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Investigation of Teachers' Reflections on Countrywide Tablet PC and Interactive White Board Initiative in Turkish Schools

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The Turkish government made a significant decision in 2012 to transform its educational system and improve educational outcomes through technology. For this purpose, a consortium among different ministries initiated the "Movement of Enhancing Opportunities and Improving Technology" (FATİH) project with the aim of providing each K-12 student with a Tablet PC and every classroom with an Interactive Board using a high-speed Internet connection. Therefore, this study was designed to investigate teachers' reflections on this countrywide technology integration initiative. In 2012 a pilot study in 52 public schools in 17 cities in Turkey was initiated. Participants consisted of 54 teachers in 11 of the pilot schools. Details from teachers' reflections on technology use in teaching and learning as well as issues and problems they faced during the pilot study are provided. Participatory observations, structured interviews, and focus group meetings were held to collect data to answer the research questions. These data were analyzed using content analysis principles. Concerns-Based Adoption Model (CBAM), Technological Pedagogical Content Knowledge (TPACK), and Technology Acceptance Model (TAM) were used as the guiding framework to interpret this study's results. Based on the principles of these three conceptual frameworks, results indicated several factors affected teachers' effective use of technology. These factors can be categorized as teachers' concerns, pedagogical issues, and attitudes toward technology use. Based on these results, in-service teacher training programs, including technological and pedagogical aspects on Tablet PC and interactive board use, are offered for teachers to improve their knowledge and embrace new technology. These results also provided important insights for policy-makers about the dynamics of countrywide technology integration projects.

Introduction

The importance of technology use for teaching and learning is no longer a central point of discussion among educators in terms of its effectiveness and benefits to learners (Bransford, 2000; Chen & Tsai, 2021; Cviko, McKenney, & Voogt, 2014; Friedman, 2005; Sailer, Murböck, & Fischer, 2021; Sang, Valcke, Van Braak, & Tondeur, 2010). Worldwide, many

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countries have been working to transform their educational systems through information technologies (Bonifaz & Zucker, 2004; Chen, Kao, & Sheu, 2003; Coppock, Smith, & Howell, 2009; Crompton & Keane, 2012; Dailyrecord, 2010; Dale, 2008; Fri-tic, 2012; Gateway, 2004; Ingram, Willcutt, & Jordan, 2008; Joureau, 2011; Kim & Jung, 2010; *News Report*, 2007; Olofson, Swallow, & Neumann, 2016; Saine, 2012; Vallance & Numata, 2011). Large investments in technology integration projects draw the attention of critics on the effectiveness of technology in teaching and learning. Among the leading critics is Cuban's approach. For example, according to Cuban (1998), although there have been large investments made in technology in U.S. schools, the results were not so impressive. He strongly emphasized technology integration projects did not progress in the past via updating and transforming old technologies. Thence he argued the promised outcomes of technology were not been achieved. A careful review of the literature showed debates on technology use in education settings are an ongoing process, along with those of the advocates of technology integration to the educational system. That said, there is a sizable group of educators who oppose large investments in technology at schools worldwide.

Setting aside discussions of philosophical aspects, educators assessed the results in terms of enhancing students' learning and teachers' teaching with technology. Among these debates, several countries (i.e., U.S., Italia, Portugal, South Korea, and Uruguay) have initiated large-scale technology integration projects to transform their educational systems (Avvisati, Hennessy, Kozma & Vincent-Lancrin, 2013; European Commission, 2019; Fourgous, 2010; Shin, 2015; Kozma & Vota, 2014; Voogt & Tondeur, 2015). For example, South Korea has made technological investments in schools by using an e-document project to share all kinds of printed materials in electronic form with all students (Kim & Jung, 2010; Shin, 2015). The Italian Ministry of Education launched in 2007 a National Plan for Digital Schools (Piano Nazionale Scuola Digitale) to use technology as a "catalyser of innovation", and to conduce new teaching practices, models, and new school organizations (Avvisati, Hennessy, Kozma & Vincent-Lancrin, 2013). Portugal has distributed laptop PCs to every school child to provide equal access to technology and resources to better prepare future generations in the 21stcentury (Fourgous, 2010). In their research, Kozma and Vota (2014) emphasized not only developing countries but also least developed countries are spending significant efforts to integrate technology in their classrooms. For example, the government of Kenya provided its schools with recent technological equipment to ensure all students were literate in ICT (Tondeur, Krug, Bill, Smulders, & Zhu, 2015). Although some of these initiatives mainly focused on transformation of education, others, such as Portugal's Magellan project, sought not only to transform education, but also to boost their economy (Intel, 2009).

