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Research Article

# Determining the Roles of Mentors in the Teachers' Use of Technology: Implementation of Systems-Based Mentoring Model

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## Abstract

The aim of this case study is to evaluate the effect of mentors on teachers' technology integration process into their classrooms. In integration process, interactions between the mentors and the teachers are implemented in terms of Systems-Based Mentoring Model (SBMM). Mentors' leadership roles were determined and changes in teachers' technology integration indicators were analyzed. Observations, dairies and the Indicators of Technology Integration Scale (ITIS) were used for collecting data. The results indicated that the roles of mentors in the integration process are providing technological support, presenting teaching materials and guiding for the achievement of those materials, encouraging teachers for the use of technology in their lessons, increasing the technological literacy and guiding for using technology in the teaching program. Moreover, it was determined that following the steps in the SBMM positively affected to the indicators about teachers' technology integration. The results shed a light that, dealing with mentorship within a framework of a systematic structure in technology integration process among the teachers may contribute the integration process via facilitating the roles of the teachers.

## Keywords

Improving teaching • Technology integration • Mentors • Systems-based mentoring model • Technology leadership

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The role of supporting teachers related to the technology integration was generally given to the school managers. However, it is pointed out that the school managers fail to satisfy in having knowledge about using teaching technologies, perceiving their user, cooperative, and facilitating roles in learning-teaching process and they were insufficient in the mentorship (Brockmeier, Sermon, & Hope, 2005; Can, 2008). In this context, as well as school managers, other specialized people in the field of Information and Communication Technologies (ICT) integration related to technology integration is also needed. Sugar and Holloman (2009) determined that those experts who may be assigned as mentors, should be eager to learn new technologies, capable of solving technical problems, able to access technology resources, and have capacity of cooperating with teachers. In order to conduct an effective ICT integration process, a mentor is expected to interact with teachers by presenting new technologies related to their fields, supporting them in solving the technical problems, developing the materials which they employ in their lessons, and suggesting different technologies for different issues (Anderson & Dexter, 2005; Frazier & Bailey, 2004; Sugar, 2005). On the other hand, Lesisko (2005) emphasized that mentors have positive effects on removing the anxieties and providing professional development for the teachers.

In the technology integration process, numerous components take place such as teachers, administrators, schools/institutions, infrastructure/resources, experience and attitudes. The complexity of the interactions between the components guided researchers to construct various models to define and implement the process (Çakıroğlu, 2013; Mazman & Usluel, 2011). In order to determine the stages of integration, Toledo (2005) aimed to determine the stages of integration process with regard to features of educational, Wang and Woo (2007) focused on determining the ICT integration levels drawing attention on handled issue, Roblyer (2006) revealed the conditions of establishing the principles of integration. The efforts related to the integration process generally reflect social, pedagogical, and technical dimensions in order to guide the implement the ICT technologies to learning environments (Wang, 2008), and determine the factors affecting to this integration and the implementation process in teaching programs from school based perspectives (Vanderlinde & van Braak, 2010). Some integration models have been implemented in the last two decades in order to provide maximum efficiency in the integration process. Five-step integration model of computer technologies (Toledo, 2005), systemic planning model (Wang & Woo, 2007), technological, pedagogical, and content knowledge model (Mishra & Koehler, 2006), generic model of pedagogy, social interaction and technology (Wang, 2008), e-capacity model (Vanderlinde & vanBraak, 2010), and technology integration planning model (Roblyer, 2006) related to technology integration are some of those. Another model, Systems-Based Mentoring Model (SBMM) came into prominence in terms of removing the obstacles and complexity of the new technologies which enters into learning environments which the teachers frequently encounter (Kopcha, 2010).

In the model, the teachers are guided to employ the technology through experiencing various activities in the stages of the model. Basically, the model promises teachers' guidance which is administered by the mentors. Numerous common obstacles (time, attitude, access, culture, professional development etc.) encountered by teachers who is overcomes via the facilitating roles of the mentorship. Moreover, various strategies such as creating a vision for technology integration, modelling the use of technology and training leader teachers are also included in the model. The structure of the model was summarized in Figure 1.

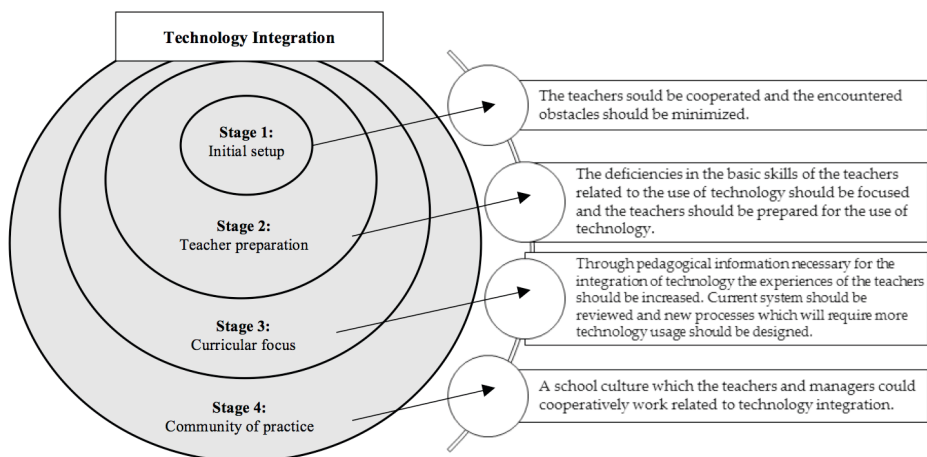


Figure 1. The stages of technology integration process.

According to the model, technology integration process consists of four basic stages, shown in the shape of overlapping circles in the figure. Teachers who learn to overcome problems they encounter, thanks to mentors, were able to get rid of them without any help (Franklin, Turner, Kariuki, & Duran, 2001; Smith & Smith, 2004). Thus, according to SBMM the basic objective of the mentors at the initial setup should be to minimize the obstacles via cooperating with teachers. Since technological skills are crucial components for employing the skills related to the use of technology to teach (Hew & Brush, 2007; Rakes, Fields, & Cox, 2006; Zhao, Pugh, Sheldon, & Byers, 2002), during the stage of teacher preparation mentors focus on deficiencies in developing the basic skills of using technology. The mentors may conduct their duties through executing weekly meetings with the teachers related to their competency in the use of computers and internet resources for educational purposes (Gallagher, 2000), guiding teachers related to the use of technology within the curriculum (Smith & Smith, 2004), and organizing mini-interviews about the problems in the school with the teachers in the school whenever they need (Marcovitz, 2000). During the stage of curricular focus, the aim is to design technology supported teaching scenarios compatible with the curriculum through the cooperation between the mentors and the

teachers. Accordingly, a school culture in which the teachers and administrators may collaboratively work in relation with the technology integration process should be established during the stage of community of practice.

