at the elementary school level (Lai, 2010). For example, in 2007, IWBs were used at 98% of high schools and 100% of primary schools in England (Becta, 2008, cited in Lai, 2010). Based on the literature, Emeagwali and Naghdipour (2013) lists the benefits of IWB to the instructional process as follows:

- Increasing student motivation and sense of responsibility.
- Increasing participation.
- Increasing the effectiveness and frequency of student-teacher and student-student interactions.
- Providing the opportunity to prepare for the lesson effectively.
- Supporting teacher development and providing an opportunity for it.
- Providing the opportunity to re-produce instructional materials into the digital environment.

Studies on IWBs show that teachers' attitudes are positive, IWBs are used relatively easily and some problems are experienced (Saltan et al., 2010). In a study, middle school teachers emphasized the benefits of using IWBs in their classes and the importance of participating in workshops on how to use them. Besides, they stated that the practical knowledge of IWBs was extremely important and this would be helpful in integrating IWBs into courses (Lai, 2010). In England, the effect of IWBs on student-teacher interaction was investigated in teaching reading-writing and mathematics. Based on the findings, it was emphasized that IWBs had a small effect on discourse moves in the context of teaching through interacting with the whole class, there was quicker progress in lessons taught with IWBs and less time was spent on group-work activities (Smith, Hardman & Higgins, 2006).

According to a study conducted with 2007 teachers from 12 cities to determine teacher competencies in Turkey, the rate of teachers who never use instructional technologies in their classrooms was found to be 22%, and that of those who use these technologies a few times a month was 49%. From this perspective, it can be argued that the investment in instructional technologies can be ineffective without necessary teacher competencies (Turkish Education Association, 2009). Similarly, according to the results of a study by the Ministry of National Education, 43% of teachers needed professional development in instructional technologies and materials development. 30.21% of teachers also needed in-service training on "using IWBs". Considering that this study was conducted with 57.358 teachers, it seems that nearly 25.000 teachers needed support in instructional technologies, and nearly 18.000 teachers in the use of IWBs (Ministry of National Education, 2012a).

The studies in the literature report that IWBs are tools that are beneficial, useful and facilitate the instructional process (Ekici, 2008; Saltan et al., 2010; Tataroglu & Erduran,

2010), workshops and practical knowledge on usage are of importance (Lai, 2010), and with IWBs, the instructional process progress more quickly and group-work activities become easier (Smith et al., 2006). On the other hand, student motivation decreases when IWBs are not used effectively, and there are problems due to the lack of infrastructure and teachers' lack of knowledge (Turel, 2012). Among the studies presented in this section, those conducted in Turkey mostly included quantitative methodologies (Ekici, 2008; Saltan et al., 2010; Turel, 2012; Tataroglu & Erduran, 2010). Therefore, there is a need for studies that examine the use of IWBs more deeply. In this sense, this study is expected to both provide more in-depth insights to IWBs and contribute to the field in terms of narrating the process from the perspective of a practitioner. Besides, this study is also the first of the studies that examine the use of IWBs through narrative inquiry in the field of education in Turkey.

One of the reasons behind the widespread use of IWBs at schools is the increase in the software developed for IWBs in Turkey in the last 10 years and the decrease in unit cost. Technical problems experienced after the IWBs are set up in classrooms and teachers and students' lack of software and hardware knowledge can prevent macro and micro-level investments from being successful. In this regard, we need to know what teachers experience in using investments and resources related to IWBs, and students' achieving meaningful learning while having fun at the same time. Revealing teachers' experiences of IWBs through scientific processes is expected to contribute to increasing the quality of the instructional processes in addition to providing information to policy makers, planners and investors. Therefore, a more in-depth and detailed examination of the experiences of particularly the teachers who are experienced in using IWBs can be argued to be more meaningful.

In the study, the transformative learning theory was adopted in understanding the professional development of an elementary school teacher in using IWBs. The transformative learning theory firstly appeared in Mezirow's 1978 study on the drastic changes and experiences experienced women after they got back to university. The meanings that these women's experiences formed in their own worlds and how they were seen by others are the dimensions that this theory mostly focused on. The primary emphasis of transformative learning is on adult education and professional development of teachers or teacher candidates (King, 2002; 2004; Mezirow, 2000; 2003). In this study, the transformative learning theory formed the basis for holistically examining an elementary school teachers' IWB experiences, including before and after.

Transformative learning is the learning that transforms problematic reference frameworks into a form that is more intrinsic, open, reflective and open to change. In another definition, transformative learning is adults' meta-cognitive questioning (Mezirow, 2003). According to Mezirow (1997), individuals develop a world in which they define their feelings, thoughts, concepts and values based on their experiences in daily life. These definitions are called the *reference framework* that individuals form themselves. Accordingly, this reference framework is divided into two as "*habits of mind*" and "*perspective*". Habits of mind is individuals' thinking, feeling and acting based on cultural, economic, educational, political or psychological codes they live in. Ethnocentrism is an example of habits of mind. Perspective, on the other hand, is open to change compared to habits of mind. In perspective, individuals change/revise their assumptions based on their state of solving the problems they encounter. This study focused on revealing how the participant's habits and perspective regarding the use of technology in education in general and IWBs in particular changed, and his reflections on the factors affecting these issues and their consequences.

Transformative learning highlights statements, reflexivity and autonomy (King, 2004; Merriam, 2004; Mezirow, 2003). With statements, the emphasis is on individuals' evaluations regarding their own beliefs, feelings and values, and thus, their meta-cognitive questioning. Reflexivity is about the interaction of a new experience with individuals' prior experiences. Experiencing, by itself, is not enough for individuals. They need to make sense of their new experiences by making a critical evaluation of the existing situation, and achieve the transformation. Autonomy is regarded as individuals' taking the responsibility of their own learning based on their knowledge, skills and moral values. These assumptions of transformative learning were discussed in the study with reference to what the elementary school teacher, whose IWB experiences were examined, did to adapt to the transformation in technology, and his professional experiences in the process. In this regard, Mehmet Bey's technology usage and reasons for using technology, and his understanding, point of view and experiences in adapting to the transformation in instructional technologies in his professional life of nearly 40 years between the years 1975-2014 were addressed from the perspective of the transformative learning theory.