In addition to these worldwide projects, Turkey has also made investments to integrate technology into schools (MONE, 2012a; MONE, 2012b; Yildirim, 2007). In 2012, Turkey initiated a countrywide technology integration project viz. Movement of Enhancing Opportunities and Improving Technology" (FATİH). In its simplest sense, FATİH aimed to enable equal opportunities for all students. The main objective of this project was to transform schools into more productive places where students learn better (MONE, 2012a). The scope of this countrywide project was to provide approximately 18 million Tablet PCs to 700,000 teachers and 17,000,000 students in 570,000 classrooms of 42,000 schools equipped with interactive white boards (MONE, 2012a). Turkey also planned to transform its education system and boost its information technology-based economy with the FATİH project. Major components of this project were: 1) development of e-materials, 2) teacher in-service training programs, 3) establishment of schools' network infrastructures and Internet connections, and 4) provide each student and teacher with a Tablet PC.

However, before actually initiating this project countrywide, a pilot study was implemented. During the first stage of the integration process, the Ministry of National Education (MONE) selected 52 public schools as pilot schools and established an Internet infrastructure in these schools. A majority of these schools were at the high school level. Therefore, the current study was conducted with 54 teachers at 11 pilot schools in year of 2012.

Theoretical Perspective

As discussed in the literature review, effective technology integration is a complex, multi-stage process involving consideration of many aspects and perspectives (Henriksen, Mishra, & Fisser, 2016; Hofer, Nistor, & Scheibenzuber, 2021; Scherer, Siddiq, & Tondeur, 2019). Because of complexity, several theoretical frameworks were defined, based on these different perspectives. For example, while Roger's (1995) diffusion of innovation model described the process from a more system-wide perspective, Hall and Hord's (1987) Concerns-Based Adoption Model (CBAM) insisted on an individual adopter's reaction to the innovation and described the technology adoption process from a more individual perspective.

Another theoretical framework, Technology Acceptance Model (TAM) (Davis, 1989), referred to technology as an integration model and defined the process from the innovation adopter's perspective. Davis stressed the critical motivation for individuals to adopt and use technology are twofold the technology should: (1) be user-friendly and (2) have observable results gained from its use. According to TAM, "perceived usefulness" and "perceived ease of use" are two important components, and these directly affect technology usage (Fındık-Coşkunçay, Alkış, & Özkan-Yıldırım, 2018).

In addition, Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge (TPACK) framework took a more specific aspect of the integration process and discussed the role of teachers' pedagogical readiness of teaching with technology, appropriateness of the content taught, and interrelations among technology, pedagogy, and content in given specifics.

Although these different integration models have different perspectives, the models used to investigate technology integration efforts in different settings report some points in common. For example, teachers' training on specific technologies have been deemed a crucial step, which should be taken into consideration before the process (Goktas, Yildirim, & Yildirim, 2009; Newhouse, 2001; Yurdakul et al., 2011). Based on insights of the technology integration process reviewed and the specific context in which this study was completed, it was unrealistic to take a more system-specific perspective and assess project outcomes in such a short period of time—about a semester. Instead, we preferred to take a more individual adopter (teacher) perspective and discussed the process based on participating teachers' experiences. Hence, a semester time period was adequate to understand teachers' reactions and perspectives on the project along with the integration process. In brief, a semester time period might not be fully adequate to obtain concrete outcomes and assess the overall big project, but was indeed sufficient for analyzing teachers' reflections. For this reason, we mainly focused on a smaller component—the individual teachers' experiences'—and attempted to understand the process from their perspectives.