On the other hand, mentorship is crucial in terms of providing guidance to the teachers in the integration process and encouraging teachers about the use of ICT during the lessons. The related literature suggest that teachers need to learn the contributions and disadvantages of various technologies and the ways for implementing them in order to meet objectives in the curriculum (Zhao et al., 2002) and the teachers should be equipped with necessary pedagogical information in order to provide designing technology-supported meaningful learning and sustainability (Bauer & Kenton, 2005; Hughes, 2004; Koehler & Mishra, 2005; Waight & Abd-El-Khalick, 2007). However, there are only a few models and approaches indicating and guiding the people by drawing a path to develop integration surrounded the whole school. Accordingly, this study is attempted to reveal the effects of mentors in the technology integration process of teachers in their lessons. The following sub-problems addressed in the study.

1. What kinds of leadership roles were exhibited by mentors in the teachers' ICT integration processes?
2. How did the teachers' technology integration indicators change through the effect of mentors?

### **Method**

In the case studies, one or more circumstantial factors are analyzed through an integrated approach. Also in-depth investigations related to how much the influence took place in the occasion is provided (Cohen, Manion, & Morrison, 2005). Within this context, this case study was conducted to determine developments and changes in the teachers' technological integration in their lessons under the supervision of mentors. In the study, teachers and the mentors were in the same school environment during the implementation of SBMM stages. Since the analysis was conducted in terms of more than one sub-stages and various subjects (mentors, teachers) in a single case, it is regarded as an embedded design among the designs of case study (Yildirim & Şimşek, 2011).

### **Participants**

This study was carried out with two groups including 8 teachers and 3 mentors from a secondary school in Rize, Turkey. One of the researchers was an Information Technologies (IT) teacher and data collected through his teacher role. The school

had partly limited resources in terms of technological equipment. The demographic information of the participants was presented in Table 1, in which the participants were coded as “M1, M2, M3, T1, T2, T3, T4, T5, T6, T7, and T8”.

Table 1  
*The General Characteristics of the Participants*

<i>Codes</i>	<i>Participation Type</i>	<i>Department</i>	<i>Gender</i>	<i>Term of Office (Year)</i>
M1	Researcher (Mentor)	Information Technologies	Male	6
M2	Mentor	Assistant Manager	Male	7
M3	Mentor	Science and Technology	Male	7
T1	Teacher	Mathematics	Female	7
T2	Teacher	Mathematics	Female	2
T3	Teacher	Turkish	Female	7
T4	Teacher	Science and Technology	Female	5
T5	Teacher	Social Sciences	Female	1
T6	Teacher	English	Female	4
T7	Teacher	Religious Culture	Female	3
T8	Teacher	Technology and Design	Female	7

Although investments had been implemented in the school where the study was conducted during the years the study was conducted, there is insufficiency in terms of both technological infrastructure and physical opportunities. There are no technologies such as internet connection, a computer and a projection device in the classrooms. The teachers of the fields usually don't use technology in their lessons or they rarely employ it in the ICT classroom or in the school library. The teachers in the study were selected through maximum diversity sampling method among the purposive sampling method with the aim of providing the reflection of the individuals related to field based issues. The voluntariness is also taken under consideration. While determining the mentors, criterion sampling method among the purposive sampling methods was employed. In this sampling method, sampling is conducted within the framework of cases responding a serial of predetermined criterion (Yıldırım & Şimşek, 2011). Those criteria or criterion may be formed by the researchers or the list of criterion established as a result of the researches may be employed. Accordingly, two teachers who are close to respond to the criteria in terms of having characteristics and competencies of a mentor emphasized in the literature regarded as mentors.

### **Implementation Process**

In Turkey, IT teachers are considered as natural mentors (Çakır, 2013; Seferoğlu, 2009). For that reason, the researcher participated to the process as a mentor. The researcher was able to communicate with the teachers through as IT teacher. By this means, it was possible to observe the teachers' activities in the lessons and collect data about the technological integration process and also the effect of the mentors.

Moreover, the teachers conducted their lessons freely without being annoyed from the existence of the researcher and behaved sincerely in the interviews which they communicate with the researcher. Two mentors with the aim of increasing their awareness were participated to the informative meetings related to the characteristics which mentors should have (Frazier & Bailey, 2004; Lesisko, 2005; Sugar, 2005; Sugar & Holloman, 2009). Then, the mentors worked with teachers on the integration process in line with SBMM. Mentors generally provided interactions with the teachers in the lessons, in the lesson breaks and the periods after the lessons. The mentors organized seminars and weekly meetings with the teachers related to the technology integration and guiding them about the problems they encountered in the integration process. Throughout the research, weekly meetings were held with the mentors and the activities to encourage the mentors for playing their roles in technology integration. The contributions of the mentors in the process are assessed through informal interviews with the teachers in their free time during the lesson breaks, and after the school time. The interactions between the researchers, mentors and teachers were depicted in Figure 2.

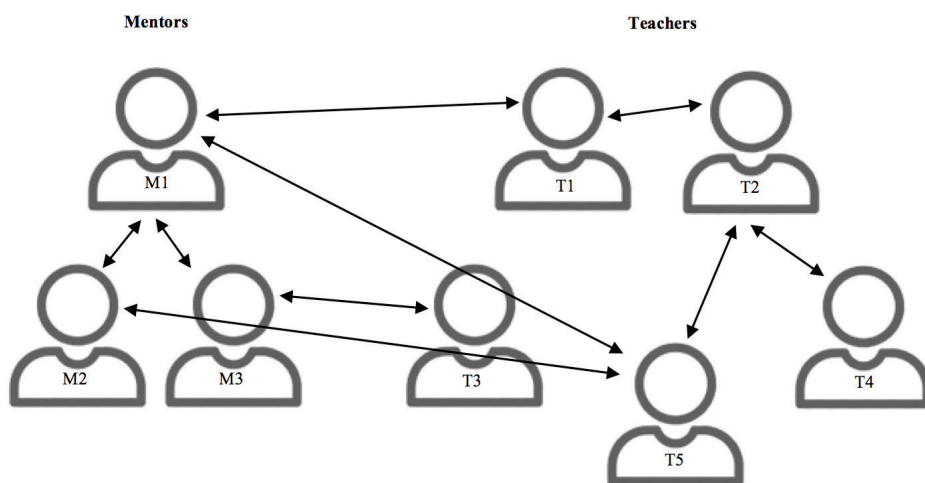


Figure 2. A symbolic view about the interactions between the participants.

