INTEGRATING TECHNOLOGY INTO TEACHING AND LEARNING USING VARIETY OF MODELS

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Abstract

By means of the innovations on Information and Communication Technology, people are able to rapidly learn and transferring information becomes easier. Technological devices such as computers, mobile gadgets and Internet are essential in our daily lives and using those technologies is not a luxury for us anymore but a necessity. Keeping up with those innovations and using them in our lives is the key factor for being a knowledge society. Not only having those technologies in classroom and at school but also knowing how to use them is important. Also, it should be recalled that those technologies are more than just transferring learning materials to a digital environment because they are expected to provide communication, cooperation and meta-cognition. In this study, comprehensive processes of applying technology to the curriculum models are examined in detail.

Keywords: Technology; teaching; technology integration

Introduction

In the last quarter of the previous century, changes in Information Communication Technologies (ICT) have made educators revise their own instructional skills and teaching methods while trying to help students integrate them to new technologies. Technology integration means teaching a subject which exits in the curriculum via technology as an instructional tool. Even though it is predicted that technology use will promote students' learning, there is no common ground about how computers should be used with other learning tools. This lack of common ground can be claimed to cause teachers' using computers randomly or not using them at all.

Although technology integration is generally understood as the existence of technology in the classrooms, actually the main problem should focus on integrating technology to teaching process, learning experiences, and curriculum. 'Integration' which is a word derived from Latin means completeness and wholeness or including technology in the teaching and learning process by making basic components come together and eliminating artificial differences (Earle, 2002). Technological practice not only enhances students' gain of learning and understanding but it also increases their willingness to learn, which is necessary for learning, promotes collaborative learning and contributes to improvement of problem solving skills (Schacter and Fagnano, 1999).

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Russel and Sorge (1999) emphasized how technology helps students have a broader control on their own learning experience by allowing analytical and critical thinking which are asserted in Constructivist Learning Theory. It is often indicated in literature that with technology integration to education, classes will not be teacher centered anymore but they will become more students centered environment.

In the last few decades as technology has become an indispensable part of our daily life, different learning opportunities have been introduced to the students, which have led to the need for educators to review their teaching methods. Educational researchers indicate that integrating technology into the classroom may be advantageous for students and teachers. For example, technology can help motivating learners and provide them important skills to reinforce their learning (Bissell, 1998; Burns, 2006; Feldstein, 1988; November, 2010; Project Tomorrow, 2010).

Technology also allows students to have access to many sources to become independent learners and to communicate directly and effectively with experts (Project Tomorrow, 2010). In USA within the scope of the project No Child Left Behind (NCLB, 2001) it is aimed to increase the academic achievement of children by employing high quality teachers (Southworth, 2010), reducing the number of students per class (Milesi & Gamoran, 2006), and with technology integration in education (U.S. Department of Education, Office of Planning, Evaluations and Policy Development, & Policy and Programs Studies Service, 2009). It is also aimed to actualize integration in Turkey with the Basic Education Project and the FATIH Project, to reduce the inequality in opportunities and to increase the quality of education (Çelen, Çelik ve Seferoğlu, 2011). With the various multimedia facilities, it has, technology offers ways of learning in ways that were not possible earlier. Hew and Brush (2007) defines technology integration as teachers' use of any technology in the classroom to increase the success of the students. According to Hennessy, Ruthven and Brindley (2005), technology integration is defined as the re-shaping of teachers' educational activities in the classroom.

With a successful technology integration, learners need to learn to use the technology tools they need for information retrieval. Therefore, technology should be accessible in educational environments such as other classroom tools. In successful technology integration, teacher does not consider ways to use tools in classroom, but thinks about using them to improve learning without problems, whatever the content is. Thus, while technology supports content knowledge, it is also used to acquire technology skills (ISTE, 2007).

However, technocentrism and pedagogical dogmatism can be cited as the main reasons for the failure of large-scale technology integration (Harris, 2008). According to Papert, technocentrism is the center of all problems (Papert, 1987). Technology involves the transmission of content and the use of equipment, but the main goal should be to strengthen teaching and learning (Doyle, 1992). In summary, integration is not related to the ratio of technology used, but how and why it is used.

