Turkish Online Journal of Qualitative Inquiry (TOJQI)
Volume 10, Issue 4, October 2019: 439-461
DOI: 10.17569/tojqi.613969

Research Article

A Holistic View to Barriers to Technology Integration in Education

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Abstract

Technology integration is sustainable and persistent change in the social system of schools caused by the adoption of technology to help students construct knowledge (Belland, 2009). Although it is not possible for technology integration initiatives to have an absolute purpose, studies are conducted and application examples are designed to make this integration process more effective and efficient. The focus of many of research is to identify barriers to technology integration and provide solutions. In literature, factors affecting technology integration in education are handled in different ways and various classifications are used. The aim of this study is to compile the results of research on factors affecting technology integration in education according to Hew and Brush (2007) and Belland (2009) classification. This study was designed using integrative review method which is one of the literature review methods. In this study, barriers and solutions to the integration of technology in education are determined by Hew and Brush (2007) (*i*) resources, (*ii*) knowledge and skills, (*iii*) institution, (*iv*) attitudes and beliefs, (*v*) assessment, (*vi*) subject area culture, and (*vii*) habitus determined by Belland (2009). When the barriers to technology integration in education are examined, it is seen that these barriers are mostly directed towards teachers. In other words, teachers' knowledge, skills, attitudes, beliefs and inclinations on integration should be emphasized after the elimination of external barriers in order to achieve technology integration. Technology integration should be seen as adapting and transforming it into a culture rather than a mechanical process.

Keywords: *Barriers, institutional substructure, habitus, teacher beliefs, technology integration.*

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Received: 02.09.2019, Accepted: 26.10.2019

Eğitimde Teknoloji Entegrasyonunun Önündeki Engellere Bütüncül Bir Bakış

Öz

Teknoloji entegrasyonu, öğrencilerin bilgiyi yapılandırmalarına yardımcı olmak amacıyla teknolojinin benimsenmesi sonucunda okulların sosyal sisteminde sürdürülebilir ve devam eden bir değişimdir. Teknoloji entegrasyonu girişimlerinin mutlak bir amacının olması mümkün görülmemekle birlikte, bu entegrasyon sürecinin daha etkili ve verimli olması adına araştırmalar yapılmakta ve uygulama örnekleri tasarlanmaktadır. Bu araştırmaların birçoğunun odak noktası teknoloji entegrasyonunun önündeki engelleri belirlemek ve çözüm yolları sunmaktır. Literatürde eğitimde teknoloji entegrasyonunu etkileyen faktörler faklı şekillerde ele alınmakta ve çeşitli sınıflandırmalar kullanılmaktadır. Bu çalışmanın amacı, eğitimde teknoloji entegrasyonunu etkileyen faktörlere yönelik yapılmış araştırma sonuçlarını Hew ve Brush (2007) ve Belland'ın (2009) sınıflandırması doğrultusunda derlemektir. Bu çalışma literatür değerlendirme yöntemlerinden bütünleştirici değerlendirme yöntemi kullanılarak desenlenmiştir. Bu çalışma kapsamında eğitimde teknoloji entegrasyonu önündeki engeller ve çözüm önerileri Hew ve Brush'ın (2007) belirlediği *(i)kaynaklar,* (*ii*)*bilgi ve beceriler,* (*iii*)*kurum,* (*iv*)*tutumlar ve inançlar, (v)değerlendirme, (vi)konu alanı kültürü* ve Belland'ın (2009) belirlediği *(vii)habitus* olmak üzere toplam 7 kategori altında incelenmiştir. Eğitimde teknoloji entegrasyonunun önündeki engeller incelendiğinde bu engellerin daha çok öğretmenlere yönelik olduğu görülmektedir. Diğer bir ifadeyle, teknoloji entegrasyonunu gerçekleştirmek amacıyla dışsal engellerin ortadan kaldırılması sonrasında öğretmenlerin entegrasyon konusundaki bilgi, beceri, tutum, inanç ve eğilimleri üzerinde durulmalıdır. Teknoloji entegrasyonu, mekanik bir süreçten çok, bireysel ve kurumsal düzeyde teknolojiye uyum sağlama ve bunu bir kültür haline dönüştürme olarak görülmelidir.