The aim of the study was to reveal an elementary school teacher's experiences regarding the use of interactive whiteboards in his classroom. The following research questions were specified based on this aim:

- What does the elementary school teacher think about the use of technology in education?
- How does he make sense of the development of using technology in education in the course of time? What are his experiences in this respect?
- How does he make sense of his own professional development process regarding interactive whiteboards?
- What are his experiences related to the contributions of interactive whiteboards to the instructional processes?
- How does he solve the problems he encounters in using interactive whiteboards in the instructional processes?
- What are his suggestions to teachers who use interactive whiteboards in the context of professional development?

Method

Design

In the framework of transformative theory, this study was designed as a narrative inquiry. Narrative inquiry is an individual's effort to present the events he has experienced in the past in an orderly manner, and his presenting simple or important events he has experienced by gathering them considering time and place (Sarbin, 1986 cited in Guler, Halicioglu & Tasgin, 2013). Connely and Clandinin (1990) claim that what we know about education is based on others' stories of educational experiences (cited in Webster & Mertova, 2007). Narrative inquiry includes examining one or more individuals' experiences, collecting data by gathering the life stories of these individuals, reporting individual experiences, and chronologically listing the meanings that these experiences involve (Creswell, 2007). In other words, narrative inquiry is analysing and discussing the stories that are narrated, heard and read with respect to education (Webster & Mertova, 2007). Narrative inquiry in education mostly focuses on understanding how teachers structure their practices. Reflective practice and teacher research emphasize hearing teachers stories and listening to their voice (Bell, 2002). In this scope, Johnson (2007)

states that to understand teachers' professional development, how teachers' define their learning experiences should be firstly revealed.

In accordance with the basic assumption of narrative inquiry, the transformative learning theory was adopted in this study. In this regard, taking the transformative learning theory as the basis was thought to provide better insights into how the elementary school teacher makes sense of his professional development process with IWBs both in terms of place and time, and from his own perspective. It was aimed to understand what the elementary school teacher, whose experiences were examined in the study, did to use IWBs in his classes through his own statements. The study is of significance in terms of presenting what the teacher did to use IWBs effectively in the context of his professional development from his perspective. Therefore, narrative inquiry was deemed to be suitable to reveal the complexity and the development of the teacher's practices with IWBs in the course of time.

Elementary school teacher, Mehmet Bey, and his participation in the study

The professional experience of the elementary school teacher, Mehmet Bey (i.e. a pseudonym), is nearly 40 years. He retired after working as an elementary school teacher at state schools for a total of 25 years, 15 years in villages and 10 years in cities. Afterwards, he continued to teach at private schools. He was interested in using tools in the instructional processes because his elementary school teacher did experiments in lessons and used simple tools when he was an elementary school student, and thus, he used every kind of contemporary technology in his classes during his teaching career. He was known in the city where he worked as one of the elementary school teachers who first used IWBs with their own efforts. He had used IWBs in his classes for approximately 10 years. Mehmet Bey convinced parents to financially support the school for IWBs, and after he successfully used an IWB in his classroom, he supported and pioneered some of the elementary school teachers in his school to use IWBs. After starting to use IWBs due to the elementary education curricula renewed in 2005, which prescribed the use of technology in the instructional processes, and his own interest, he trained other teachers on the use of IWBs with the FATİH[1] Project and shared his experiences with them.

The participation process of Mehmet Bey to the study can be summarised as follows. The second author of this study conducted a semi-structured interview with Mehmet Bey as an assignment for a doctoral course, Qualitative Research Methods, in 2013. In this assignment, the aim was to develop interviewing skills and carry out a pilot study. The first author, who was the instructor of the course, evaluated the assignment and realised that the teacher had unique experiences regarding the use of IWBs and provided interesting examples. As a result of reviews and discussions on what type of a study can be conducted with this teacher, it was decided that a narrative inquiry could be performed. The researchers got an appointment from the teacher, the research project was explained and he was asked whether he would participate in the study. The teacher stated that he would participate voluntarily. The necessary permissions were then received from the Ethics Committee of the University and the Provincial Directorate of National Education.

[1] The FATIH Project: "Movement of Enhancing Opportunities and Improving Technology", known as the FATIH Project, is one of the most significant educational investments in Turkey. The FATIH Project proposes that "Smart Class" project is put into practice in all schools around Turkey. With this project, 42.000 schools and 570.00 classes will be equipped with the latest information technologies and will be transformed into computerized classes (MoNE, 2012b).

Data gathering and analysis

The research data were gathered through three successive semi-structured interviews with Mehmet Bey. The first interview was on December 26, 2013, which was within the scope of the doctoral assignment. Following this interview, the researchers decided on the design of the study to be narrative inquiry after reviewing the literature and discussions for nearly six months to determine the re-planning process of the study. The second interview was conducted on September 23, 2014. This interview consisted of questions towards deepening the data obtained from the first interview and planning the process within narrative inquiry. To deepen and make sense of the data obtained from the first two interviews, questions were developed for a further interview and the third interview was conducted on December 6, 2014. All the data obtained from the three interviews were examined by the researchers and the necessary preliminary works were completed.

In qualitative research, data analysis is about organising the raw data in a way that they can be presented to the reader (Liamputtong, 2009). This can be achieved by transforming the data into a clear and meaningful form (Liamputtong, 2009; LeCompte, 2000). The data of this study were analysed using narrative analysis. Narrative analysis includes analysing participants' stories and re-storying them in a way that is meaningful to the reader. In this process of re-storying, elements such as time, place and set of events are examined. Because individuals do not present their stories in a chronological order in narrative inquiry, the researcher needs to pay attention to such elements and make the analyses that would present the events in a chronological order. More clearly, while a narrator narrates his/her stories in a random order, a researcher needs to analyse the story of this narrator in a way to present it as "introduction, body, conclusion" or "past, present, future" (Liamputtong, 2009).