Throughout teacher training process, trainee teachers receive pedagogical, content and technological information but it is observed that teachers' skills of using technology for educational purposes is not sufficient because of the information that is not given together accordingly (Çoklar, Kılıçer and Odabaşı, 2007). According to Wenglinski (2005) educational technology should not be perceived as an isolated phenomenon but it should be regarded as a piece of the jigsaw of how teachers teach and students learn. According to Haşlaman et al. (2007) when ICT is integrated to teaching-learning process, it means that;

• Teachers will plan and design effective learning environments and experiences that are supported by ICT,

• Teachers will create suitable learning opportunities for applying teaching strategies that are enriched by ICT in order to support diverse student needs and

• Teaching plans which contain methods and strategies that are necessary for using relevant technologies will be applied.

In this paper, using integration models which enhance learning and teaching by integrating technology to learning environments are analyzed in detail.

Technology Integration Models

ICT's modeling of learning and teaching process's integration is important in terms of the embodiment of technology integration which is a complicated process and appearance of its fundamental components. The following models that are related to ICT's integration to learning and teaching process explained below:

• Apple Classrooms of Tomorrow (ACOT) Model (Dwyer, Ringstaff, Sandholtz and Apple Computer Inc., 1990)

• Pierson's **Technology Integration** Model (Modified) (Woodbridge, 2004)

• Technology Integration Planning Model for Teachers (Roblyer, 2006)

• Technological Pedagogical Content Knowledge Model (TPACK) (Mishra and Koehler, 2006)

• Social Model (Wang, 2008).

• Systematic ICT Integration Model (Wang and Woo, 2007)

• The Substitution Augmentation Modification Redefinition Model (SAMR) (Puentadura, 2012)

Apple Classrooms of Tomorrow (ACOT) Model (1990, 2008)

ACOT (Apple Classrooms of Tomorrow) is a project which started in 1985 with the association of schools and Apple Computer. The purpose of the project is to investigate how the technologies used by teachers and students affect learning and teaching. According to ACOT Model, integration has five following levels: Entry, Adoption, Adaptation, Appropriation, and Invention (Dwyer, 1994). The Project of ACOT which started in 1985 and lasted till 1995 aimed to show how technology will change teaching and learning as a result of its use by teachers and students.
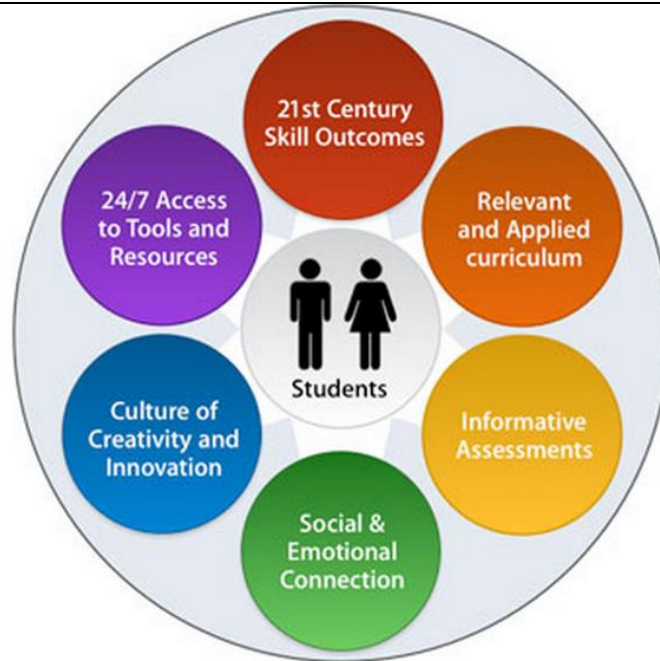
Figure 1. Components of ACOT2 Model

Changes and improvements that have occurred in every field of life have also affected the field of education, learning environments and learning tools and techniques have changed and the project which started in 1985 is regenerated by being adapted to the conditions of the day. The second phase ACOT2 is more target oriented than ACOT and it ensures that students be in the learning environment where their needs, wishes and expectations are met, i.e. that 'students stay at schools'.

In Apple Classrooms of Today and Tomorrow Model, it is mentioned that changes in every field also affect the field of education and the answers to what should be taught and how have changed. Schools should not ignore the fact that the students of new generation are different than the previous generations when teaching methods are compared with students of today who were born in a world where there are portable computers, cell phones with web browser, instant messaging software, platforms like Wiki and blogs where they can express themselves. ACOT2 Model has six components and these components can be seen in Figure 1.