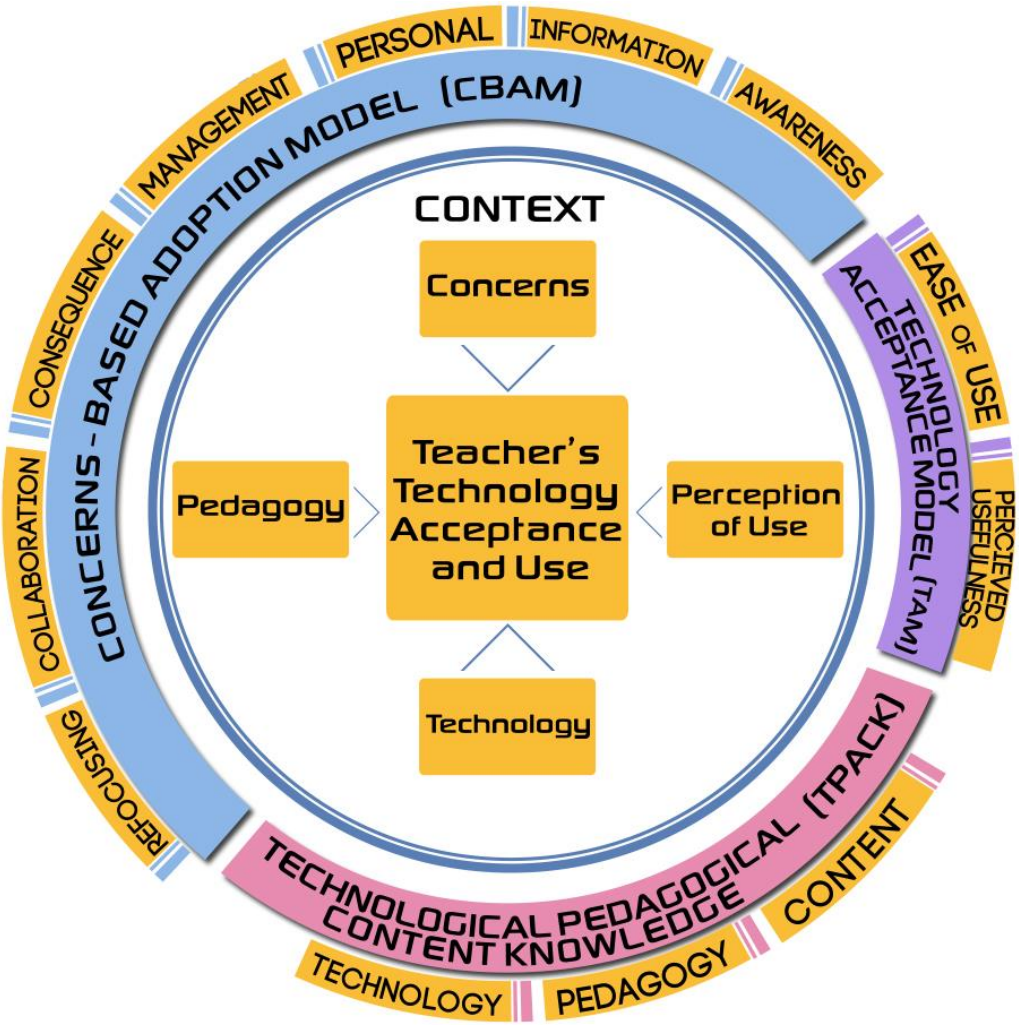

Figure 1. Representation of overall perspective derived from CBAM, TAM and TPACK

Studies in the related literature strongly emphasized teachers' embracing a new technology is vital to effectively use technology in the classroom. Among these studies, Pynoo et al. (2012) stated teachers' adaption of technology is one of the most important factors for using technology in the classroom. The success of technology in the classroom depends considerably on teachers' acceptance and use of these technologies in their teaching activities (Van Raaj & Scheepers, 2008). Moreover, Cviko et al. (2014) emphasized teachers' actively designing and using technology in their classrooms affect their perceptions and implementation of technology usage. However, it would not be incorrect to conclude an understanding of teachers' reactions to usage of such technologies in teaching and learning would be an important point for planning future steps of such large educational investments. We believe the results of the current study could help policy-makers to understand and take into account teachers' reactions to use of information technologies in the public schools.

To accomplish our purpose, we took an overall approach developed from major technology adoption models (i.e., TAM, CBAM, and TPACK) and analyzed the data according to the principles of these models and perspectives (Figure 1). As seen in Figure 1, TAM includes ease of use and perceived usefulness components; CBAM includes awareness, information, personal, management, consequence, collaboration, and refocusing; and TPACK includes

technology, pedagogy, and content.

These three models were used to target the three major aspects— (1) usage of technology, (2) concerns of teachers, and (3) effective use of technology. To address these very dimensions, TAM was chosen to investigate teachers' use of provided technologies; CBAM was specifically selected to understand teachers' concerns with regard to technology use, and TPACK was implemented to understand whether teachers have used specific technologies effectively in terms of pedagogy, content, and technology. For example, although some groups of participants discussed the importance of technical knowledge, others stressed the use of appropriate materials developed specifically for the given course content and pedagogy. Considering the wide variety of participants' backgrounds and concerns, having such a holistic approach to the data allowed us to interpret the process in greater detail with an opportunity to explain different reactions in the field.

Purpose of Study

Teachers' personal attitudes and approaches toward technology acceptance and use of it effectively require them; a) to develop, first of all, a clear conceptual understanding of potential benefits from technology use, b) to address concerns they may have, and c) to develop necessary skills of using it. More specifically, teachers may have to deal with various barriers, challenges, and concerns on the way to technology use in their teaching practices, which may eventually impact the overall project outcomes.

As mentioned previously, FATİH was a countrywide project initiated in Turkey with a large budget. Surely, such a big project entailing Tablet PCs for 17,000,000 students and 800,000 teachers, and an Integrated White Board (IWB) for each classroom draws critics from some educators in terms of effectiveness, while there exist "more urgent" problems. Therefore, it was important for educators and policy-makers to understand all the related details of the project at the pilot stage and the results. One essential component of such a big technology integration process in an educational setting was necessary to understand what teachers in the pilot study reflected upon in their one-semester usage and their reflections on the future of this project. As discussed in the related literature in more detail, nations seek with their large-scale technology integration projects not only the most optimal ways to enable their students at schools to reach recent technologies, but also to prepare tomorrow's teachers, develop novel models, and teaching/pedagogic strategies. In this sense, understanding teachers' reactions to using provided technologies in their teaching gains more importance.