Atkinson (1998) emphasizes three important points regarding the process of analysis in narrative inquiry. One of these is that the researcher should look for links between stories and events rather than being judgemental in the narrative process. The researcher should try connecting events without judging transitions, classifications and stories. The second point is that the phenomenon that is focused in narrative inquiry is a life story, and it is a text like a poem or a novel. In other words, the researcher should present the interaction of the hero with the world to the reader without detracting its originality. This is because it will find its own audience like a poem or a novel. The third point is that every life story is from within the life. Therefore, it will present people examples from life. In this study, the researchers aimed to present the stories of Mehmet Bey, the elementary school teacher who shared his experience with IWBs in his classroom, in a process as natural as possible. Mehmet Bey's experiences are narrated to teachers who use or want to use IWBs in their classrooms.

Findings

In this study focusing on understanding Mehmet Bey's experiences of using IWBs, two main stories were constructed as a result of the narrative analyses. These are "Mehmet Bey as a Teacher" and "His Use of Technology in the Classroom". The first main story consisted of four sub-stories including what the technological tools that Mehmet Bey experienced in his professional life of 40 years were, how these tools transformed in the course of time, how the teachers and students adapted to this transformation, and how and for what purpose he used IWBs in his classroom. In addition, his story of teaching also involved becoming innovative and transformative teachers, and its difficulties. In the second main story, he narrated stories about his personal experiences of technology-based professional development and his perspective on technology.

Mehmet Bey as a teacher

Graduating the teacher's training school in 1975, Mehmet Bey started the profession as an elementary school teacher in a village of Kutahya province in the same year. After working in a village of Ankara, he was appointed to Eskisehir and retired here. Following his retirement, he worked as an elementary school teacher at two private schools in Eskisehir. He had still been working at a private school at the time of the study. Mehmet Bey met IWBs at a state school in 2005. His working at private schools was due to his competency in using IWBs in recent years. He stated that he was the first teacher in Eskisehir who used an IWB by saying "I am one of the teachers, actually the teacher, who had an IWB installed to his classroom 10 years ago" (Ref3-7), and he shared his experiences with his colleagues in those years. In this sense, he also said "It was 10 years ago. We even gave a demonstration at the teacher's house. Of course there were also principals invited." (Ref3-4). He expressed the role of IWBs in his being invited to work at a private school and then working at another private school after his retirement from a state school by saying:

> They hired me there (private school B) because I was using technology. They didn't have any IWBs in first grades, and they said they would buy. I used to project to a curtain behind which there was the board. It was a brand which I don't remember now. I used to stick it to the board and then installed the Smart Word on it. I already had it at state school A. I used it like an IWB in the classroom for a year... I made it myself. Then the school administration saw this. They said I deserved it and set up an IWB in my classroom. Then we used it quite easily. Something happened in the second year. They bought nine IWBs, to the library, to the entrance of the school, and I don't know, to the science high school section. They took it from my classroom. When they did it, I objected and left the school (Ref2-10).

Leaving the private school B because the school administration took the IWB from his classroom after working for nearly two years at this school following his retirement, he started working at another private school and was teaching fourth graders whom he took over as first graders at the time of the study. His views on why technology should be used in education are as follows:

> Technology is used in every area of daily life. There are scarcely any areas without technology. As in all professions, we have to use technology in the teaching profession. If we don't, we cannot teach effectively because today's children are inherently native users of new technology. So we can only teach them through technology (Ref1-1).

> I think technology is a must in education. At the beginning, I said I had been teaching for 38 years. We used to use blackboards. For about 10 years, I have been using IWBs. That's why I am one of those who can see the difference more clearly (Ref1-1).

One of the most important points that Mehmet Bey emphasized in his stories was that he told the transformation of the technologies he used in his life in a chronological order. In this chronology, he listed his experiences regarding the technologies used before IWBs. He went through a technological journey from the sand table he made in his classroom, cassette-player, videotape, presenting instructional videos on TV and using a tablet computer to finally IWBs. He narrated how he taught reading and writing by using a sand table in 1970's by saying:

> In the village where I worked in Ankara... A village house was rented, and taught children there. We only had desks. We didn't even have a blackboard. While I was thinking how to teach them in these conditions, we made a sand table in a corner of the classroom... Because there was no blackboard and how could I make them write? This idea came up at that moment... It was very interesting to the children as well. They did it. They wrote to their notebooks and there. Even in those conditions, without any equipment, teaching can be done (Ref3-1 and 2).

His journey of using technology in the classroom started with teaching reading and writing on a sand table and continued in accordance with the conditions of the day. He summarized this process from the sand table to IWBs as follows:

> In the past, they used to publish journals and lecturing CDs. We even bought TVs to classrooms or brought the ones at home, and make children watch DVDs on a topic. These were also effective in those times, and children would never forget what they learned. It is effective like going to the cinema (Ref2-2).

> We used cassette-players after the sand table. In those periods, some lectures were on cassettes. We used those. They also included tales. These were really effective in children. Of course technology developed after cassettes. Video came up. Videos were different in the past, we had VHS. Then, there were CDs and MP3s. We bought a TV to the classroom. ... there were various journals. They also included a CD for the course. We watched them. For example we watched a movie, Canakkale, about the War of Independence. We watched movies about it. So it was beneficial, but it wasn't enough. In 2005, they said every school would buy a projector. It was necessary, and I bought a laptop when they said we would teach with presentations projected to a curtain (Ref3-7).