To understand 21st Century's learning products: Teachers should make logical decisions related to how and when they should teach according to students' individual needs. Teachers should think of what to teach beforehand how to teach, with the help of technological innovations. Connected and applicable curriculum presents an innovative vision by adapting the best pedagogical techniques to the needs of students. Students should be encouraged to use techniques of the twenty first century which are connected to each other. Curriculum should be applicable to the students' current and future lives which is enhanced by the power of Web 2.0 and other widespread technologies like "the internet of things" which is about to come with Web 3.0.

Evaluation tools that are used in classrooms should enhance students' learning constantly and inform learning environment by increasing the feedback given to students, teachers, parents, and decision makers. In the component of students' social and emotional connection, personal, professional, and family relationships which are the reasons of a child's health, growth and cognitive development, in

family, school and the society are defined. Schools should create a culture which will support the innovative approach for learning by enabling each individual to solve their own problems with the help of creativity and ingenuity. In addition to this, teaching and learning environments should supply the suitable environments for these techniques to develop incessantly.

Technology Integration Planning Model for Teachers

This model consists of five levels and there are questions to be answered by teachers in every level. The control list that is expected to be answered by teachers includes following questions: Why should I use technology? What are suitable evaluation strategies? What are suitable integration strategies? How will I prepare classroom environment, teaching materials? How will I know that it works? (Roblyer, 2006). So as to create effective technology integration, all of the components of education system like ministry, teachers, students, and parents should have the consensus and they should share a common vision.
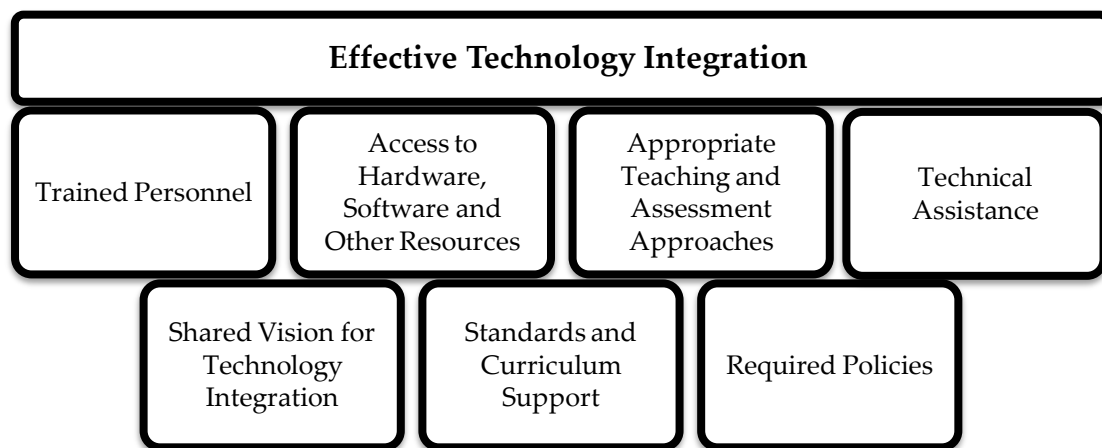

Figure 2. Fundamental Requirements of Effective Technology Integration
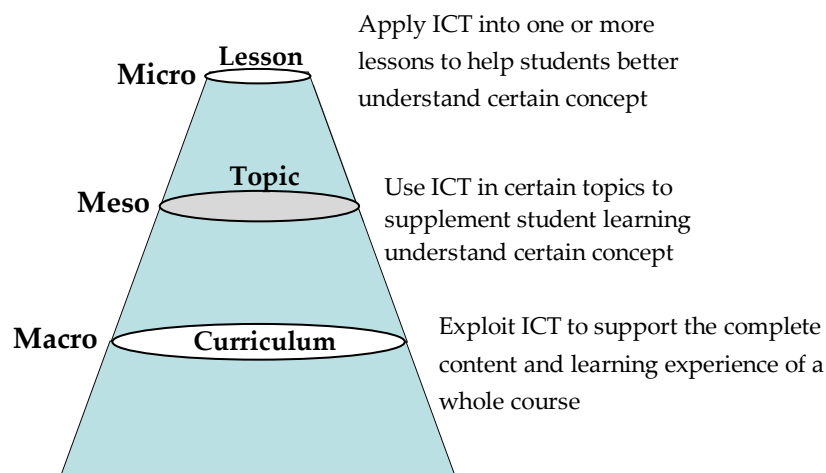

Figure 3. ICT Integration Areas

Technology integration is divided into three categories as micro, mid, and macro. Micro level covers a single lesson and mid-level covers the content area while macro level covers the curriculum which is shown in Figure 3. As for the topics, such as legal/ethical use on technology integration, safe internet use and equality, they are available in the sub-titles of necessary policies. The table that indicates the fundamental requirements of effective technology integration is shown above.