### Data Collecting Instruments and Data Collection

The process was conducted in preliminary and implementation stages. The study began with the scale development, determination of mentors and providing necessary qualifications to those mentors. The main stage which consists of the interactions with the mentors and teachers, conducting observations and interviews were conducted in one semester. The data collecting tools used in the study were shown in Table 2.

Table 2  
*Data Collecting Tools*

<i>Data Collecting Tools</i>	<i>Sampling Group</i>	
	Mentors	Teachers
ITI scale		At the beginning of the study At the end of the study
Observation Forms	During the study	During the study
Interviews		At the end of the study
Diaries	During the study	

**Indicators of Technology Integration (ITI) Scale.** The ITI scale was developed in order to determine the changes in the technology integration indicators for teachers. In this context, standards related to the conduction of the ICT integration by the teachers (Akbulut, Kesim, & Odabaşı, 2007; Commission on Information and Communications Technology, 2010; International Society for Technology in Education, 2008; Republic of the Philippines Department of Education, 2006; Tanyeri, 2008; The Global e-Schools and Communities Initiative [GESCI], 2009; UNESCO, 2008) were examined and an item pool consisting of 110 indicators was constructed. 70 items related to the general indicators of an instructional process were excluded and the indicators reflecting directly the teacher based activities were determined. In order to provide the content validity, 5 experts from Computer Education and Instructional Technologies (CEIT) department were reviewed the items and 3 more items were excluded from the scale before the final form of the scale was developed. Then the scale was administered to 717 teachers working in various high schools and primary schools.

In order to provide the construct validity of the scale, an exploratory factor analysis (EFA) was carried out on 359 forms. As a result of the analysis, 5 factors which has an eigenvalue over 1 and explain the 62.5% of the total variance was obtained and they were called “Technology Literacy (TL),” “Teaching through Technology (TT),” “Ethics and Policies (EP),” “Professional Development (PD),” and “Organization and Management (OM),” in accordance with the related studies (Akbulut et al., 2007; Commission on Information and Communications Technology, 2010; GESCI, 2009; International Society for Technology in Education, 2008; Republic of the Philippines Department of Education, 2006; Tanyeri, 2008; UNESCO, 2008). In order to evaluate the construct validity of the scale which arises after EFA, confirmatory factor analysis (CFA) was performed on 358 forms. Related to the structure consisting of five factors, goodness of fit index related to the model coming out as a result of analysis carried out as follows: Chi-Square/Degree of Freedom ( $\chi^2/df$ ) = 2.10 ( $p = .000$ ); Root Mean Square Error of Approximation (RMSEA) = .06; Goodness of Fit Index (GFI) = .88; Adjusted Goodness of Fit Index (AGFI) = .85; Comparative Fit Index (CFI) = .98; Normed Fit Index (NFI) = .96; Standardized Root Mean Square Residual (SRMSR) = .05.



In the calculation of the reliability of the scale, the Cronbach Alpha ( $\alpha$ ) reliability co-efficient and item total correlations were measured to distinguish characteristics of each item in terms of the indicators they refer to. According to the results of reliability analysis, the reliability co-efficient of the 28 items in the scale determined through Cronbach Alpha was found as .931. Total correlation of the items in the scale varies between .405 and .693.

**Observations.** The observations were conducted in order to obtain detailed data about the behaviors of two separate groups (the teachers and the mentors) which they showed in various occasions. One of the researchers directly interviewed the people at school and collected data about their experiences and perspectives they acquired through practicing their experiences when necessary. Within this context, the researcher with his identity as an IT teacher was able to obtain more natural data via his observations through playing the role of participant observer. The researcher conducted his observations on the participants without any interventions and transferred the results to the observation forms. The observation covering a period of one-month data were recorded into two observation forms developed by the researchers. The first observation form employed in the research is “The Observation Form for the Mentors” which is used to determine the leadership roles of the mentors. In the form, there are items related to the characteristics of mentorship such as developing and providing technologies and sharing them with teachers, supporting the teachers related to the problems they encountered and encouraging them to employ the technological devices at higher level. The second observation form is called “The Form for the Technological Integration of Teachers” and was employed in order to support the quantitative data obtained through the ITI Scale to analyze the changes in detail about the technological integration indicators of the teachers. In order to evaluate the reflections of the changes in the indicators of technology integration among the teachers into in-class and extracurricular activities, the teachers were observed throughout the research during the lessons and lesson breaks. The in-class observations were conducted in the library, information technologies classroom, English classroom and science laboratory which are technically sufficient when the opportunities of the school are considered. The data from the forms were evaluated by two researchers who works on the topic of technological integration for their evaluation and the observed behaviors were classified into sub-categories “Frequently,” “Moderate,” and “Rarely” according to the obtained feedback data. The mentors’ activities were observed throughout the process in order to determine the mentorship roles of the mentors and the changes in the teachers’ technology integration process.

**Interviews.** Data was obtained from mentors’ activities which contributed to the teachers, and their effects on the teachers’ technology integration indicators. To that



end, semi-structured interviews used to provide data to explain how mentors acted their leadership role. In the interviews, the teachers were asked questions about the changes in their use of technology in their lessons. The interviews averagely took about 20-35 minutes and a tape recorder was used to record the data. In order to follow the instant situation throughout the research, sincere and fiduciary interviews were conducted with the participants and the administrators of the school where the research is implemented in the form of a chatting without creating an official environment.

**Diaries.** In this study, diaries were used by the mentors in order to notice the ways that the mentors displayed their leadership roles. The informative meetings were held with the mentors related to their leadership characteristics. Then the researcher organized informative meeting about using diaries and they were asked to record the activities they conduct throughout the study and the dialogues occurred between mentors and the teachers.

### **Data Analysis**

In this study, the data was analyzed through content analysis using qualitative and quantitative data together. Two different content analysis methods were employed in accordance with the research problem. For the first research problem, the coding system in accordance with conceptions obtained from data (Strauss & Corbin, 1990). In this method, the researcher re-reads the data and tries to determine the important dimensions in relation with the purposes of the research. Depending on the emerging meaning, codes are created with reference to the data. The codes are associated and definite themes are extracted. Accordingly, data obtained from the observations related to the mentors and their diaries were organized in digital format. The organized data was read a few times and codes related to the roles of the mentors were put forward. The relationships, similarities and differences between the codes were determined and topics related to the roles of mentors in the integration process were discussed within the framework of literature related to the characteristics of mentorships (Frazier & Bailey, 2004; Lesisko, 2005; Sugar, 2005; Sugar & Holloman, 2009). An example for formation of topics was shown in Figure 3.