His transition to IWBs happened first in the state school where he worked before his retirement. Based on his statements, this transition was in three stages. The first stage is the school A before his retirement, the second is the private school B and finally the third is private school C. In school A, he reported his transition to the IWBs as follows:

> I made the transition to technology in school A. This is how it happened: Computers just became widespread those days. I started preparing questions and making annual plans on a computer. ... After that, I thought if I could do this or that, and I expanded what I could do on a computer. We bought a TV to the classroom. We watched DVDs on it. Then this felt like it wasn't enough. In a search ... we encountered projectors. We projected from a projector to the curtain, but we couldn't write on it. While searching on the Internet how we could do it, I discovered that there was something called IWB. ... I contacted the company. They brought it to the school (Ref2-6).

Mehmet Bey as an innovative and transformative teacher

Mehmet Bey thought that one of his distinct characteristics as a teacher was being open to innovations. He perceived this characteristic as of significance in terms of his professional development. Therefore, in his stories, Mehmet Bey insistently emphasized a teacher's characteristic of being open to innovations. He explained the influence of his elementary school teacher behind his characteristic of being open to innovations as in the following:

> I was the first graduate of Afyon Gazli Village Elementary School. I can't forget my elementary school teacher. He was cutting out tins, and producing electricity with water vapour. He used to do experiments like this. It was really interesting to me. It has been inside me since that time. I mean I always want to make an innovation... So that goes back to those days (Ref3-1).

As a teacher, Mehmet Bey was passionate about new technologies to provide better education to elementary school children and have an effective communication with them. Mehmet Bey's following current technologies and using them in his classroom as a pioneer was sometimes criticized by his colleagues and immediate environment. However, he both developed himself and continued to set a model for his colleagues in searching and using new technologies. Mehmet Bey's views on his being open to innovations in the context of his professional development are as follows:

> I am in a constant research process. Most people get astonished; let's say you are teacher for 38-40 years. What on earth are you doing with an IWB? There are those who think like 'Did we use to do things like this in the past?'. I am open to innovations. This is my biggest advantage. Perhaps the current technology will become primitive in the future because everything changes every other day. Children also change. If we tried to teach them as if it is 30-40 years ago, we would lose these children. They can't gain anything. They can't understand and do anything (Ref2-1).

Mehmet Bey thought that only doing research, being open to innovations and sharing experiences with colleagues were not enough to use technology in the classroom effectively, and children should also be listened to and observed. In doing so, he personally experienced learning many things from students. Mehmet Bey explained how he learned some features of IWBs from his students and how this contributed to his professional development by saying:

> A teacher should know how to learn as much as he knows how to teach. I mean not like he/she doesn't know, but by saying they want to learn from students (Ref3-5). Let's say there is an eraser on the board. I was erasing words one by one, but a student came up and said we could erase all the text. He drew a circle, touched in the middle of it and erased all the text. I didn't know that for instance (Ref3-6).

Foreseeing that classrooms would be technology-supported in the future before he started using IWBs, he developed himself in this respect. He shared his experiences as "Discovering further. I said myself this [technology equipped classrooms] was what we would have in the future. There would be projectors, and computers would be used for it. I thought I needed to learn these. I prepared myself. There were courses given by schools back then, and there were also computer courses, I attended those (Ref3-9)".

Mehmet Bey, as an innovative and transformative teacher, shared his vision for the future regarding the technology integration in education and what he did in this regard. He associated his interest in using technology in education with the experiments that his elementary school teacher did during his student years. As a teacher who used IWBs in his classroom for nearly 10 years, he pointed out that he learned some features of IWBs from students and teachers should be open to this while using technology in the classroom. Moreover, he thought that students were more advanced in using technology than teachers. According to Mehmet Bey, an innovative teacher should also learn from his/her students and this constitutes an important part of professional development.

Difficulties of being a transformative teacher: Prejudice and competency

In the process of using IWBs for the first time during his teaching at a state school, Mehmet Bey mentioned some difficulties he had with his colleagues, the resistance to innovation, prejudices and how he coped with all these issues. With respect to teacher prejudices, he stated his views on what should be considered in professional trainings on IWBs and sharing experiences with colleagues, the reasons for prejudices and how these prejudices can be overcome. Mehmet Bey asserted that teachers did not want to give up on the systems that they were used to and perceived as successful, which was behind the prejudices of his colleagues. His views on his colleagues' prejudices against innovations and his experiences of overcoming these prejudices include the following:

> Nobody wanted to. Because they needed to learn. They thought learning would take hours, days. But it's not (Ref2-3).

> I discovered IWBs and had one installed to my classroom. Everybody looked at it, I told them where to touch or how to use it... they were scared. That was something that they hadn't done before. They thought how it was going to be like. They thought they didn't have a teacher like that before. But they were successful the way it was. So they

> thought how it was going to work out. They didn't want to do it. Some teachers still have this fear (Ref3-1).
>
> At first they said it was emitting radiation. Then I did a research about it all night long. The next day I explained it to my colleagues in a meeting. Zero. I mean the radiation rate of this IWB is zero. But the rate of a fluorescent light is 1800. So a smaller fluorescent light emits more radiation. When I explained this, they couldn't find any other excuses. ... I mean they had a system that they were used to ... Giving up on a system for another system, they see it as a burden. It is difficult for them. I mean they were successful the way it was for years. They were used to it. They thought they will fail when they changed it (Ref2-4).

After persuading the teachers in his school to use IWBs, Mehmet Bey organised seminars on introducing and using IWBs for other schools and the provincial directorate of national education. According to him, there was an interest aroused in IWBs after these were used for the first time in his school, and he received requests for seminars. Mehmet Bey shared his experiences with his colleagues regarding the process of choosing IWBs, the limitations and advantages of markers and how they can be used in the classroom. Some of his views regarding his experiences in this respect are as follows:

> These boards were firstly used at school A. It was then made available to other schools. There was even a meeting organised at the provincial directorate of national education. We also showed them there... Yes, I and a colleague of mine gave a talk. We were only two. Since he was also using an IWB, we gave the talk together (Ref2-7).
>
> It became widespread in Eskisehir. In that year, there were only two classrooms at school A, but this number suddenly went up to eight. After that meeting. There were a total of 24 classrooms, and eight of them had these IWBs. It also started to be used in other schools. .... Teachers need to know how they will use it at the first stage, and what benefits they will gain. Since they don't know these, the selling company only tell them the aspects that are, let's say, cool. It quickly does that, turns this around, splits a circle into four, etc. Teachers get confused since they tell these features really quick. That's why they don't want to do anything (Ref2-8).