Technological Pedagogical Content Knowledge Model (TPACK)

Mishra and Koehler (2006) developed Technological Pedagogical Content Knowledge Model by broadening Schulman's frame of including technology into teaching. Mishra and Koehler define TPACK Model as the pedagogical techniques that are used to teach the content in a constructivist way by using technology. The ways which find out what makes learning concepts easier or harder and how technology can be a solution to the problems that students face, information on students' former knowledge and information hypothesis theories, the ability of new technologies' constructing new knowledge on the previous knowledge and developing new information hypothesis or teaching well by using the technology that requires making the ones that already exist stronger
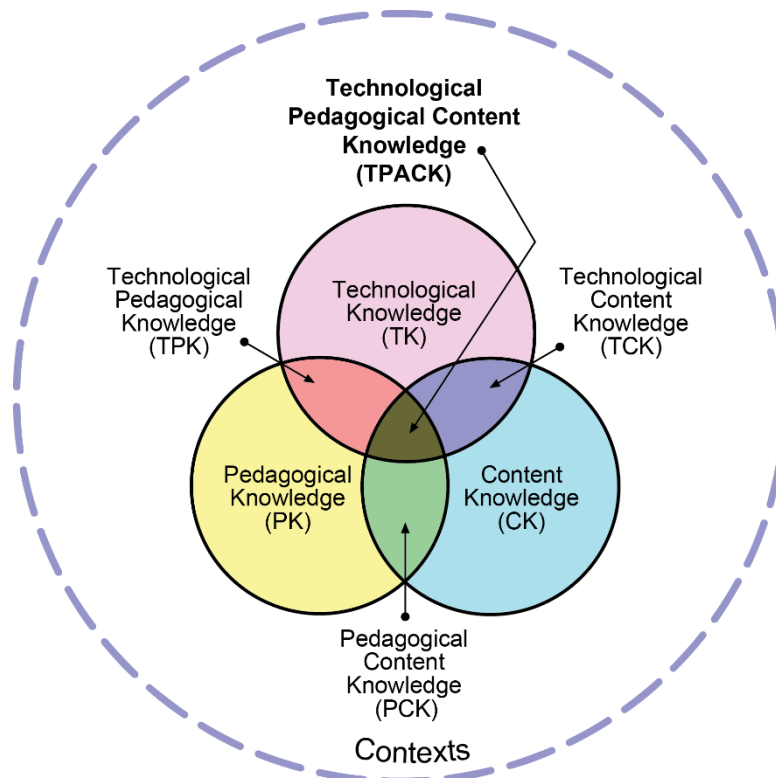

Figure 4. TPACK Model

TPACK Model is a three-component model which represents teacher's pedagogical, content and technological knowledge. TPACK Model which has seven different areas with the combination of the components of this three-component technology model is shown in the Figure 4. While the areas of content, pedagogy and technology fields consist of the information that is specific to their areas only, other areas cover the information that is created by their intersection. For instance, when pedagogical content knowledge field is used in math lesson, it contains pedagogical content knowledge that is

related to teaching math lesson not general teaching techniques. As for pedagogical content knowledge field, it is aimed to combine the teaching methods and techniques of a specific course with technology use for a course's content teaching effectively. TPACK Model enables teachers transfer the content knowledge to the students and helps students learn better. In addition to aforementioned literature, several works implied TPACK is helping to prepare new teachers for using technology in the service of early literacy development. Hence investment in developing the TPACK of teacher educators is an important issue to focus on (Kihoza, P., Zlotnikova, I. & Kalegele, K., 2016; Voogt & McKenney, 2017).