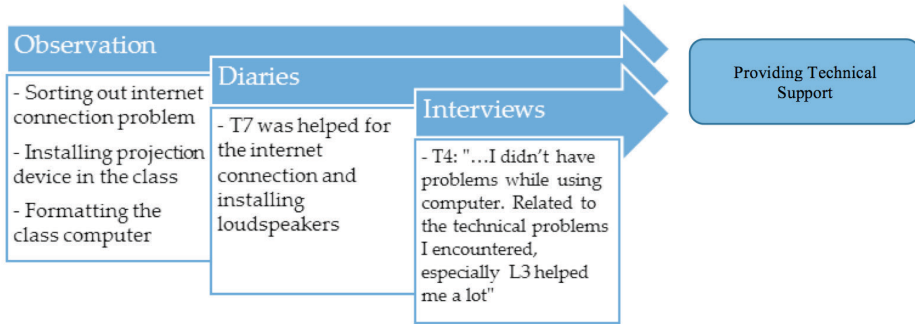


Figure 3. The process of forming topics.

In relation with the second research problem, a coding method was adopted according to the previously determined concepts (Strauss & Corbin, 1990). In case a theory or theoretical frameworks which consist the base of the research exist, it is possible to make a list of codes without collecting data (Yıldırım & Şimşek, 2011). Accordingly, it was aimed to elaborate quantitative data obtained from the ITI Scale at the beginning and the end of study. Thus, the data obtained from the observations conducted throughout the process and data obtained from the interviews were coded and classified in terms of the components of TL, TT, PD, EP and OM in the ITI scale. In this way, the data related to the changes of the teachers on ITI was more easily organized and analyzed. The changes in the indicators of the teachers' technology integration were presented through the quantitative data obtained from each sub-components in the ITI scale. Afterwards, the direct citations from the interviews conducted at the end of the process within the framework of the related theme and the observations conducted on teachers were employed. Finally, the relationships between quantitative and qualitative data, their similarities and differences were examined for each theme.

### Validity and Reliability of the Study

In this study, qualitative and quantitative data is equally employed throughout a long term interaction with the both sampling groups. Thus, the participants behaved naturally during the interviews and gave sincere answers to the questions. In the observations and interviews, the participants were ensured to behave sincerely, objectively and naturally. The possible threats which affect the validity Creswell and Plano Clark (2007) were drawn attention and strategies for qualitative and quantitative reliability and validity Cohen et al. (2005), Johnson and Christensen (2004) and McMillan and Schumacher (2010) were followed. The strategies for validity and reliability were summarized as seen in Table 3.

Table 3  
*Validity and Reliability Strategies in the Research*

<i>Strategy</i>	<i>Activities</i>
<i>Persuasiveness</i>	<p>The study was conducted in a definite environment in which all participants were in similar equipped environments.</p> <p>Different data collecting techniques (scales, observation, and diaries) were employed to provide data triangulation.</p> <p>The observations were conducted in the form of participative observations for 4 months.</p> <p>The transcripts of the interview recordings were checked by the related participants.</p> <p>The quotations from the participants were clearly presented.</p>
<i>Transmissibility</i>	<p>The methods employed during the selection of the participants were explained in detail.</p> <p>All the stages of the research were explained in detail.</p> <p>Maximum diversity sampling method was employed in order to reflect all fields..</p>
<i>Consistency</i>	<p>The method employed in the research and data collecting process were explained in detail.</p> <p>The findings obtained through various data collecting instruments were compared and associated with each other.</p> <p>During the process of data collection, leading conversations were avoided and questions were asked in parallel to each other.</p>
<i>Confirmability</i>	<p>The findings and results obtained during the process of study were evaluated by the experts of related fields.</p> <p>All the data collected throughout the research was recorded in detail and stored.</p>

## Findings

In this chapter, the findings obtained through analyzing the qualitative and quantitative data were presented in accordance with the research problems.

### The Leadership Roles Displayed by the Mentors

The interactions between the mentors and the teachers carried out in the following forms; presenting seminars to the teachers, weekly meetings, interviewing during the lesson breaks and intervention during the lesson. Data obtained from the observations, diaries and interviews was analyzed through content analysis method. The coding results were presented in accordance with their frequencies under sub-titles and listed from the most to the least.

**Providing technical support.** It was observed that the mentors guided teachers in determining the resource of technological problems, and they were instructive about how to solve the encountered simple questions by organizing weekly meetings with the teachers and informing them about the working principles of technologies used in the classes. The technological problems teachers encountered during the classes were intervened and resolved by the mentors. The findings related to the technical support provided by the mentors were presented in Table 4. At the end of the process, the quotations from the opinions of the teachers related to the technical support provided by the mentors were given below:

...this year, I was able to find someone to ask questions related to technology. Whenever I needed to use either speakers or projection devices, or others, I found them ready to use. (T7)

...related to using technology, we were helped whatever we need in many times. We were able to get support whenever we needed projection device, computers or tablets. (T8)

Table 4  
*Activities Related to Providing Technical Support*

Codes	Methods	Participants		
		M1	M2	M3
Providing information about the working principles of technologies used in the classes	Weekly meeting	T1 T2	T6 T7	T4 T5
Determining the source of technological problems		T5 T3		T4
Resolving simple hardware problems		T7	T5	T4 T6
Resolving simple software problems		T7	T3 T6	T2 T4
Resolving internet connection problems		T7 T3	T7 T2	T4
Resolving the visual problems related to the computer and the projection device	Intervention during the lessons	T5		
Resolving the audial problems with the computer		T7	T5	
Opening file types with different extensions		T7 T4	T5 T7	T4
Resolving the problems related to the printer	Interviews during the break	T4 T6	T7	
		T8		
		T1 T2	T3	

Within the scope of SBMM the mentors’ role of providing technical support was observed that the mentors generally conducted activities related to the initial stage. In the observations, the teachers were able to solve the technical problems they encountered without receiving help and they expressed similar to observations that they had less problems during the process about the use of technology.

**Providing educational materials to be used in the lessons.** The educational materials provided to the teachers by the mentors may be listed as various visuals, presentations, videos, animations, simulations, educational web sites and various learning objects. The mentors organized weekly meetings during the break times and discussed how to use those materials in the classroom. Those materials were analyzed with the teachers and the question whether they can be employed in the lessons was discussed. Mentors provided some arrangements requested by the teachers related to the materials which were agreed to be employed in the lessons. were occurred. Thus, it was aimed to increase the awareness and interest among the teachers related to the materials which they can employ in their lessons The activities related to providing educational materials by the mentors were given in Table 5.