Mehmet Bey thought that the trainings for teachers who would use IWBs for the first time should be given by teachers who actually used IWBs in their classrooms. In this regard, he observed that the trainings given by the staff of IWB companies or university instructors were not sufficient. He stated that the teacher who uses an IWB in his/her classroom can best teach another another teacher. He also thought that the trainings that are not given by a teacher can even negatively affect teachers' use of IWBs. Some of his views regarding his experiences are as follows:

> For instance, I have been using IWBs for nearly six years in this school (private school C). Although it has a history of six years, they still have such problems. They couldn't apply themselves. To the IWBs. They don't even know that an IWB has a material like this. That's why there should be a training for this. In fact, there was a training at the school. However, since the trainers were the sellers and they just told everything they knew one after another, the teachers didn't know which one would be useful for them or not. For example, they don't use the tools for angles until the fourth grade (i.e. the grade in which angles are taught). Because it was not used since the time it was told, it was forgotten in 3-4 years. Maybe that's why he can't use it. I showed a few colleagues, and they liked it. Now they started using it (Ref2-2).

His use of technology in the classroom

His use of technology in the classroom comprised of different sub-stories in which he told the dimensions of using IWBs including the technologies he used in the classroom before using IWBs. These sub-stories that focused on technology were named as "technology in the instructional processes, the change in children, perspective of future, adequacy of

infrastructure, assessment and evaluation, facilitator role, family involvement, and challenges". The scope of these sub-stories is respectively explained below.

Technology in the teaching-learning processes

In his stories on the instructional processes in the lessons he taught with an IWB, Mehmet Bey mentioned issues such as the technologies he used before IWBs, positive and negative experiences with using technology, attractiveness and facilitative role of learning with IWBs, making use of different features of IWBs, and teacher readiness in using IWBs. He reported his experiences regarding the technologies he used before IWBs as follows:

> I am one of the teachers, actually the teacher, who had an IWB installed in his classroom in Eskisehir 10 years ago. It became widespread in Eskisehir after me. After all the work I have done. By doing research, and this was because the curriculum changed in 2005. With this change, every classroom was obliged to have a computer and projector. We used to project contents to the board with the projector. For instance, PDF files, I don't make student carry books, I make them leave the books in the classroom. I scan them into PDF files and give these to students. They only need to have their flash drives with them (Ref1-1).

> I had them in my flash drive. We used to project these to the board. But we couldn't write on it. While doing research on it, I found tablet computers first. I connected my tablet to the computer in the classroom. Since it had a cable, I took them to students so that they could write, and then we projected it to the board. This was quite difficult. Then, in another research, I found that the device that could do this job was IWBs. That's how we headed towards IWBs (Ref1-2).

Due to the elementary curricula implemented as of 2005 in Turkey requiring the use of contemporary technologies in the classroom, Mehmet Bey used a computer and projector at first, a tablet computer for a short amount of time and lastly an IWB. After he started using a computer in his classroom, he transferred the coursebooks to the electronic environment as PDF files. He explained the reasons why he used a tablet computer in his classroom for a short amount of time by saying: "With the tablet... the students would come to my desk and project it to the board. Well, to the curtain. We had a curtain, not a board. That was really difficult. And time-consuming. After that, we headed towards IWBs" (Ref2-1). His trying to use a single tablet computer of himself in the classroom was not functional and effective. This made him take an interest to IWBs.

Mehmet Bey thought that IWBs made learning more interesting compared to other technologies he used. In this regard, he reported his experiences with different dimensions such as angles, visuals and performing mathematical operations in the mathematics course with his following statements:

> Being able to project and write on it. This is one of the best features of IWBs. Another feature is being able to move materials in the resources, which is also very effective. For example, most of my colleagues say that they cannot draw a triangle, or a circle on the IWB. But it is easier to draw on it. Our first lesson this semester was on angles. I showed the students and they enjoyed drawing the angles and circles. Because it has its own materials and tools. It has its goniometer, protractor, divider (Ref2-1).

Mehmet Bey compared using IWBs in teaching and teaching with a traditional blackboard, and explained that the instructional processes were easier, more practical and effective with IWBs. According to him, with IWBs, more questions can be answered, the content can be finished in time, the subjects can be covered multidimensional, and students can have more meaningful learning. Some of his views regarding his experiences are as follows:

> If I had a traditional board, I would write a question on the board, and write the answers below. I can barely solve six or seven problems in a lesson. But with an IWB, the questions are ready. I copy and paste questions at home the previous evening and we can handle 40-50 questions in a lesson. This is the difference in-between. By solving many different problems, children become versatile and learn... (Ref2-4).
>
> In the past, we couldn't even finish the course-books, now we can even finish the supplementary books (Ref3-1).
>
> It attracted students' attention and enhanced their power of learning. Children cannot concentrate on something that does not attract their attention, but they learn well when they can concentrate (Ref3-7).

That using IWBs in the classroom attracted students' attention, facilitated learning and reduced undesirable student behaviours was among the experiences that Mehmet Bey reported. He associated reducing undesirable student behaviours by using IWBs in the classroom with students' active participation and directing their attention to lessons, and said:

> Students feel happy because they apply themselves. Otherwise, they cause disturbance and distract their friends because it doesn't attract their attention. In that case, it becomes difficult to control the class. But if you do something that is interesting to them, they listen to you with complete attention... And they direct all their attention to it. Sometimes children do something different from what they listened to. They make something up. Then they try it out during the break. They become successful or not. They are happy by learning in this way (Ref3-10).