To this end, this study specifically aimed to understand participating teachers' reflections on the FATİH project, their concerns about technology use, and pedagogical approaches deployed during their teaching activities.

The main purpose of the current study was to investigate and assess the countrywide technology initiative from participating teachers' experiences and reflections. In this context, we attempted to understand this initiative through responses to these research questions that guided this study:

(1) To what extent teachers at the pilot schools used Tablet PC and IWBs in their teaching and what were their reflections on these technologies?
(2) What were the major issues, concerns, and problems teachers faced and how did these barriers affect usage?
(3) To what extent did teachers use the provided technologies effectively?

Methodology

In this study we utilized the case study qualitative research approach to provide a deeper understanding of teachers' reflections and experiences on Tablet PCs and IWBs. The implementation levels in the field during the pilot process occurred in a specific context—the Turkish educational system. Merriam (2002) describes case study as "intensive description and analysis of phenomenon or social unit such as an individual, group, institution, or community" (p. 8). According to Baxter and Jack (2008), the case study approach allowed researchers to gather data from a variety of sources and to see the overall picture through this lens. To understand participants' reflections and experiences in detail, researchers did not solely rely on self-report data through individual interviews. They also implemented different research tools and strategies effectively, including participatory observations, structured interviews, and focus group meetings to collect pertinent data to answer the research questions. These techniques clearly provided ample evidence to address reliability and validity concerns. The collected data were analyzed with content analysis principles, depending on the research questions (Strauss & Corbin, 1998).

Data Collection and Research Instruments

The data collection procedure consisted of three major steps. (1) The researchers (five professional researchers with the author) visited individual pilot schools in each city without any pre-arrangements and observed some of the teachers in the classroom. (2) Following each participatory classroom observation session, individual, semi-structured interviews with observed and/or other teachers were held in the teacher's classroom (3) A focus group with teachers selected from different subject areas was held at each school with teachers from other pilot schools in the city.

Observation sessions occurred in each school. Generally, more than one classroom in each school was observed. During these observations, researchers were interested mostly in exploring (1) whether or not teachers used Tablet PCs and IWBs, (2) how teachers used technology in their teaching activities, and (3) challenges they faced when using these technologies. Researchers took notes about the classroom environment, technology usage, and other issues (i.e., teacher's technology usage, technical problems, classroom management, students' motivations).

Following classroom observations, on the same day of the visit, interviews with individual teachers or small groups of teachers were conducted in the teachers' meeting room. Interview questions were mostly arranged in such a way that they mostly focus on teachers' reactions about using Table PCs and IWBs in teaching, as well as on the issues and challenges they faced.

The researchers attempted to obtain the experiences, reflections, ideas, comments, perceptions, and responses of the participants through interviews. Interviews with teachers were completed to better understand their experiences and reflections about Tablet PCs and IWB use in the schools. The interview questions were related to the research questions. The interviewing process took approximately 30-60 minutes. Questions included: (1) What are your experiences with use of Tablet PCs and IWBs? (2) Do you think use of provided technologies contribute to your teaching and students' learning? (3) What are issues and challenges, including pedagogical ones, you confront as a teacher? And, (4) What are your reflections on what may be handled differently in terms of improving the project's effectiveness? Interviews were transcribed by the researchers soon after they were completed.

After completion of the observation and interview processes, researchers held structured focus group meetings in each city. The main reason for the focus group meeting was based on the initial analysis of the observation and interview data. The researchers desired to confirm their initial understanding and the results with the participating teachers. It is known that reaching a consensus among participating teachers on the results would increase credibility or validity of the study. Schools' principals were asked to send at least one teacher from different subject areas (such as math, science, social studies) to the focus group meeting so the researchers could have a better understanding of the pedagogical or content-related issues with regard to Tablet PC and IWB use. Among the observed teachers in the classrooms, researchers purposively invited teachers from different subject areas (i.e., 1 math teacher, 1 social studies, and so on). The main objective for these focus group activities was based on the initial data from observations and interviews.

Data Analysis

The data analysis procedure was composed of three major stages: (1) data were coded with "open coding" principles, (2) "axial coding," and (3) "selective coding" to create major themes or categories (Strauss & Corbin, 1998). This process was an analytical process that began with separating data into discrete pieces through coding data sentence-by-sentence and creating major themes around the theoretical framework. This process continued until no new data or information was needed (Jones & McEwen, 2000).

Based on these principles, the researchers read through all transcripts obtained from different data sources, and coded them sentence-by-sentence in the initial stage. For example, a teacher's reflection during the interview session, "*Due to virus protection reasons, we cannot copy our files to Tablet PCs through their USB connection.*" This was coded as *hardware configuration problem* in the open coding process. During the second stage, all coded sentences (labels) were collected and categorized under more general terms, according to their properties. For example, hardware configuration problems were listed under the "*Technological issues*" category. During the final stage, namely, the selective coding procedure, the researchers reviewed all categories and connected them based on their properties and relevance to each other to create a concept map. During this categorization process, data were labeled according to CBAM, TAM, and TPACK components. For example, if a teacher mentioned a problem with regard to lack of technical knowledge about provided technologies, researchers labeled this sentence as CBAM-Information and also TPACK-Technological knowledge. In the data analysis process, the author and a senior researcher worked together to label the data and categorization procedure through sharing and discussing their reflections.