Table 5  
*Activities Related to the Providing of Teaching Materials*

Codes	Methods	Participants		
		M1	M2	M3
Presentation of photographs and maps	Interviews during the break	T5 T6	T5	
Presentation of files for presenting		T5 T7	T3	T7
Presentation of animations and simulations		T1 T4	T1 T2	T4
Suggesting educational web sites	Weekly meeting	T2 T4 T5	T3	T2 T4
Presentation of videos		T6 T7 T8	T5	T7

Some selected expressions from the teachers related to the instructional materials provided by the mentors were given below:

This year, I am searching for some innovations to use in the classroom and so I tried to find various sites. Moreover, I discovered that I was able to find some e-books and virtual manipulative in the online educational forums... (T4)

...the computer lab was prepared for our use. The activities we had carried out encouraged me to use this lab, even it forced me to do so. It was better this way, because I was able use the materials I had prepared previously. (T5)

On the other hand, the activities conducted by the mentors are in relation to the phase of *teacher preparation* of SBMM. At this stage, the role of the mentor is enhancing the basic skills of the teachers related to the use of technology and prepare them to teach through the support of technology. The providing teaching materials such as photographs, videos and web sites etc. which the mentors submit to the teachers may be interpreted as the complementation of this stage.

**Guidance in accessing instructional materials.** During the weekly meetings conducted by the mentors, the teachers were shown and given opportunity to practice how to find the teaching materials related to their fields through using search engines. Afterwards, the depository of learning objects where the teachers might find numerous materials related to their fields was introduced to the teachers. In the interviews conducted during the lesson breaks, the mentors explained the teachers how to find and download teaching materials through web. Within this framework, the findings related to guiding activities for the teachers were shown in Table 6.

Table 6  
*The Guidance Activities in Reaching Teaching Materials*

Codes	Methods	Participants		
		M1	M2	M3
Providing information on search engines		T8	T1 T2	T4
Doing searches for a definite file type	Weekly meeting	T2 T3	T5	T7
Introduction of repositories of various learning objects		T1 T4 T7 T8	T3	
Finding materials in the repository of learning objects	Interviews during the break	T5 T6	T3 T6	T1 T2 T4

During the interviews conducted at the end of the process, some selected quotations about the guidance activities performed by the mentors were shown below:

...principally, I wouldn't follow it unless somebody came and asked about the status of the case and informed us about the developments. However, I can search on the important related to the materials I need in my lesson. (T2)

...the rate of my employing internet in the courses increased. Not only in the 4.th grade but also in the 6th and 7th grades, I found vast number of materials on the internet and employed them in the lessons after the second term. (T6)

The expressions above indicate that the guidance activities of the mentors related to the accessing to the teaching materials provided teachers more eager to research for the teaching materials for their lessons. The teachers learned about various online environments and started to use those sites. It can be stated that the conducted guidance activities intend to employ SBMM to *teacher preparation*.

**Encouraging the use of technology in the lessons.** The mentors encouraged the teachers about using technology in their lessons through contributing to the solutions of technological problems which the teachers encountered. Mentors introduced online environments to the teachers about their fields and presented them the teaching materials to be used in their lessons. These activities were presented in Table 7.

Table 7  
*Activities Related to Encouraging Teachers to Use Technology*

Codes	Methods	Participants		
		M1	M2	M3
Introduction of smart-response system	Seminars	All the teachers		
Encouraging the use of tablet computers	Interviews during the break	T3 T7	T5 T8	T4
Introduction of mouse-pointer device				T4 T6
Encouraging the use of internet for educational purposes	Weekly meeting	T2 T5		
Providing samples related to the technology integration in education		T1 T2 T7	T5 T6 T8	T2 T4

It was observed that the mentors tried to introduce various technologies such as tablet computer, mouse pointer or smart response system to the teachers and encourage them using those devices in their lessons. Moreover, positive examples related to the use of social networks in educational settings were shared with the teachers. Some teachers' perspectives were as follows:

...previously, the way I taught, the techniques and methods I gave, and the materials I used were all enough. However, this activity proved that I was insufficient and I executed almost all the topics of grammar in a computer-aided environment and received extremely positive feedbacks from my students. (T3)

... I had been already using the technology in my lessons but this year I have employed the technology more than last year and I received seriously positive feedback from my students. (T4)

In the framework of SBMM, we may conclude that mentors intend to provide *teacher preparation*. In this study, the activities of the mentors such as informing the teachers about the importance of technological integration and introducing the contemporary technologies such as smart response systems, mouse-pointers, tablet computers and social networks to the teachers played an encouraging role for the teachers in the use of technology in their lessons.

**The activities related to the increase of the ICT literacy.** Throughout the study, the mentors provided an encouraging role in order to contribute to teachers' professional development. Mentors motivated teachers about the use of technology in their lessons during the teaching process and using the technological devices more frequently. For this purpose, mentors conducted various activities to increase the technological literacy among the teachers through performing weekly meetings and the interviews during the lesson breaks. The findings of the related activities were shown in Table 8.

Table 8  
*Activities Related to the Increase of Technological Literacy*

Codes	Methods	Participants		
		M1	M2	M3
Informing about computer and internet security		T1 T2 T5 T8	T3 T7	T4 T6
Informing about viruses and harmful software		T2 T4 T5	T6	T3 T7
Healthy use of the computer	Weekly meeting	T3 T5	T6 T7	T4
Informing about copy rights		T1 T7 T8	T2 T5	T4 T6
Computer-aided exam analysis		All the teachers		
Introduction of online learning environments		T2 T3		

Through the activities in Table 8, it was aimed to increase the information of the teachers related to the technological literacy and make them need for using the technology in their daily life and teaching-learning process. Some expressions from the interviews which are related to increasing the knowledge of the teachers for technological literacy were listed below:



...while using the technology, I learned that there were some mistakes technologically and pedagogically which I assumed true. I started to be more careful on many matters. (T2)

Normally, teachers still seemed as well-informed people, yet the teachers will fall behind the students in using technology. Before I have difficulties in the future, I can solve some problems by myself. (T4)

When activities during the process were evaluated, the SBMM can be considered to be for the *initial stage*. The increase in the ICT literacy of the teachers might be regarded as one of the sub-components of minimizing the obstacles they encounter in the process which is the basic aim of the initial setup. Hence, the increase in the ICT literacy of the teachers would increase their self-confidence related to the use of technology.