Mehmet Bey narrated stories about his experiences of how he used technical features of IWBs such as saving, recalling, editing, sending e-mails and connecting to online learning environments in the instructional processes. He reported his experiences as in the following:

> Of course, you can send e-mails to students and those who are not in the classroom also know about the assignments. And you can send the contents covered on that day. I read on the Internet that IWBs with a more advanced technology can also record audio. The one we have can also record audio. You can record audio and send it (Ref2-5).
>
> There are useful links now. .... You can go to those links and make your students watch videos about the topic of that day... (Ref3-2).
>
> For example we have an OKULISTIK (i.e. an online learning platform) membership that the school bought. Students can log in with their passwords. If there is a video about a topic that we will cover, they watch it there. It has simple questions that students answer afterwards. Then we cover it again in the classroom… It is usually like this. It is reinforcing. Students can even ask the teacher questions on the topic that they had difficulty with (Ref3-5).

Another story that he narrated with respect to his experiences of using IWBs in the classroom is about getting prepared for a lesson. This story is also related to the story of "*the change in children*". Because he thought that students adapt to new technologies quickly, he explained the necessity of a teacher's coming to the classroom prepared for the content to be covered and for teaching it with an IWB by saying:

> T: If he comes to the classroom unprepared, children can ask interesting questions and he can have difficulty in answering them. Therefore, the teacher need to be prepared not to be embarrassed in front of the students.
>
> R: Well, you say that he shouldn't put something that he doesn't know well on the IWB.

> T: Yes, he shouldn't. Otherwise what he says can be wrong and that would be worse. Preparation is a must because of this. I sometimes don't teach a subject if I'm not prepared for it. I leave it to the next day. Today's children are very smart and come up with interesting things that you don't even understand (Ref3-3).
>
> If you don't come to the classroom prepared, then you can't be effective on that day. I wouldn't feel comfortable, I would be unhappy. Maybe I would teach them with my prior knowledge, after all I have experience, based on this experience. I might have missed a current event of the day. That makes you feel uncomfortable, that's why the teacher should always come to the classroom prepared. I mean you can't be unprepared in front of today's children. ... A student of mine told me. I didn't know a star called the dog star. He told me that while counting starts (Ref3-8).

Mehmet Bey's story regarding his experiences of using IWBs in the instructional processes showed that the emphasis of technology in the new elementary curricula implemented as of 2005 and his interest in new technologies were behind his decision to use an IWB in his classroom Although the new elementary curricula has made it necessary to use technology in the instructional processes, it is known that teachers do not have a obligation in this respect. However, Mehmet Bey's tendency to technology, being a pioneer in ensuring the technology integration into instruction processes in his school and having personal characteristics such as being open to innovation did not limit him with only computers and projectors and led him to use an IWB in his classroom.

The change in children

Mehmet Bey thought that the change in students was a driving force for his efforts in adapting to technology and innovations. Accordingly, the continuity and inevitableness of change led him to teach in accordance with the interests of today's children. He mentioned his observations regarding his students' adapting to the IWB quickly in the process. Mehmet Bey stated the following with respect to the continuity of change:

> Today, all children have a mobile phone in their hands. They know everything. They can use technology comfortably. That's why one needs to open to innovation. We need to follow what is new. This is what comes before everything. You cannot succeed unless you follow innovations. Because things change every other day (Ref2-1).

He stated that students sometimes knew some features of IWBs better than him. This can again be associated with his statement that students can adapt to the transformation more quickly. In addition, he asserted that he learned some features of IWBs from students. He stated his views as follows:

> Sometimes a student wants a word and shows me a shorter way to do something when I choose a longer way. We do what they say and thank them. ... so today's children are into it, and they want it. It attracts their whole attention. Other tools are done now (Ref1-3).
>
> Sometimes a child shows me how to do something that he/she discovered although I have been using this for 12 years. I learn from them. Today's children are quite into technology (Ref2-2).

Three dimensions appeared in the stories that he narrated with regard to the change in children. These are the continuity of change, students coming to the classroom having learned the technologies used in daily life and teachers having to know current technology.

Adequacy of infrastructure

The stories that Mehmet Bey narrated related to infrastructure to be able to use IWBs without any problems in the classroom contained issues such as "technical features and

economy of IWBs, calibration problems and power cuts". His story in which he narrated his research on IWBs in terms of technical features and economy and his first experiences of using an IWBs is as follows:

> T: I contacted the company. They brought it to the school. We had a look and it was really nice. We also arranged a few other colleagues from other classes because it would be really expensive for us. At the beginning, we bought them only to two classrooms and started using them. It was indeed convenient.
>
> R: What year was that when you first started?
>
> T: I was 2004 or 2005. Then various companies came to the school for advertising. But none of them was like the brand A. This one is different.
>
> R: What is special about it?
>
> T: The features and software they have are not as comfortable as this. No touch screen. Markers were quite expensive. There was the risk of falling and breaking down. If this breaks down, buying a new marker costs like almost half amount of the board. So even if the markers of brand A fall and breaks down, they will be all right. And you can use them without any markers, too. With your fingers. They are more advantageous since they have touch screens (Ref2-1).

He explained the infrastructure problems regarding IWBs firstly referring to the brand, and then giving examples of electricity cuts and calibration maintenance. He stated that he compared different brand, and chose the one that was more economical. This is because these problems can negatively affect using IWBs effectively in the classroom. He touched upon the calibration problem that he had while using IWBs in the classroom by saying "sometimes I couldn't properly set the calibration of the board... On those days, I couldn't do anything on the board. I used other techniques without making students feel the absence of it. I had the school key, and at the end of the day, I tried to fix it, till the morning if necessary" (Ref3-2). Another problem that he had was the electricity cuts while using IWBs in the classroom. On this issue, he said: "When the electricity blacks out for a moment, the calibration immediately resets. Sometimes you need to calibrate every other minute... and it affects the flow of the lesson. .... When the electricity is cut, you can find a solution, but when it blacks out for a moment, that is difficulty to solve" (Ref3-3).