Each step was based on the theoretical principles demonstrated in Figure 1 and all results were summarized according to the given theoretical principles provided in Table A1.

Participants

The current study was conducted at schools in four different cities (İzmir, Yozgat, Samsun, and Kayseri) in Turkey. A total of 54 teachers from 11 schools participated in this study. Forty-four teachers (24 men, 20 women) participated in the focus group activities.

Results

Overall results demonstrated integration of the provided technologies during a one-semester pilot implementation had several drawbacks that could jeopardize all the efforts.

Although teachers, who participated in the project, expressed their desire to benefit from technology in their teaching, they were skeptical about the benefits of Tablet PCs and IWBs, about their readiness to use these technologies, and about the availability of e-materials. These results are similar to those found by Pamuk, Cakir, Ergun, Yilmaz, and Ayas (2013) in their study—although the participant teachers welcomed the technology, they were not confident about the projected results.

In this study, teachers' reflections were examined according to three different technology use/integration perspectives. The obtained results are summarized and details are provided in the Table A2. Based on these detailed results, the following issues emerged as the most important that should be taken into consideration by policy-makers or program coordinators in Turkey.

- *Lack of e*ducational and *p*edagogical *a*wareness: Generally, teachers are mostly aware of the provided technologies, especially Tablet PCs, at a certain level. However, teachers do not present adequate evidence regarding their awareness of the technology integration process in teaching and learning. Therefore, it was concluded *no problem exists with technical/technological awareness, but there is a problem with pedagogical or educational awareness or a lack thereof.*
- *Need m*ore *i*nformation on *technology:* Although teachers indicated they had the basic knowledge about the use of given technologies, they highlighted a concern caused by not having sufficient information about the Tablet PCs and IWBs.
- *Teachers' need for information is not only pertinent to technical (how to use) level, but also to the effective use of the provided technologies. Lack of information about using given technologies effectively in classes created a serious concern among teachers.*
- *Personal concerns with regard to technology use*: *Several teachers questioned their readiness with regard to technical and pedagogical knowledge and experience.* For example, sufficiency in using technology, attitudes against the new technology, and concerns in the adaptation process are amongst these.
- Teachers are also concerned about being humiliated and ridiculed in the classroom because of their *insufficient technical knowledge.*
- Classroom management and student motivation: Teachers had concerns about *effective technology use, classroom management, students' concentration, and keeping the technological devices operating during usage in the classrooms.*
- *Concerns about t*echnology's contribution to teaching and students' learning.

The data analysis clearly revealed teachers were questioning the impact of the technology use on overall teaching and students' learning. They include:

  - The extent the provided *technologies contribute to students' success and learning*.
  - *Problems students may have in social relationships because of technology addiction.*
  - Teachers and students' performance in classes may be negatively affected. Teachers question the *correlation between the time they spend on technology use and the benefits they would obtain*.
  - Concerns about *students' distraction because of managing different applications on the Tablets during the lecture*.

- Since students use ready e-materials on Tablets, teachers raise concerns about the technology that may cause *students' passiveness in classes* and, therefore, they do not think the desired learning outcomes would occur.

- *Students' reading and writing skills may be negatively affected* because of technology use taking place at such a high frequency. *Need for sharing good examples: The concern about school climate* in terms of sharing experiences on technology with the school principal and other teachers as necessary.
- *The need for sharing good examples*, which were insufficient during the pilot study among the teachers. *Teachers' positive attitude as a necessary element: Observations noted teachers had insufficient positive attitudes, approaches, or alternative ideas about the provision of technologies, due to their current level of use.*
- *Ease of use:* Technology provided for teachers was *not easy to use or helpedachieve what they wanted in the classrooms*. IWB was not easy to use either. Therefore, teachers encountered technical problems in thteir classes and received help from students. *Teachers' technical skills and knowledge are lower than those of their students.* Therefore, students assisted their teachers in solving the technical problems. *The difficulty with sharing the materials* prepared by teachers on the Tablets and IWBs. *Teachers did not have easy access to the e-materials and software they could use. It was difficult for teachers to develop their own materials on Tablets and IWBs.*
- *Perceived Usefulness:* Concerns about students included the one about benefitting from the Tablets as desired. Tablets may be harmful to them. *The idea that pinpoints the IWBs are useful, but the Tablets are not.* T*echnology is not always beneficial* at every step of education. M*aterials prepared for teachers are insufficient and content should be enriched*.
- *Implementing p*edagogical preferences: Several teachers from different subjects indicated the *use of the given technologies with preferred pedagogical preferences was difficult*.