**The guidance related to the use of technology through curriculum.** The mentors have guided teachers in order to integrate technology due to their teaching programs. During the break times, mentors provided some analysis on the various teaching programs and they addressed some usable materials to be used in the lessons. The findings related to the activities are shown in Table 9.

During the weekly meetings, all of the teachers were asked to prepare a private program or plan for their courses and some analysis were conducted to see how to integrate technology to those programs. To set an example, each teacher was presented samples related to integration of technology into their programs and thus it was aimed to increase the experience of the teachers.

Table 9  
Guidance Activities to Use Technology in Teaching Programs

Codes	Methods	Participants		
		M1	M2	M3
Determination of course gaining's to integrate technology		T1 T2 T3 T4 T5 T8	T2 T3 T7	T4 T6 T7
Giving examples related to the integration of teaching program and technology	Weekly meeting	T1 T2 T5	T3 T6 T8	T4 T7
The use of teaching materials effectively within the course		T2 T6 T7	T3 T5	T4

Some quotations from the interviews which are related to the issue were given below:

...I have learned that using technology on time was more important than using it continuously. When you show different slides, colorful pages and music, he starts to perceive the topic even though he is involuntary in learning. (T2)

Using technology in my lessons also requires preparation for the lesson, in this sense I didn't have any difficulties on this matter. I will never forget about this. (T7)

It can be stated that providing guidance to the teachers related to the use of technology in the curriculum is conducted with regard to curricular focus in the SBMM. In this context, the mentors conducted weekly meetings in order to give examples related to

the determination of benefits which technology can be integrated. The match up of the roles exhibited by the mentors in the SBMM is summarized in Table 10.

Table 10  
*The Leadership Roles on the Systems-Based Mentoring Model*

<i>Leadership Roles</i>	<i>Phases of Technology Integration</i>
Providing technical support	Initial setup
Presenting teaching materials related to the lessons	
Guidance in accessing the teaching materials	Teacher preparation
Encouraging the use of technology in courses	
Activities related to increase technology literacy	Initial setup
Guidance related to the use of technology in teaching program	Curricular focus

### **The Changes in the Indicators of Technology Integration of the Teachers**

In this section, the data obtained through ITI scale which was implemented on the teachers prior and after the interactions between the mentors and the teacher were analyzed in terms of the changes level in the teachers' technology integration. The Wilcoxon test was conducted to the data obtained through ITI scale and the results were discussed in terms of the sub-components in the ITI scale. The results of the related test were shown in Table 11.

Table 11  
*The Results of the Tests Related to the Changes in the ITI Scale Indicators of the Teachers*

<i>Indicator</i>	<i>Pre-test - Post-test</i>	<i>N</i>	<i>Line Average</i>	<i>Line Total</i>	<i>z</i>	<i>p</i>
<i>TL</i>	Negative Line	0	.00	.00	-2.38	.01
	Positive Line	7	4.00	28.00		
	Equal	1				
<i>TT</i>	Negative Line	0	.00	.00	-2.21	.02
	Positive Line	6	3.50	21.00		
	Equal	2				
<i>PD</i>	Negative Line	0	.00	.00	-2.52	.01
	Positive Line	8	4.50	36.00		
	Equal	0				
<i>EP</i>	Negative Line	0	.00	.00	-2.52	.01
	Positive Line	8	4.50	36.00		
	Equal	0				
<i>OM</i>	Negative Line	0	.00	.00	-2,38	.01
	Positive Line	7	4.00	28.00		
	Equal	1				

\*Negative line-based

The quantitative findings obtained throughout the research indicate that positive developments were provided in the indicator levels of the teachers in their sub-dimensions TL, TT, EP, PD and OM of the technology integration indicators after the activities with the mentors. The mean values of pre-study and post-study periods related to the development of the teachers on those components were outlined in Figure 4.

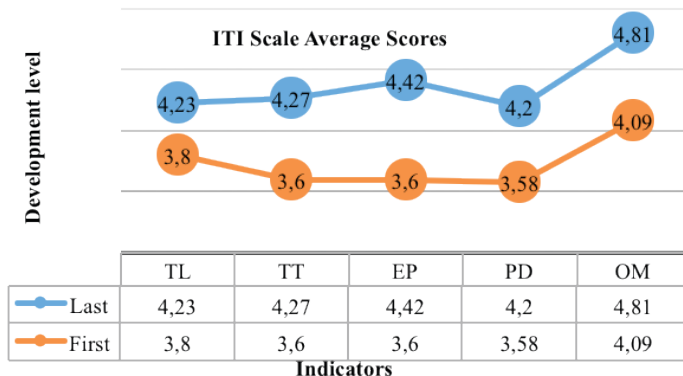


Figure 4. The changes in the mean scores of ITI scale sub-components for the teachers.

The highest development of the teachers was observed in the component EP. In order to reflect the changes in the ITI levels of the teachers, the quantitative data obtained from both the observations and the diaries were presented in this chapter. The scores of the teachers for the ITI scale implemented before and after the study and sections from their quotations during the interviews at the end of the process were presented in Table 12.

Related to the results of the Wilcoxon test, it was seen that almost all the teachers displayed developments in the TL indicators. The participants displayed development related to using online environments at most levels while they generally preferred taking help from the mentors related to their technical problems.

The findings obtained from ITI scale and observations indicate that the teachers who participate the activities conducted by the mentors have become more eager to use multimedia materials and online environments in their lessons as motivate the students. Moreover, the awareness of the teachers related to the available technical opportunities of the school where they work was increased and they started to utilize those opportunities.

Table 12 reflects that all the teachers displayed development related to the EP indicators. The participants who displayed development are the teachers with the code of T2, T3 and T4. The findings obtained through the ITI scale and observations point out that the teachers who participate the meetings conducted by the mentors displayed development in terms of EP indicators. Moreover, it is also observed that almost all the teachers displayed developments on PD indicators. Throughout the study, the mentors introduced new technologies to the teachers and tried to provide them experiences related to the use of new technologies. The teachers who are observed throughout the study to follow limited number of internet sites related to their fields explored new sites related to their fields at the end of the study and they

utilized those new sites. The Wilcoxon test was showed that the teachers displayed development related to OM indicator. When the changes in the OM indicators of the teachers are analyzed, it may be seen that almost all the teachers displayed changes in terms of OM indicators. As a result of the observations, all the teachers except T1 experienced development on the OM indicators.