Anahtar Sözcükler: *Engeller, habitus, kurumsal altyapı, öğretmen inançları, teknoloji entegrasyonu.*

Introduction

Technology is one of the most important parts of our daily lives, it has become impossible to think of education and teaching independently from technology. Technology integration with continuous development and change of technology continues to be one of the most important reforms in education (Jhurree, 2005; Jonassen, Peck, & Wilson, 1999; Polly, Mims, Shepherd, & Inan, 2010). Many projects around the world have been implemented in order to ensure technology integration and include ICT tools such as interactive boards, tablets, laptops and projectors in schools; high level access to software, internet infrastructure and various equipments (Beauchamp, 2004; Falloon, 2015; MoNE, 2017; Pamuk, Çakır, Ergun, Yılmaz, & Ayas, 2013; Smith, Higgins, Wall, & Miller, 2005; Slay, Siebörger, & Hodgkinson-Williams, 2008; Türel, 2011).

On the one hand, while technology integration studies gain momentum in schools, it is seen that research on technology integration has increased. In many studies examining the effects of the use of various technologies in education, it has been concluded that technology positively affects learning and success when used with appropriate pedagogical methods (Albaaly & Higgins, 2012; Almekhlafi, 2006; Erbas, Ince, & Kaya, 2015; Lei & Zhao, 2007; Malik & Shanwal, 2015; Mouza, 2008). However, it is thought that the results of these research are insufficient to say that the use of technology is effective in improving the quality of teaching and providing learning (Inan & Lowther, 2010). In addition, although access to technology is easier in schools, it is seen that technology is not used as often as desired in education (Belland, 2009; Inan & Lowther, 2010) and has not yet been able to improve the teaching practices in the classroom (Lim & Chai, 2008; Lowther, Inan, Strahl, & Ross, 2008).

Technology Integration in Education

While there is no clear definition of technology integration due to the ever-changing nature of technology and different perspectives, it can be said that it is a process that contributes to students' learning. Widely varying definitions of technology integration have emerged that; a sustainable and on-going change in the social system of schools as a result of the adoption of technology to help students structure information (Belland, 2009); using ICT tools for teaching

in schools (Hew & Brush, 2007); the use of ICT tools as integrative or mediator to perform learning and teaching activities (Lim, 2007) or the use of technology as a tool to support the learning process by teachers and students (Polly et al., 2010).

Similar to the different perspectives in the definition of technology integration in education, there are several models for integration in the literature. These models are Technological Pedagogical Content Knowledge Model (Koehler & Mishra, 2005), Technology Integration Planning Model (Robyler, 2006), Social Model (Wang, 2008), Systematic ICT Integration Model (Wang & Woo, 2007), Pierson's Technology Integration Model (Modified) (Woodbridge, 2003), Apple Classrooms of Tomorrow Model (Dwyer, Ringstaff, Sandholtz, & Apple Computer Inc., 1990), A Five-Stage of Computer Technology Integration Model (Toledo, 2005), E-capacity Model (Vanderlinde & Van Braak, 2010), 5W 1H Model (Haslaman, Mumcu, & Usluel, 2008) and the Activity System Model (Demiraslan & Usluel, 2006). The focus of these models is on different components such as educational institution, teacher, curriculum, process, benefit, pedagogical theories, learning, and technology. Each model proposes useful frameworks for teachers to ensure technology integration in education.