The most frequently observed scenario during the observation sessions was the fact that teachers actually tended to use technology with their pedagogic strategies instead of transforming their teaching into new forms supported with technology.

The relevant *technology does not support or provide the opportunities for teachers to complete the pedagogical practices they want to implement,* so they are reluctant to use the technology.
Tablets affect the learning processes negatively, especially interest and motivation of students towards the course. Students develop negative attitudes towards the course. Very few teachers manage to use the technology and endear the lesso content.

Difficulties that the teachers encounter in *classroom management. Educational use of technology:* In general, *teachers are not versed in using the provided technologies. They cannot integrate this technology with the education process*. In the teaching process, *they are limited with methods and strategies to follow*. They would like to get support from the trainers about their subject areas of teaching in the form of in-service training sessions.

- Content specific issues: Content area's specialty (i.e., physics or mathematics) makes it difficult for teachers to use the provided technologies.

Inadequate enriched materials for different subject areas in terms of quality and quantity.
It is difficult to prepare some content in different presentation forms or *teachers do not have advance technical skills to develop their content successfully.*

Based on the results, the following major themes and issues were created. In our theoretical conceptualization, we intended to search for answers to our research questions through different theoretical lenses. TAM principles were helpful to address whether or not the provided technologies were accepted and utilized by teachers. CBAM provided lenses to understand the concerns teachers expressed. TPACK was referred to with a vie to seeing the educational value of this technology used in the project. Based on these three theoretical landscapes, the results are summarized and provided in Table A1.

Summary of the Results

According to results from the study, there are several drawbacks or limitations with regard to teachers' adaptations of the provided technologies. Among these include the following:

(1) Limitations mostly emerged from a lack of technical knowledge, pedagogical experience, and skills on teaching with this technology.
(2) There was strong opposition against the benefits of Tablet PCs compared with IWBs. Therefore, teachers do not think about using them.
(3) Teachers' attitudes toward Table PCs were not positive for several reasons. However, we can conclude they were more eager to maximize the use of IWBs in the classroom.

In this study, teachers expressed their anxieties and concerns about new technology in the classrooms. Therefore, the concerns of teachers about usage of Tablet PCs stem from a lack of technical knowledge regarding use of these Tablet PCs. Moreover, results showed attitudes towards new technology vary from teacher-to-teacher. It was clearly observed that teachers' attitudes towards new technologies influenced their usage of technology effectively in the classrooms.

Usability of the provided technologies was also a critical factor. Davis (1989) stated the usability of the system is affected by perceived ease of use and perceived usefulness. In this sense, teachers in this study indicated although IWB is easy to use in the classroom, Tablet PCs are not practical for use in teaching activities.

Discussion

There is no single solution nor a single method to implement technology integration. Technology integration is a multi-stage, complex process. In this current study, the focus was placed on understanding teachers' attitudes toward technology use in teaching and learning, the concerns they shared, and whether or not technology was used effectively. As noted earlier, the FATİH project is a large-scale technology integration initiative.

As discussed in TAM, teachers and students' beliefs in potential benefits of using Tablet PCs and IWBs are the key issue for implementing the process appropriately (Christensen, 2002; Jacobsen, Clifford & Frieson, 2002; Hew & Brush, 2007; Kopcha, 2012; Lee, Yoon,& Lee, 2009; Pierson, 2001; Scherer, Siddiq, & Teo, 2015). Results clearly showed that in addition to being provided with technical supportive services, teachers should also be trained about how to use those technologies provided to them within the context of the FATİH Project.

Factors that affected teachers' attitudes and motivations to use the provided technologies in the project are not limited to their beliefs in technology use. Teachers demonstrated they also have certain concerns about the project. As CBAM stated, although teachers were aware of the technologies provided, they were unable to obtain the necessary skills, and most importantly how to receive benefits from them in their teaching (Baltaci-Goktalay, 2006; Hall & Hord, 1987; Wong, Teo, & Goh, 2013). In other words, teachers indicated clearly their concerns about classroom management, pedagogic issues, and student engagement. It can be concluded the teachers' concerns and attitudes about the use of Tablet PCs stem mostly from the lack of knowledge regarding the use of these Tablet PCs.

In addition to teachers' beliefs in potential benefits of technology and their concerns in the integration process, pedagogical issues also play a critical role. By noting these pedagogical issues, we do not necessarily indicate strategies with regard to teaching and learning. TPACK framework defines dimensions of the "complex process." As this study reveals, even though some teachers would prefer to use technology, they encountered problems with regard to their pedagogical preferences and abilities to use the provided technologies. In other words, teachers would like to use technology according to their preferred pedagogical principles, rather than exploring new pedagogical practices. As discussed by Mishra and Kohler (2006), TPACK framework insists on reaching or defining new pedagogical practices. In the current study, moving from "current pedagogical approach" to "technology-based pedagogical approach" was a key issue. It seemed it required time and effort to make this transition.