Table 12  
The ITI Changes of the Teachers

Indicators	The expressions of the participants																											
<p><b>TL Indicators</b></p> <table border="1"> <thead> <tr> <th></th> <th>T1</th> <th>T2</th> <th>T3</th> <th>T4</th> <th>T5</th> <th>T6</th> <th>T7</th> <th>T8</th> </tr> </thead> <tbody> <tr> <td>First</td> <td>3,14</td> <td>3,86</td> <td>3,57</td> <td>4</td> <td>4</td> <td>4</td> <td>4,29</td> <td>3,57</td> </tr> <tr> <td>Last</td> <td>3,57</td> <td>5</td> <td>4</td> <td>4,43</td> <td>4,57</td> <td>4,14</td> <td>4,29</td> <td>3,86</td> </tr> </tbody> </table>		T1	T2	T3	T4	T5	T6	T7	T8	First	3,14	3,86	3,57	4	4	4	4,29	3,57	Last	3,57	5	4	4,43	4,57	4,14	4,29	3,86	<p>At the beginning, I was petrified in the middle of the class when the computer broke down or the least problem occurred. Now, I know how to do things or how to solve the problems. I can use more comfortably (T5)</p>
	T1	T2	T3	T4	T5	T6	T7	T8																				
First	3,14	3,86	3,57	4	4	4	4,29	3,57																				
Last	3,57	5	4	4,43	4,57	4,14	4,29	3,86																				
<p><b>TT Indicators</b></p> <table border="1"> <thead> <tr> <th></th> <th>T1</th> <th>T2</th> <th>T3</th> <th>T4</th> <th>T5</th> <th>T6</th> <th>T7</th> <th>T8</th> </tr> </thead> <tbody> <tr> <td>First</td> <td>3,67</td> <td>2,5</td> <td>3,83</td> <td>3,33</td> <td>4</td> <td>4,67</td> <td>4,17</td> <td>2,67</td> </tr> <tr> <td>Last</td> <td>4</td> <td>4,33</td> <td>3,83</td> <td>4,5</td> <td>4,33</td> <td>4,67</td> <td>4,67</td> <td>3,83</td> </tr> </tbody> </table>		T1	T2	T3	T4	T5	T6	T7	T8	First	3,67	2,5	3,83	3,33	4	4,67	4,17	2,67	Last	4	4,33	3,83	4,5	4,33	4,67	4,67	3,83	<p>...When I compared the courses I used technology to those I didn't use; I realized that the courses I used technology were more profitable. Thanks to technology, I was able to teach more comfortably... I discovered that I could use social networks for educational purposes. Even, I asked awarded questions to the students from my Facebook account and shared entertaining videos and animations which teach Mathematics. I shared the photos I took in the class. I received very good feedbacks.(T2)</p>
	T1	T2	T3	T4	T5	T6	T7	T8																				
First	3,67	2,5	3,83	3,33	4	4,67	4,17	2,67																				
Last	4	4,33	3,83	4,5	4,33	4,67	4,67	3,83																				
<p><b>EP Indicators</b></p> <table border="1"> <thead> <tr> <th></th> <th>T1</th> <th>T2</th> <th>T3</th> <th>T4</th> <th>T5</th> <th>T6</th> <th>T7</th> <th>T8</th> </tr> </thead> <tbody> <tr> <td>First</td> <td>3,6</td> <td>3</td> <td>3</td> <td>3,6</td> <td>4,6</td> <td>4</td> <td>3,2</td> <td>3,8</td> </tr> <tr> <td>Last</td> <td>4,2</td> <td>4,8</td> <td>4</td> <td>5</td> <td>5</td> <td>4,4</td> <td>3,4</td> <td>4,6</td> </tr> </tbody> </table>		T1	T2	T3	T4	T5	T6	T7	T8	First	3,6	3	3	3,6	4,6	4	3,2	3,8	Last	4,2	4,8	4	5	5	4,4	3,4	4,6	<p>...I didn't care about copyrights previously but I search for the copyrights of the materials in the internet sites. I look at bottom, top and sides of the material while I download it. After I was told, I decided to be more careful (T4)</p>
	T1	T2	T3	T4	T5	T6	T7	T8																				
First	3,6	3	3	3,6	4,6	4	3,2	3,8																				
Last	4,2	4,8	4	5	5	4,4	3,4	4,6																				
<p><b>PD Indicators</b></p> <table border="1"> <thead> <tr> <th></th> <th>T1</th> <th>T2</th> <th>T3</th> <th>T4</th> <th>T5</th> <th>T6</th> <th>T7</th> <th>T8</th> </tr> </thead> <tbody> <tr> <td>First</td> <td>3</td> <td>4</td> <td>3,83</td> <td>3,83</td> <td>3,5</td> <td>3,83</td> <td>3,67</td> <td>3</td> </tr> <tr> <td>Last</td> <td>3,33</td> <td>4,5</td> <td>4,17</td> <td>4,5</td> <td>4,67</td> <td>4</td> <td>4,5</td> <td>4</td> </tr> </tbody> </table>		T1	T2	T3	T4	T5	T6	T7	T8	First	3	4	3,83	3,83	3,5	3,83	3,67	3	Last	3,33	4,5	4,17	4,5	4,67	4	4,5	4	<p>...when I integrate the exercise programs which I used during extra-curricular periods with computer-aided teaching, I understood that people who use technology in class didn't waste their time. Throughout the activities, I saw that accessing a material related to my course on the internet wasn't difficult at all. I learned what to, how to and where to find. From now on, I can easily find all types of materials from every site I want (T3)</p>
	T1	T2	T3	T4	T5	T6	T7	T8																				
First	3	4	3,83	3,83	3,5	3,83	3,67	3																				
Last	3,33	4,5	4,17	4,5	4,67	4	4,5	4																				
<p><b>OM Indicators</b></p> <table border="1"> <thead> <tr> <th></th> <th>T1</th> <th>T2</th> <th>T3</th> <th>T4</th> <th>T5</th> <th>T6</th> <th>T7</th> <th>T8</th> </tr> </thead> <tbody> <tr> <td>First</td> <td>3</td> <td>2,75</td> <td>4,25</td> <td>5</td> <td>4,75</td> <td>4,75</td> <td>4,75</td> <td>3,5</td> </tr> <tr> <td>Last</td> <td>4,5</td> <td>5</td> <td>4,75</td> <td>5</td> <td>5</td> <td>5</td> <td>5</td> <td>4,25</td> </tr> </tbody> </table>		T1	T2	T3	T4	T5	T6	T7	T8	First	3	2,75	4,25	5	4,75	4,75	4,75	3,5	Last	4,5	5	4,75	5	5	5	5	4,25	<p>...my class generally doesn't know how to raise fingers during the lessons, how to ask questions, how to participate lessons through asking questions and even an environment of chaos occurred most of the times. Through technologies I adopted in the lessons, I can state that such problems decreased. Whenever I use something technical during the course, the students start to listen very carefully (T2)</p>
	T1	T2	T3	T4	T5	T6	T7	T8																				
First	3	2,75	4,25	5	4,75	4,75	4,75	3,5																				
Last	4,5	5	4,75	5	5	5	5	4,25																				