Pierson's Technology Integration Model (Modified)

Woodbridge (2004) adapted Pierson's 1999 integration model, and defined technology integration as teachers' combination of the content of the lesson and their technological and pedagogical experiences in order to make students learning easier. It is indicated that technologic integration is difficult to achieve and that's why teachers and students should use software and hardware devices that allow a student-centered approach. In the model, the importance of students' construction of the information as the forth component is highlighted by the fact that it is placed in the center of technological, pedagogical and content knowledge which can be easily seen in Figure 5. According to Pierson, education reform should focus not only on buying more computers but also some efforts should be put in to improve learning strategies that complete the curriculum.
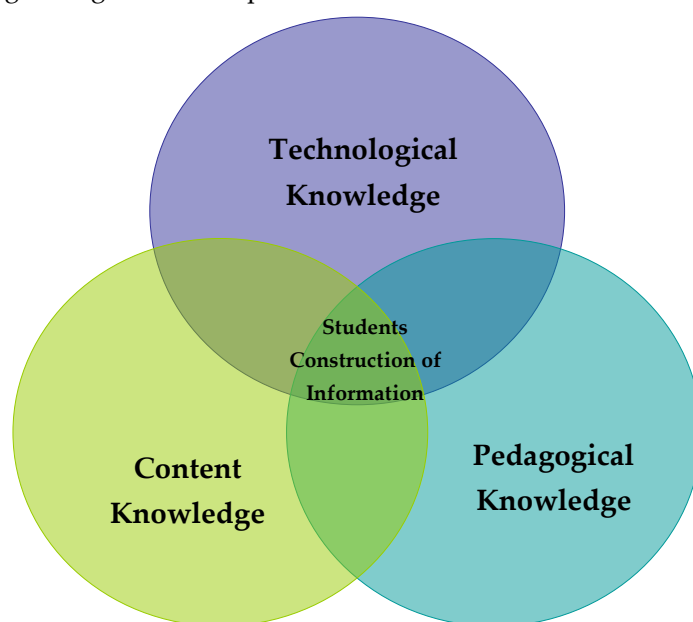

Figure 5. Pierson's Technology Integration Model

Systematic ICT Integration Model

In the integration of ICT with instructional design models Wang and Woo (2007) concocted Systematic ICT Integration Model. Systematic ICT Integration Model which has a logical flow structure that is shown in the Figure 6. Every component's development is dependent on the completion of the preceding component. This model has an easy to follow structure which can go on with the next component when they are done with the current component. The most important process step is that it reveals why the technology is used in the current step. Depending on the extent of the content ICT

integration can take place in three areas. These are: curriculum (macro), subject area (mid) and lesson (micro). ICT integration to curriculum can be a science lesson of which many of its subjects are included. Integration of such subjects which can be covered in one lesson as DNA structure or cell division into technology with the use of ICT is defined as micro level. ICT integration model is shown in Figure 6.
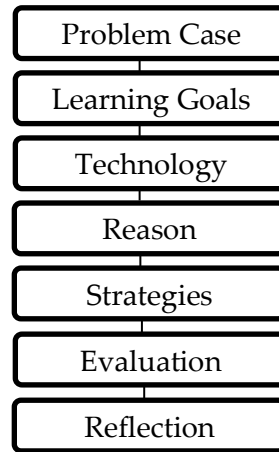
Problem Case

Learning Goals

Technology

Reason

Strategies

Evaluation

Reflection

Figure 6. Systematic ICT Integration Model

Social Model

There are many teaching models that teachers can integrate ICT to curriculum. ASSURE and ICARE models and Systematic Planning Model can be given as examples. According to Wand and Woo (2007) although these models lead teachers in showing how different sources can be integrated to learning and teaching environments, they don't inform teachers about why these sources and devices should be used that way. These models provide useful principles in integrating ICT to teaching and learning from different perspectives. However, researches have shown that teachers who have been educated by the use of linear teaching model are generally reluctant to use the models as their use in school environment is inconvenient during teaching planning process (Mishra and Koehler, 2006; Neiss, 2005).

Social Model contains three basic components: pedagogy, social interaction and technology. Education is a whole with its pedagogical, social and technological components (Kirschner, Strijbos, Kreijn and Beers, 2004). In educational context, pedagogy is the teaching strategies, techniques and approaches that teachers use in order to give instructions and make learning easier. Pedagogical design is a continuous process which cannot be determined only before the lesson. In addition to the choice of suitable content or activities, pedagogical design also deals with the effective use of these sources in students' learning. In terms of pedagogical design, learning environment should meet and support the learning purposes and needs of students from different origins. Furthermore, it should include using diverse sources and activities that support learning and ways of teachers' making learning easier (Chen, 2003; Kirschner et al., 2004). Social activities are rather important in daily life. Without any doubts, people live and work in an environment where they ask for help from someone when they encounter a problem (Wilson & Lowry, 2000).