The challenges and barriers that hinder reaching these promised benefits of technology still remain an important issue. Studies reported a range of barriers that educators face in their daily use of technology in the classroom (Ertmer et al., 2012; Hew & Brush, 2007; Scherer, Siddiq, & Tondeur, 2019). This study also revealed a lack of technical and administrative support, lack of confidence, self-efficacy, technical skills, personal concerns, and training are some of the most reported issues, as also reported in the literature (Al-Senaidi, Lin, & Poirot, 2009).

Parallel to Cuban's (1998) criticisms on the use of technology by faculty members, the data in this specific study also showed similar issues exist in the field. Although there has been an increase in the number of teachers who access information technologies in their homes and schools, they do not feel well prepared to integrate technology into their teaching.

While Turkey initiated this big education project almost a decade ago, teachers' readiness to use provided technologies has preserved its significance (Goktas, Yıldırım, & Yıldırım, 2008; Isman, Yaratan, & Caner, 2007). In addition to traditional in-service teaching training, modeling pedagogical use, and content-based material development seem to be some of the major issues that require attention. In this sense, technology integration should begin with a process to identify teachers' concerns, abilities, reflections, and other issues. Based on the data obtained from the teachers, we strongly believe in-service teacher-training programs must be planned in a manner that allows teachers from similar subject areas to work together with a specific content. In these programs, teachers should not be a passive receiver of the how-to-use type technological information, but should work together in an active fashion with technical experts to create effective learning models according to their needs. Their teaching experience, pedagogical preferences, and other professional knowledge and expertise should be expanded upon in these programs. As indicated in many studies, a "one-size fits all" type in-service teacher-training programs, as implemented in the Turkish case, does not work. Teachers find it difficult to combine their pedagogical preferences with technical equipment. Therefore, there must be some kind of sharing platform that combines technical and pedagogical expertise.

Conclusions

This study was aimed at understanding teachers' concerns, readiness, reflections, and limitations on Tablet PCs and IWBs usage in classrooms in the Turkish educational context. Three major theoretical frameworks (CBAM, TAM, and TPACK) were utilized as a guide to interpret teachers' experiences during the pilot study of the provided technologies.

As discussed in detail, teachers' perceptions about the usefulness of the provided technologies, limitations in the use of technology as well as in implementing appropriate pedagogy, and teachers' individuals concerns at different levels were all critical issues to be addressed in advance. In addition to the remedies offered in the literature, this study revealed for the first time that technology integration should be considered as a process expanded for a period of time—not a quick or a one-off sort of solution to the problems. Second, teachers are critical partners of the process; thus, addressing their concerns, and technical and pedagogical needs are crucial. Third, most importantly, instead of organizing general professional development activities inviting all teachers from different subject areas, as the case in the current context suggests, content (subject)-specific teacher in-service professional development programs should be arranged.

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Appendix

Table A1. Details of overall results according to TAM, CBAM and TPACK

Components	Issues	Example Quotations from Interviews with Teachers
CBAM-Awareness	Lack of educational & pedagogical awareness	I don't think Tablet PCs are suitable for such courses as mathematics and geometry because of its screen size. Both the IWBs and Tablet PCs are wonderful. But, there was no period of adjustment. Students should have been trained about how and why to use the Tablet PCs.
CBAM-Information	Need more information on technology	We were provided technical training with no hands-on experience during the in-service training sessions. That's why I cannot use the IWBs properly. In-service training is not an efficient method to transfer information. Simply, it doesn't work. What is the IWB used for? What are the properties and how much could I use it in the classroom? We weren't trained about these issues. We are trying by ourselves to learn by trial and error.
CBAM-Personal	*Personal concerns with regard to technology use*	As my friend said, students are better than us in technology. When we have a technological problem in the classroom, they immediately solve it and this sometimes makes us anxious. We feel uncomfortable in front of the students.
CBAM-Management	Classroom management and student motivation	Students' play with Tablet PCs during the lecture time. Therefore, we have problems with students' focusing in the classroom. We have to deal with issues such as running out of battery power or locked Tablets, etc. By the time I deal with such problems, the lecture time is over. While I'm trying/struggling to use the IWB, students are walking or chatting in the classroom. So, you lose your classroom management.