Technology integration in education is difficult and problematic (Cuban, Kirkpatrick, & Peck, 2001; Ertmer, 1999; Voogt & McKenney, 2017); it is also considered as a slow and complex process affected by many factors (Ertmer et al., 2012; Kim, Kim, Lee, Spector, & DeMeester, 2013; Valcke, Rots, Verbeke, & Van Braak, 2007; Webb & Cox, 2004). There is a consensus in the literature that technology integration cannot be fully achieved (Bauer & Kenton, 2005; Ertmer, 2005; Hew & Brush, 2007; Ilgaz & Usluel, 2011; Inan & Lowther, 2010; Lawless & Pellegrino, 2007; Thompson, Schmidt, & Davis, 2003). The use of technology in schools is expected to increase as a result of the widespread use of many technologies in schools through high budget projects and initiatives. However, teachers often use technology for non-instructional purposes (Cuban et al., 2001; Gray, Thomas, & Lewis, 2010; Hur, Shannon, & Wolf, 2016; Russell, Bebell, O'Dwyer, & O'Connor, 2003 and also, they give exaggerated responses to data collection tools related to the use of technology (Kopcha & Sullivan, 2007). According to these results, it can be said that technology integration is not of the expected quality and quantity.

While it is not possible for technology integration initiatives to have an absolute purpose, research are being conducted and application examples are designed to make this integration process more effective and efficient. In the literature, technology integration has been discussed with many concepts. Such as professional development (Kopcha, 2012; Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010), subject area (Hennessy, Ruthven, & Brindley, 2005; Howard, Chan, Mozejko, & Caputi 2015; Lim, 2007), self-efficacy belief (Abbitt, 2011; Wang, Ertmer, & Newby, 2004), attitude (Van Braak, 2001), pedagogical beliefs (Inan & Lowther, 2010; Lim & Chai, 2008; Liu, 2011; Sang , Valcke, Van Braak, & Tondeur, 2010), epistemological beliefs (Maor & Taylor, 1995), technopedagogical content knowledge (Ay, Karadag, & Acat, 2015; Polly et al., 2010), habitus (Belland, 2009), teacher training (Lawless & Pellegrino, 2007), teaching activities (Liu, 2011; Teo, Chai, Hung, & Lee, 2008; Yen & Lee, 2011), curriculum (Pac, 2008), technical or managerial support (Bradshaw, 2002; Glazer, Hannafin, & Song, 2005; Glazer, Hannafin, Polly, & Rich, 2009) and interactive whiteboard, tablet technologies (Moran, Hawkes, & Gayar, 2010; Pamuk et al., 2013). The focus of many of these research is to identify barriers to technology integration and provide solutions.

In literature, factors affecting technology integration in education are handled in different ways and various classifications are used. The aim of this study is to compile the results of research on factors affecting technology integration in education according to Hew and Brush (2007) and Belland (2009) classification. In this context, barriers and solutions to technology integration in education were examined under following categories: (*i*) Resources, (*ii*) knowledge and skills, (*iii*) institution, (*iv*) attitudes and beliefs, (*v*) assessment, (*vi*) subject area culture and (*vii*) habitus.

Methodology

This study was designed using integrative evaluation method which is one of the literature evaluation methods. Integrative evaluation is defined as a type of literature evaluation in which the current information situation on a subject is presented and summarized, and the consensus and disputes related to the subject are highlighted (Neuman, 2007). The study was conducted in five stages: (*i*) identifying the research problem, (*ii*) collecting the data, (*iii*) evaluating the

data, (*iv*) analyzing and interpreting the findings, and (*v*) evaluating the information obtained and making recommendations on the research topic (Cooper, 1986).

Findings

Barriers to Technology Integration in Education

Many studies aiming at increasing the effectiveness of technology integration in education have focused on the barriers to technology integration. Barriers to technology integration in education; through quantitative research, structural equation modeling or regression analysis; and in qualitative research, it was determined through content analysis or descriptive analysis of data based on observation and interview. These barriers are addressed using different classifications.