## Discussion

The data from observations and the diaries indicate that the mentors played various roles in realizing technology integration by the teachers in their lessons. Those roles related to the teachers are: providing technical support (1), providing educational materials (2), guidance in accessing the educational materials (3), encouraging for the use of technology in the lessons (4), activities to increase the technological literacy among the teachers (5) and consultancy for the use of technology in the educational program (6). These roles are in line with some other studies related to the roles of the mentors and the expectation from those mentors (Devolder, Vanderlinde, van Braak, & Tondeur, 2010; Frazier & Bailey, 2004; Lesisko, 2005; Topu & Göktaş, 2012; Webster, 2010). In addition, Lesisko (2005) determined that the mentors were responsible from providing technical support, contributing to the vocational development of the teachers, conducting technological planning, and providing administrative to the teachers in terms of teachers' technology integration. However, Webster (2010) indicated that the mentors also undertook various tasks such as conducting one-to-one activities with the teachers, resolving the problems related to software and hardware and organizing activities of vocational development for the teachers. Similarly, Frazier and Bailey (2004) expressed that the roles of the mentors in the teaching and learning process such as working for the vocational development of the teachers, selecting educational software and presenting them to the teachers, searching for web-based resources, sharing the researches on effective technology integration and working for the integration of technology into the education program.

The roles of the mentors were shaped within the framework of the demands of the teachers and the needs which emerge as a result of the observations of the mentors during and after the lessons. The weekly meetings and seminars conducted with the teachers by the mentors within the framework of those roles were positively affected to increase the interest of the teachers towards technology and their knowledge and skills related to the use of technology in their lessons. Likewise, similar studies address that skill-based, short-term and regular training which will be organized by the mentors in accordance with the teachers' needs was important in terms of technological integration (Frazier & Bailey, 2004; Kopcha, 2010) and it would encourage them in terms of using technology (Bradshaw, 2002). On the other hand, the mentors conducted various intervenes to the encountered technology originated problems, they guided in accessing the educational materials and presented examples of related to the integration of technology into the education programs through introducing the teachers with various contemporary technologies. Those roles provided an increase in the experience and belief of the teachers related to the use of technology in their lessons and made them eager to use technology more frequently. Accordingly, Smith and Smith (2004) emphasized that presentation of epitomes by

the mentors within the framework of integration could provide contribution in their insistence on implementing new teaching techniques and increase their motivation in struggling with problems which may emerge.

It is observed that the mentors mostly undertook the role of providing technical support to the teachers. Technical support and guidance provided to the teachers by the mentors in terms of resolving the problems of software and hardware also contributed to the elimination of prejudices related to the use of technology. In similar studies, it is stated that the teachers who learn to tackle with the problems can be successful in encountered problems related to technology through mentors' support (Franklin et al., 2001; Smith & Smith, 2004). Moreover, Frazier and Bailey (2004) pointed out that it is the responsibility of the mentors to provide technical support while Devolder et al. (2010) indicated that mentors should allocate majority of their time for providing technical support.

As a result of the activities conducted under the guidance of the mentors, positive contribution is observed in the information and skill levels of the teachers related to the components of TL, TT, EP, PD, and OM. This result is similar to the results of some other studies by Franklin et al. (2001), Polselli (2002), and Gallagher (2000) which analyze the mentorship as an auxiliary strategy in the execution of the teachers' technological integration. In the study by Franklin et al. (2001) which was conducted for 21 weeks in the form of one-to-one weekly meetings with the participation of 8 teachers and 8 mentors who work in a primary school, a development was observed among the teachers in terms of the levels of TL, TT, EP, PD, and OM. In his study which he conducted on 139 teachers who receive support from the mentors, Polselli (2002) revealed that the teachers' skills related to the use of technology were improved after the activities conducted with the mentors.

In this study, the systematic development of the integration process gradually increased the knowledge and skill levels of the teachers' technology integration. As SBMM suggested, decreasing the obstacles which the teachers may encounter during the start-up-phase and focusing on deficiencies related to the use of technology during the preparation of the teachers consolidated the belief for the positive effects of the process among the teachers. During the stage which model focuses on the education program, the mentors guided the teachers related to the use of technology in the education programs by the mentors and effectively delivering the objectives of the lesson through the support of technology. Among the sub-components of the ITI Scale, the changes in the component of "teaching through technology" and interviews indicate that the teachers started to employ technology in their lessons more frequently after they were given practice related to the technological integration. On the other hand, no prominent situation was observed related to the stage of implementation

society of SBMM. It is thought that it was resulted because there was not more than one teacher in a branch so they could not establish a group. The teachers in the study could not find people to share their knowledge, skills and experiences which they gained and discuss about the integration thus the stage of establishing a school culture related to the technological integration grew limitedly.

### **Conclusions and Suggestions**

Mentors are regarded as an important people for the integration of technology into the teaching-learning process. A conclusion drawn from study results that; the mentors generally undertook the roles as a guide, a promoter, consultant and the supplier of educational materials within the context of the technological integration in terms of providing the integration of the teachers into technology.

It was seen that the mentors' leadership roles have supportive effects on the integration of technology to the courses by the teachers. Through the seminars, weekly meetings, short talks during the breaks and interference during the lessons; the mentors had an opportunity to evaluate the needs of teachers related to the integration of the technology. According to their experiences, they obtained more concrete experiences about their roles in the technology integration process.

As a result of the activities carried out with the mentors, it was concluded that the technology integration indicators of the teachers significantly changed in a positive way. The activities performed by the mentors provided developments in the levels of information and skills in the dimensions of technology literacy, teaching through technology, ethics and policies professional development and organization and management. Throughout this process, the gradual follow-up of the technological integration process in SBMM under the guidance of mentors contributed to the teachers in completing the integration process effectively and establishing an attitude towards the use of technology in the lessons.

In conclusion, the contribution of the mentors to the teachers is important for the success of the integration activities in terms of transformation of the teachers. Accordingly, system-based mentorship model has great significance in terms of emphasizing the importance of the mentors to guide the integration and conduct necessary interventions and revealing the roles of the mentors. For future studies the applicability of mentorship within the framework of different models in the schools with different aspects may contribute to the technology integration efforts.



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