Assessment and evaluation

Mehmet Bey told how he made use of IWBs in the instructional processes based on his own and his friend's experiences. He reported that he use digital materials in assessment and evaluation, and in this way, he could obtain information regarding students' learning more clearly and quickly. He stated his views on this issue as follows:

> T: I have a look at the exam results and analyse them. Let's say there are many students who couldn't answer 7th or 15th questions. I go back to that objective. I teach it again and the level of the students comes to a balance. (...) Assessment and evaluation are very important in this respect. I mean I use assessment and evaluation really well. This is an advantage brought by the technology. Because I use it, I know everyone's level.
>
> R: Do prepare the exams in a digital environment?
>
> T: Sure, digital.
>
> R: How do you do it?
>
> T: There are companies that sell materials in the digital environment. We buy questions from these companies. Afterwards, since the objectives that these questions refer to are certain, I prepare the exam answer sheet as an optical form (Ref2-1).

Besides using it in his classroom, he narrated the story in which he helped one of his colleagues to transfer assessment and evaluation to the digital environment by saying:

> I taught one of my colleagues how to scan it. He applied his exam and I had free time. And his classroom was opposite the teacher's room. As he scan the forms, it makes a sound like ding ding. If a student gets all the questions right, everybody applauds him/her. I hear all these from the teacher's room. He also feels happy. He sees something in there. If desired, the teacher can also give student a report card (Ref3-2).

Facilitator role

In his stories, Mehmet Bey frequently emphasized that IWBs facilitated all instructional processes. Examples on how he used IWBs, while either teaching or solving questions, were provided. He said the following with regard to how he used IWBs in teaching:

> You can draw pictures on an IWB. Particularly, it is very suitable for teaching fractions in mathematics. Drawing lines or a circle. You don't waste much time. It has a magic box right over there. You choose triangle and resize it as you want. Or you can erase it. You can also scroll down the board as much as you want, you don't need to erase to make up space. You can save the content you teach that day for students who may not be present. You copy it to their flash drive when they come to school the other day so that they can review it at home, or you can send them an e-mail. Children can be sick and may be absent. In this way, they also have the chance to keep pace with their peers. However, there was no opportunities like this in the past, you solve a problem on the board but you don't have to erase it. Some children cannot copy them to their notebooks in the lesson, so they can do it in the break (Ref1-3).

His statements on his use of IWBs in the classroom showed that IWBs facilitated teaching, problems can be easily solved in especially the mathematics course with the digital environment they present, they give students who miss the lesson the chance to keep pace with the process, and they facilitated the lessons in terms of time and effort. In this sense, he thought that he acted economically and provided teaching to each of his students equally.

Family involvement

Family involvement referred to the technologies that Mehmet Bey used to interact with his students and parents. He founded a class web site during the years 2005-2006, then used the OKULSIS (i.e. an online platform for school administrators, teachers, students and parents), and created a Facebook page for his class. In this regard, examples from his views on how he founded the web site in the first place and for what purpose are as follows:

> I founded a class web site. I have been using it for almost 12-13 years. Studens scores, grades are all on it (Ref2-1).

> In those times, even schools didn't have a website. It was for sharing children's pictures and their in-class activities with parents. It was also for parents to follow their children's assignments (Ref2-3)

> In 2006... The school had a web site. I uploaded what I did in the classroom to the web site, and other colleagues felt disturbed by that. Because it was the school web site. They said it was like the web site of grade 1-A. When they said that, I decided to found my own web site for my class, and thought it would be more beneficial. For instance, I could publish the course timetable, and everybody could check it. I could publish our activities and upload children's pictures. This is how it came up. We did that, we even uploaded the poems of those who could write well, and chose the poem or text of the week. Publishing online also attracted great attention (Ref3-1).

> I uploaded the weekly timetable on the website. For instance, parents can see what courses their children have the following day. Announcements, what the meetings to be held, when children can come to school without having to wear uniforms. These are all sent to parents by handing them to children but sometimes they lose them. Therefore, some parents come to meetings, some don't. The site is really useful in this sense (Ref2-2).

He stated that he founded a web site for his own class after the criticisms of some colleagues when he posted about his class to the school web site in 2006, and he shared announcements with students and parents on the class web site. In addition, it was also inferred from his statements that due to the OKULSIS program that the school bought in the 2013-2014 school year and the widespread use of Facebook, the class web site could not be used actively any more. He expressed his views on the OKULSIS program the school bought as "I used to assign homework to students like that. But I don't know. This is what stopped me: the school bought a program called OKULSIS. Assignments are given on that platform and feedback is received from students. So that made the school web site less popular" (Ref3-1). In addition, he also emphasized that the Facebook group reduced the effect of class web site by saying "We now have a Facebook page. Both for the school and the class... So the school web site somewhat lost its charm" (Ref3-1).

He made use of different technological environments, beside IWBs, for parents' involvement. When listed chronologically, the technologies that he used included interactive whiteboards and the school web site, then the OKULSIS program with change in the school, and the decrease in the popularity of the class web site with Facebook.

Challenges

The stories that Mehmet Bey narrated with regard to the problems he experienced while using IWBs in the classroom comprised of the brand and features of IWBs, students' breaking the IWB, calibration and backup. He mentioned that in the period when he first met IWBs, the school chose an IWB with the wrong brand and features, but gave up on that brand afterwards. In addition, he shared his knowledge and experiences of IWBs with the colleagues and administrators in the Provincial Directorate of National Education in his region. He narrated the following related to students' deleting or changing the content or material on the IWB knowingly or unknowingly, and how this can be overcome.

> T: During the break, children delete the program I installed, it is not that they do it in purpose. I touch the board without knowing it. If the computer is on, they can delete that program without noticing. That can also be a problem. They don't do it in purpose.
>
> R: What is the solution then?
>
> T: The solution is to have a flash drive or a hard disk with you all the time. I realize that something is deleted. For instance, I downloaded the course-books this year. They were deleted, but I had a backup (Ref3-7).

For eliminating the problems that he experienced while using IWBs, the right brand with effective and functional features should be firstly preferred, and the data on IWBs should always be backed up in case students delete some features or documents on the IWB, knowingly or unknowingly, causing various problems. Calibration problems and electricity cuts could also affect the instructional processes negatively.