Barriers were first conceptualized as internal and external barriers by Ertmer (1999). Internal barriers can be explained as beliefs, perceptions, and attitudes about the learning-teaching process in which individuals cannot be noticed from outside and perhaps even the individual is not aware of them. It suggests that internal barriers are more difficult to overcome than external barriers due to the possibility of not being made concrete and not being aware of even the individual himself/herself (Ertmer, 1999). One thing to consider is that these barriers cannot be addressed solely for teachers. However, teachers' key role in technology integration shows that many of these barriers are related to teachers. Ertmer (1999) states that external barriers, which are defined as the absence or insufficiency of external resources such as access to technology, time, support and education for teachers, are more easily measured and resolved than internal barriers. With the investments made to ensure technology integration, considering that the necessary resources are provided in schools, it is concluded that overcoming external barriers alone is not sufficient for technology integration.

Hew and Brush (2007) identified 123 barriers by examining 43 empirical studies, and then summarized under following 6 categories (*i*) resources, (*ii*) knowledge and skills, (*iii*) institution, (*iv*) attitudes and beliefs, (*v*) assessment and (*vi*) subject area culture. Belland (2009) underlines teacher beliefs in the integration process. He tried to explain how these beliefs were

shaped by Bruner (1996) 's public pedagogy and Bourdieu (1979)' s habitus concepts. Tsai and Chai (2012) highlighted the dynamics of the classroom environment and underlined that design-oriented thinking, which enables them to produce and organize materials and activities to meet the instructional needs of learners, can be another type of barrier. Kopcha (2012), on the other hand, discussed the criticisms of the failure to achieve technology integration despite the time, money and efforts spent and pointed out the barriers faced by teachers in providing technology integration. These barriers are summarized under (*i*) access, (*ii*) vision, (*iii*) beliefs, (*iv*) time and (*v*) professional development. In this research addressed barriers are as shown in Figure 1.

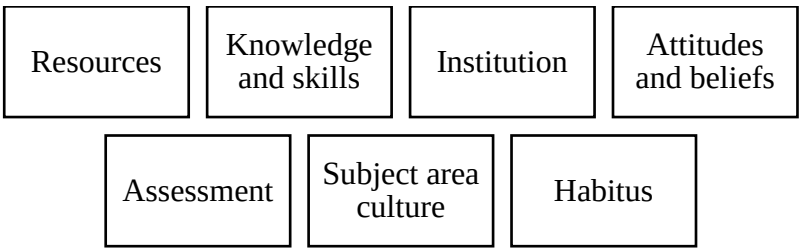

Figure 1. Barriers to technology integration

Resources

The existence of technology, access to existing technologies, technical support, lack of time and software are considered as barriers to integration (Hew & Brush, 2007). It is stated that the existence of technology and access to technology is one of the most important elements of technology integration (Hew & Brush, 2007; Nikolopoulou & Gialamas, 2015) and teachers need to be supported regularly on a managerial and technical basis (Ertmer & Ottenbreit-Leftwich, 2013; Hur et al., 2016). Teachers have very limited technical support in schools (Cuban et al., 2001), and they are disappointed when they want to access technology and have problems in terms of technical or access (Sandholtz, 2001), however, when access and support is provided for continuous education, usage is in high level (Lowther et al., 2008). In addition, it was seen that teachers could not find time for preparation due to their intensive course loadings (Al-Alwani, 2005; Sicilia, 2005) and that they could experience burnout when they spent the extra time required for preparation process (Hew & Brush, 2007).

Knowledge and skills

In technology-assisted instruction, the lack of technological knowledge, techno-pedagogical knowledge, classroom management knowledge, and skills is defined as the biggest barrier to technology integration (Hew & Brush, 2007). It is interesting that teachers do not prefer to use technology in teaching because of their anxiety and insecurity about this disability (Wachira & Keengwe, 2011). The use of technology in teaching requires teachers to change their existing pedagogy and classroom management knowledge. On the other hand, the use of technology is seen as a burden both in terms of its use during teaching and in terms of pedagogy and technical knowledge to be learned (Belland, 2009; Kopcha, 2012). Therefore, teachers, who do not prefer change, reflect the shape they will draw on the blackboard by means of a projection device and use technology only as a passive tool within the framework conceptualized by Beauchamp (2004).