CBAM-Consequence	*Concerns about technology's contribution to teaching and students' learning*	We have IWBs in two classrooms and we don't have any in the other two classrooms. When we compare these two classrooms, the students' grades in the classrooms with IWBs are lower. IWBs make both the teacher and the student passive. I don't think Tablet PCs are beneficial for students. Tablets may be for games, but I don't think they are suitable for studying. I don't believe students use the Tablets for studying at home. Better learning would come mostly by writing what you learn. But, with these technologies, students don't take notes or write any assignments. They find it on the Internet and bring it to me.
CBAM-Collaboration	*Need for sharing good examples*	What I dream in my own classroom is to make groups and the students. Whenever I ask, I will be able to send his/her homework to the IWB and then present his/her work. This seems impossible, doesn't it? I am amazed the students in one of my colleague's classrooms could use Tablets. It's very difficult to use effectively.
CBAM-Refocusing	Teachers' positive attitude necessary	It was observed that *teachers didn't have positive attitudes, approaches or alternative ideas about the provided technologies due to their current level of use.*
TAM-Ease of Use	Teachers' ability to use provided technologies	There can be a number of problems, of course. For example, if I want to draw a shape or write something during the presentation, I cannot do it because the page skips. The only way to do this is to close the slideshow, so it's time consuming. When we leave IWB running during the break times, students change its settings. Therefore, it takes too much time to change it back. The content provided for both teachers and students is inefficient. I wish we, as teachers, were able to prepare our own materials.
TAM-Perceived Usefulness	Teachers' perceptions about the usefulness of provided technologies on students' learning.	I cannot say it is useful because it is a waste of time. We have to act all the time and have the pen in hand. If you get too close to the smart board, even without touching, it becomes activated. I don't let my students use the Tablets but sometimes I use the IWB. For 4-5 years, I have been doing the same things by plugging my Notebook into the projector. Tablets may be for games, but I don't think they are suitable for studying. I don't believe students use the tablets for studying at home.

TPACK-Pedagogy	Issues with implementing pedagogical preferences with provided technologies.	For example, teachers question and see technology as an obstacle, if they are unable to use the technology in their classroom activities to ensure students' participation in the lesson. I also use audio-visuals in my classes to teach poetry, short stories and poems, etc. I want my students, for homework, to prepare similar presentations. I think this is an interesting way for them because they haven't been taught this subject in this way previously. Children try to pay attention for about 10 or 15 minutes. Then, they begin to stretch or put his/her head on his/her friend's shoulder and become drowsy. It is very good the children do not have to carry books and notebooks, but they have problems taking notes, following, and highlighting the important points on Tablets.
TPACK-Technology	Educational use of technology	I have been using the pdf files ready for use or the videos I downloaded. I tried to prepare a concept map, but it was a waste of time. So I started to use previously prepared presentations. Again, I tried to prepare a concept map with my students, but we could not do it much and then we gave up. I only use the IWB. I am faced with many technical problems. I wish we were trained in these matters. Generally, in-service trainings are inappropriate for our branches. I think it would be better for us to have subject-area oriented, in-service training programs. This would help us use the system better.
TPACK-Content	Content specific issues	There is a book for IWB. It is really useful. But, we should have ready information to use in the class. If so, it would be easier for us to learn. It is necessary to transmit data to IWB, to match, and to access the other Tablets in the classroom. Also, teachers should be able to intervene in the programs. Sometimes, I manage to prepare something to use in class, but when I try to open it on the smart board I cannot. The content provided to us is insufficient. We were given a system to log in, but there are many programs.

Table A2. Teachers' reflections by three different technology use/integration perspectives & Research questions

	Tablet PC	**IWB**
Beliefs/Acceptance / (TAM) Use *of Tablet PC & Interactive White Boards* *Research Question #1: Do teachers use Tablet PCs and IWBs?*	▪ Tablet PCs were found not useful and not in use in many schools. Teachers questioned their benefits. ▪ Along with the contributions of the Tablet PCs for teaching and learning, several technical barriers and issues with regard to ease of use reported.	▪ IWBs have been accepted as a useful tool in the classroom by several teachers and they attempted to use it as necessary. ▪ Teachers have generally found it easier to use IWBs. However, they faced several issues regarding functions and use.
Concerns (CBAM) *about Table PC & Interactive White Board Use* *Research Question #2: What are the major issues and concerns with regard to use of Tablet PCs and IWBs?*	▪ Teachers questioned the potential benefits of Tablet PCs, their impact on classroom management, and technical knowledge necessary to use it. ▪ Results clearly showed teachers' beliefs on the benefits of Tablet PCs are at the very low level. The potential benefits they obtain are limited. Teachers question their perceived usefulness. They think use of these technologies could limit their effectiveness in terms of classroom management, instruction, and personal development of the technology.	▪ Several concerns about functionality of IWBs (CBAM-Management) were also reported. Teachers reported they spent time to get their materials prepared (pdfs or any other formats) for use with IWBs. ▪ Teachers mostly raised concerns at Personal, Management, and Consequence levels. ▪ Adequate materials would motivate teachers to use IWBs more frequently.
Integration (TPACK) of the Tablet PCs & IWBs *Research Question #3: Are teachers using provided technologies effectively?*	▪ Teachers were not ready to use Tablet PCs with their current technological knowledge. ▪ Tablet PCs were mostly a presentation tool rather than a content development tool. ▪ Use of Tablet PCs in traditional teaching strategies was inadequate.	▪ Teachers use IWBs in more traditional forms—"IWBs as presentation tools." ▪ IWBs serve as a board for some teachers, presentation tool, or pdf reader. ▪ Few good examples demonstrate effective use. For example, a teacher uses IWB to show a video clip and begins a discussion on the clip.