Conclusion and suggestions

In this study that examined the journey of Mehmet Bey, an elementary school teacher for nearly 40 years, in using technology in the classroom, it was found that Mehmet Bey had certain characteristics regarding using technology. He used every kind of technology in his

classroom since the day he started the teaching profession. While the first technology he used was the sand table that he made himself, he was using IWB at the time of the study. Besides, radio, television, computer, VCD, MP3, tablet computer and projection were the other technologies he used. It was drawn from Mehmet Bey's stories that he was not merely interested in technology as a fashion, did research on which technology was economical and technically suitable, took the technology that he wanted to use to the classroom after he mastered it, shared his experiences with the school and the local educational institutions, and made an impression of an innovative and transformative teacher. Moreover, he was a teacher who introduced the technologies he used to his colleagues, convinced them to use these technologies, had the economic support of parents for new technologies, and shared the achievements he obtained by using technology in the classroom with parents. Mehmet Bey's stories based on his experiences of using technology revealed that teachers play the primary role in using technology in the classroom effectively. During the interviews, he made statements that he was the first teacher who used the technology of IWBs in Eskisehir. As a result, Mehmet Bey was innovative, transformative and a voluntary technological change agent in the schools he worked.

His reasons for using current technology in the classroom included trying to adapt to the technology-based change in children, interest in following innovations and technology, and the elementary curricula of 2005 prescribing the use of technology. In terms of using the class time effectively, it was inferred that more questions can be solved by means of an IWB, it enhanced the interaction with students, and thus affected achievement. This is consistent with some of the studies specifying the positive aspects of IWBs in the literature (Ekici, 2008; Pamuk, Cakir, Ergun, Yilmaz & Ayas, 2013; Sad & Ozhan, 2012; Saltan et al., 2010; Smith et al., 2006; Tataroglu & Erduran, 2010; Yang, Wang & Kao, 2012). He attributed the increase in his students' exam results to solving more questions by means of IWBs, sending students the course materials and notes digitally, and memorability due to their being active. This can be explained by the lessons taught with IWBs attracting students' attention and ensuring their motivation. He also stated views in this direction.

One of the notable findings of the study was Mehmet Bey's belief that for effective technology integration to education, teachers should overcome their prejudices against technology and be open to innovation. He stated this view based on his experience of using technology in the classroom for nearly 40 years, and the resistance that his colleagues showed against technology. The characteristics that Mehmet Bey observed in other teachers such as showing resistance to innovation, continuing teaching with traditional methods, having prejudices against using new technologies and not accepting innovative teachers can be regarded as important reflections. In this regard, Kim and Kankanhalli (2009) state that variables such as "*self-efficacy for change, organisational support to change, colleague views and perceived value*" are determinant in showing resistance to new information systems. In this study, it was also seen that teachers who perceive themselves as innovative do not feel themselves competent for change, and they need the views and guidance of their colleagues in using IWBs. In addition, as Cakiroglu, Akkan and Guven (2012) state, and it was also observed in this study, the acceptance of new technologies by teachers requires a long period of time and should be encouraged and guided by both administrators and colleagues. Mehmet Bey, who is an innovative teacher, played a pioneering role in encouraging teachers to use IWBs in state and private schools, and shared his experiences with elementary school teachers within seminars organised by the provincial directorate of national education. He made all these efforts voluntarily. The importance of being voluntary in the technology integration to education confirms what Mehmet Bey did during his career in this respect.

Mehmet Bey, whose experience of using IWBs in the classroom for nearly 10 years was examined in the study, was observed to encounter a set of problems. These problems were related to the Internet and electricity infrastructures, calibration and backup. In addition, Mehmet Bey stated that classroom management and effective teaching could be difficult without preparation, and various problems could be experienced in touch screens and electronic markers if a good brand was not chosen. Touch screen problems, boards not having their markers, classroom management problems and various IWB problems due to lack of knowledge, which were reported in a study by Pamuk et al. (2013), were those that Mehmet Bey solved himself, but warned to be careful about. In terms of the problems that Mehmet Bey overcame with his competencies but can be encountered, the study can be argued to have revealed similar results with the studies in the literature (Pamuk et al., 2013; Sad & Ozhan, 2012; Saltan et al., 2010; Turel, 2012). Mehmet Bey's suggestion that in addition to learning how to teach effective lessons with an IWB, teachers should also train themselves in solving little technical problems due to user mistakes is meaningful for those who want to use IWBs in the classroom. For example, changing the colour setting of the marker, or performing a task in another way. Teachers should train themselves in technical matters so that these little problems would not disturb the lessons.

Mehmet Bey's stating that the trainers in meetings such as in-service trainings and seminars in which demonstrations are made to teachers regarding using IWBs and similar technologies should not be company representatives is a notable finding. He thought that the trainings of company representative mostly included the technical aspects of IWBs, but teachers needed information on how to use those features in teaching mathematics, science or Turkish based on experience. For this reason, it should be laid emphasis on his suggestion that there should be interactive trainings in which teachers of similar subject areas share their experiences with each other. Based on this suggestion, workshops toward ensuring effective use of IWBs in the classroom can be organised. In these workshops, teachers like Mehmet Bey who use technology in their classroom environments, technical staff who can teach the technical features of IWBs and academics who do research on this issue can be gathered together. Besides, values like Mehmet Bey can be introduced to the educational community through events such as good examples or successful practitioners in using IWBs in their classrooms. In this way, other teachers can be encouraged.

To better understand the technology integration to education from teachers' perspective, long-term studies based on observations can be conducted. In the context of elementary teaching, the use of IWBs in the classroom can be associated with a subject area such as social studies, and can be examined to include more detailed insights and examples. Particularly, quantitative studies can be designed to determine whether Mehmet Bey's suggestion of receiving training from teachers who actually use the technology rather than university instructors or technical staff is meaningful.

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