From a professional development perspective, teachers need to be supported on how to integrate technology and make it routine. Another point that stands out in this context is that it does not contribute to the technology integration if there is no support given after one-time workshops and ordinary seminars (Scott & Mouza, 2007; Brinkerhoff, 2006). On the contrary, it was seen that teachers who participated in learning communities continued to use technology after intensive professional training (Cifuentes, Maxwell, & Bulu, 2011). Kopcha (2012) concluded that in a two-year professional development study with the mentor, teachers could develop activities and routines that teachers could use in their teaching practices.

Institution

Institutional barriers express high-level factors such as leadership, school planning, vision, and education policies. Inadequate or insufficient institution and country policies in terms of supporting technology integration will lead to the failure of technology integration (Vanderlinde & Van Braak, 2010; Mazman & Usluel, 2011). The fact that teachers, although competent in terms of technology integration, could not be successful without the support of managers (Dawson & Rakes, 2003) shows that managers play a key role in this process. In this respect, managers need to develop and adopt an institutional technology vision (Kopcha, 2012; Sheninger, 2014).

Attitudes and beliefs

Teachers' epistemological beliefs, beliefs about effective teaching methods, beliefs about technology, pedagogical beliefs; teacher self-efficacy, professional development, openness to innovation, attitudes towards technology are the concepts discussed in research in many contexts. In terms of technology integration, teacher beliefs have the most important role in the teacher's decision to use technology (Ertmer & Ottenbreit-Leftwich, 2010; Inan & Lowther, 2010). Inan and Lowther (2010) examined the factors affecting technology integration by path analysis and concluded that teachers' computer self-efficacy and beliefs had an effect on technology integration.

As it is known, teacher's pedagogical beliefs have an effect on traditional or constructivist shaping of teaching. Similarly, there are studies that found that constructivist beliefs and practices are important predictors of technology use (Ertmer, 2005; Overbay, Patterson, Vasu, & Grable, 2010; Sang et al., 2010). In the literature, many internal factors are emphasized such *teachers' pedagogical beliefs* (Ertmer et al., 2012, Inan & Lowther, 2010; Lim & Chai, 2008), *epistemological beliefs* (Kim et al., 2013), *self-efficacy beliefs* (Inan & Lowther, 2010), attitudes (Lim & Chai, 2008, Van Braak, 2001) and their *resistance to change* (Gomez, 2005). Arslan (2016) states that teachers' attitude towards technology integration is the most important factor affecting technology integration. In addition to this, the factors that affect the attitude of teachers are to see technology as a new teaching approach, to consider that it will be used more efficiently in certain branches. Demirbağ (2018) concluded that teachers' technopedagogical content belief systems affect technology integration.

With overcoming external barriers to technology integration, researchers' focus has shifted towards the quality of integration. In many countries, access to technological infrastructure in schools is thought to be a smaller problem than in the past (Belland, 2009). In this respect, as mentioned earlier, it is expected to teachers use technology, not as a passive tool, as an active and interactive tool. Also are expected to implement applications based on technopedagogical

knowledge that will meet their students' requests and needs (Ottenbreit-Leftwich et al., 2010; Ertmer et al., 2012). Meeting these expectations will be possible by changing teachers' attitudes and beliefs.

Assessment

The assessment, which is generally defined as the measurement of learning, is considered in two ways as formative and summative assessment. National examinations for students' graduation or progression to the next level are examples of summative assessment. It is stated that teachers' being under the pressure of these national exams is one of the barriers to technology integration (Hew & Brush, 2007). They tend to prefer traditional methods that they believe to be more applicable in teaching. This tendency can stem from inadequate time to plan and use technology (Butzin, 2004; Fox & Henri, 2005), and insufficient knowledge and belief to achieve higher and meaningful learning outcomes with technology integration in national exams (Ertmer & Ottenbreit-Leftwich, 2010). However, contrary to these beliefs and expectations of teachers; Ertmer et al. (2012) found that the classes of teachers providing technology integration achieved higher levels of success in national exams than before.