The Substitution Augmentation Modification Redefinition Model (SAMR)

The SAMR model is not a pedagogical method, but a tool that guides pedagogues and tells them what kind of assignments they should give during students learning process. It shows how to integrate training into teachers' techniques so that each student learns more deeply in the environment where each student owns a computer, and how the expectations from the students should change in lessons with digital technology. SAMR model consists of four main components, these are: substitution augmentation, modification and redefinition are explained in detail and shown below in Figure 7.

Substitution: The new digital tools are used instead of the previously used tools, but nothing is expected from the students. For example; Students write on the computer instead of writing with a pen.

Augmentation: Here, digital tools replaces the tools used before. Functional improvement, is mentioned here. For example; students fill out a Google-drive test on a computer and send it digitally to their teacher**.**

Modification: The use of computers leads to changes in education. In this social environment students learn by exchanging ideas together. For example: Students share their arguments in a digital environment by supporting them with pictures, movies and links. Thus, individual literacies turn into social acts where; thoughts, ideas and experiences are shared with others.

Redefinition: Here, technology redefines education. It's a new kind of work. Students increase communication with others, become creative and innovative. At this stage, assignments lead the student to become a teacher in teachers' position. As a result of the assignment, informing others, explaining it, teaching can be the subject. It is expected that information gathered with the assignment will be presented in a new format. The computers are used open up new windows to the world. Students can spread their knowledge, feelings and thoughts, communicate with others via blogs, wikis, or Facebook, Skype etc. For example: a written composition can be visualized with movies, pictures and/or music and shared with the world.
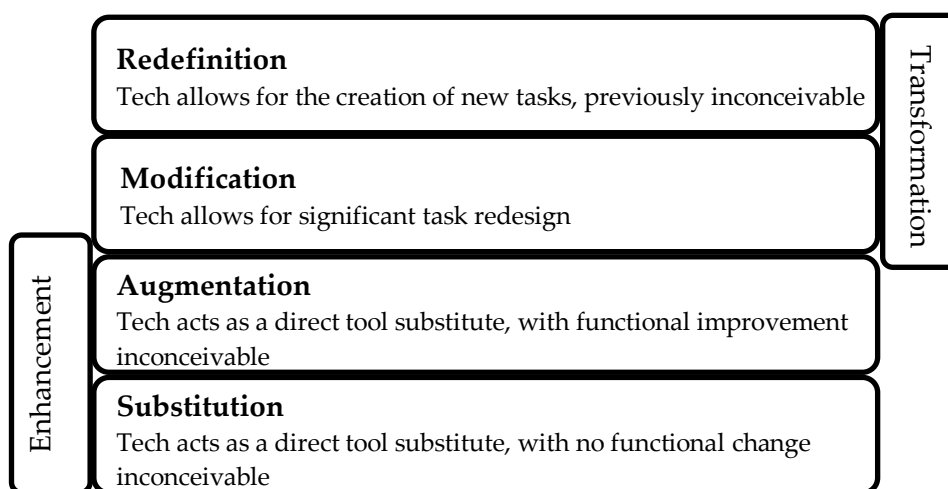

Figure 7. SAMR model of technology integration (Puentedura, 2009)

Conclusion and Suggestions

Technology integration models have an important role in terms of integration of ICT to learning and teaching process, embodiment of technology integration which is a complicated process. Technology Integration Model for Teachers and Systematic ICT Integration Model are different from other integration models for teachers in respect to having a systematic structure which requires the certain completion of one step before taking the other. Modified Pierson's Model, which defines technology integration as teachers' integration of the content of the lesson to their technological and pedagogical experiences, is quite similar to TPACK Model; however, it places students' construction of information in the intersection of technological, pedagogical and content knowledge. Social Model, which is similar to TPCAK Model and Modified Pierson's Model, highlights the importance of social activities discretely. In today's world where technology is in every aspect of our daily lives, it cannot be imagined that educational activities could be done without using technology. Although the classes are in better condition in terms of technological equipment, it is also a known fact that the teachers have problems while using technology in the classroom (Kaya & Dağ, 2013; Çoklar, Kılıçer, & Odabaşı, 2007). Teacher candidates teach better with technology if they feel confident while using technology (Ertmer & Ottenbreit, 2010; Koliant, 2010). These models are designed to help teachers and researchers, to find better ways about usage of technology, and to understand how it makes things easier. In this context, teachers should analyze technology models mentioned above and choose the one that is suitable for them. There are not many researches on the application of technology integration models. Therefore, qualitative and quantitative researches which deal with especially application process are needed.

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