Subject area culture

Subject area culture points out that each subject area has its own content, pedagogy and evaluation approach and that is one of the barriers to technology integration (Selwyn, 1999). These subject-specific approaches diversify the pedagogical perspectives of teachers in different disciplines (Niederhauser & Stoddart, 2001) and influence the use of technology in instructional applications (Hennesy et al., 2005; Howard et al., 2015; Selwyn, 1999). Accessible technological materials and software, resistance to change, the use of technology, the support of colleagues differ in various fields (Hennesy et al., 2005; Howard et al., 2015). It is known that field teachers create various learning communities in order to achieve effective technology integration. Selwyn (1999), in research conducted with teachers and students in various fields, explained how the subject area is determining the opinions of individuals about the use of technology. Arslan (2016) has stated that teachers believe that technology will be used efficiently in certain branches. Specifically, Educational Informatics Network (EBA) in Turkey is important in terms of providing material support to teachers, but it is difficult to

mention the existence of a number of content equal to in terms of content and grade level. It is possible to say that the number and quality of materials are higher in certain courses. In spite of that, technology integration in areas such as arts and physical education in the context of the subject area is more difficult, also lack vision, resistance to change, the idea of breaking away from the essence of the field limits the use of technology.

Habitus

Belland (2009), has explained the barriers to technology integration on the basis of Bruner' (1996) folk pedagogies and has used Bourdieu's (1979) Habitus Theory which explains the individual's sense, thinking and behavior schemes. Based on the studies that concluded that teachers' teaching behaviors were affected by their experiences when they were students (Marsh, 2006; Noyes, 2004); It is stated that the tendencies resulting from the experiences of the teachers in their own learning lives, in other words, the habitus affect the integration of technology (Belland, 2009). Although teachers have been learned about contemporary approaches such as constructivism, research have concluded that they use traditional teacher-centered approaches in the teaching process (Shriki & Lavy, 2005; Windschitl, 2002).
Arslan (2016) stated that one of the barriers to technology integration in Turkish education is the quality of pre-service and in-service trainings given to teachers. In this context, it can be concluded that the trainings for the effective use of technology in the classroom were insufficient. As emphasized by Belland (2009), technology integration or educational technology courses should enable prospective teachers to apply the theoretical knowledge gained in various periods.

Discussion and Conclusion

Many studies conducted on the integration of technology into the education process have concluded that teachers, students, administrators, and parents have positive opinions. However, failure to provide the required level of technology integration is still a problem try to solve. When the literature was examined, it is seen that the researchers agree that technology integration could not be achieved completely. It is also interesting to note that, although the factors affecting technology integration are clearly known, this still remains unresolved.

Barriers to technology integration in education are also factors affecting technology integration. Factors affecting technology integration in education are considered as internal and external factors. However, it is stated that external factors are more likely to be detected and eliminated than internal factors (Ertmer, 1999). Accordingly, teachers' attitudes and beliefs can be seen as the reason why effective technology integration cannot be achieved despite the elimination of external barriers such as the existence of technology and access to education. Therefore, in order to achieve an effective integration process, research can be conducted which will enable teachers to develop positive beliefs about technology and integration. The main barriers to technology integration in education are called resources. This barrier covers follow; lack of technology, lack of access to existing technology, lack of administrative support, lack of technical support, lack of time for course preparation, and inadequate software (Hew & Brush, 2007; Nikolopoulou & Gialamas, 2015; Ertmer & Ottenbreit-Leftwich, 2013; Hur et al., 2016; Al-Alwani, 2005; Sicilia, 2005).

The second barrier to technology integration is teachers' perceptions of their inadequacy or lack of knowledge and skills (Hew & Brush, 2007). The third barrier is called institutional barriers and includes educational policies of institutions and countries (Vanderlinde & Van Braak, 2010; Mazman & Usluel, 2011). Educational policies of institutions and countries are effective in achieving technology integration. Policies that support teachers in this regard contribute to the achievement of integration.

The fourth barrier is attitudes and beliefs. Bandura states that an individual's efficacy beliefs will have an effect on their attitudes and behaviors (Bandura, 1977) and that higher efficacy beliefs have an effect on the stability of their actions (Bandura, 1986; 1997). The most important factors affecting individuals' use of technology are generally their attitudes and beliefs towards technology. In terms of technology integration, teachers should first decide on the use of technology and show determination in these actions. Even if teachers have technology knowledge and technopedagogical knowledge, it is expected that their belief that the use of technology will improve their teaching performance and not require much effort. Obviously, it is not enough for teachers to have a certain level of knowledge and skills alone, also their beliefs in the use of technology should affect their behavior positively. Because of

the rapid change in technology, instead of teachers adopting and using a particular technology; they should be innovative and pioneering individuals (Tosuntaş, 2017).

The fifth barrier is that teachers do not have enough time to plan and use technology in teaching because of national exams to evaluate students (Butzin, 2004; Fox & Henri, 2005) and teachers' insufficient belief that high-level learning and high success can be achieved through technology integration in national exams (Ertmer & Ottenbreit-Leftwich, 2010). In this respect, it is necessary to develop beliefs that teachers' use of technology in teaching does not constitute a barrier for preparation for exams and on the contrary, they can achieve higher levels of success with technology.

The sixth barrier is the subject area culture. Each subject area has its own content, pedagogy and evaluation approach (Selwyn, 1999). These approaches diversify the pedagogical perspectives of teachers in different disciplines (Niederhauser & Stoddart, 2001) and influence the use of technology in instructional practices (Hennesy et al., 2005; Howard et al., 2015; Selwyn, 1999). It can be considered relatively easy to access and use materials, especially in areas such as science and mathematics. Therefore, additional studies are needed to ensure technology integration in disadvantaged branches such as arts and physical education without lose the field's soul.

The last barrier is the tendencies that are formed as a result of the experiences of teachers in their own learning life; habitus. Definitely, it can be foreseen that these trends will affect not only technology integration but also the entire teaching-teaching behavior of teachers. The fact that the tendencies arising from past experiences have such an effect on the individual's behaviors reveals the importance of teacher education. Numerically, it is difficult to reshape 12-year educational background of prospective teachers with approximately 4-year programs. On the other hand, when teacher education is taken into account, it is worth discussing the experiences created in the courses where technology integration and constructivism are conveyed through ineffective traditional methods. According to these experiences, prospective teachers can choose to follow the way they see or learn. It is evident that if the faculty members do not integrate technology in their courses and the prospective teachers cannot create experiences related to the technology integration process throughout their lives, this will have a negative impact on their professional life.

Consequently, the main barriers to technology integration in education as follows: Presence of technology and access to technology, teachers' techno pedagogical knowledge (Hew & Brush, 2007), educational policies (Vanderlinde & Van Braak, 2010; Mazman & Usluel, 2011), teachers' attitudes and beliefs (Ertmer & Ottenbreit-Leftwich, 2010; Inan & Lowther, 2010), the pressure of national exams on teachers (Hew & Brush, 2007), the subject area (Selwyn, 1999) and the teaching tendencies of prospective teachers (Belland, 2009). When the barriers to technology integration in education are examined, it is seen that these barriers are mostly related to teachers. For this reason, teachers' knowledge, skills, attitudes, beliefs, and tendencies about integration should be emphasized after the elimination of external barriers in order to achieve technology integration. For all that, teachers need to be supported in the process of technology integration, so both institutions as schools and curricula should be able to support teachers. Hew and Brush (2007) described strategies to overcome barriers and could be useful in general: (*i*) having a shared vision and technology integration plan, (*ii*) overcoming the scarcity of resources, (*iii*) changing attitudes and beliefs, (*iv*) conducting professional development and (*v*) reviewing assessments.

Technology integration should be seen as adapting to technology and transforming it into the culture at an individual and institutional level rather than a mechanical process (NCES, 2002). Future research should be to identify specific barriers to technology integration in the context of Turkey. On the other hand, in order to overcome the barriers, the effectiveness of various sustainable teacher working groups can be examined.

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