USING A MOBILE LEARNING APPLICATION FOR TROUBLESHOOTING THE TECHNICAL PROBLEMS: A CASE STUDY

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ABSTRACT

USING A MOBILE LEARNING APPLICATION FOR TROUBLESHOOTING THE TECHNICAL PROBLEMS: A CASE STUDY

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Decrease in student and instructor motivation and satisfaction can be an important problem if technical problems in classroom and offices are not solved timely in school settings. Besides, difficulties in getting technical support in the beginning or during the class hour can make instructors reluctant to use technology in their future classes. In this study, the effects of the technology related problems that teaching staff, which were faculty members and research assistants in higher education, were investigated trough using a mobile learning application. The effect of the technological problems they experience in their classes on their motivation, satisfaction and concerns, attitudes towards technology were investigated. How easy it was to use the developed mobile learning application to support them in troubleshooting these problems by themselves was also analyzed.

An Android based mobile learning application was designed and developed based on the records of the Technical Support Office on previous year reported and solved problems and the pre-interview results with the participants. An instrumental case study research design with pre and post interviews were conducted with ten faculty members and research assistants from the Faculty of Education in the Middle East Technical University. The participants used the mobile learning application for approximately six weeks. At the end of the six weeks, post interviews were conducted to the same participants. Results showed that the application prevented motivation and satisfaction drop and decreased the concerns of the participants for using technology

in their classes. Participants stated that the application was easy to use with relevant content and user interface. They also indicated that the mobile learning application had positive effect on their technology literacy.

Keywords: Technical support, mobile learning, instrumental case study, mobile application, technical problems, and technology literacy.

ÖZ

TEKNİK PROBLEMLERİN ÇÖZÜMÜ İÇİN MOBİL ÖĞRENME UYGULAMASI KULLANIMI: BİR DURUM ÇALIŞMASI

Özdemir, Yusuf Murat

Yüksek Lisans, Bilgisayar Ve Öğretim Teknolojileri Eğitimi Bölümü

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Okul içerisinde, sınıflarda ve ofislerde yaşanan ve zamanında çözülemeyen teknik sorunlar, öğrenci ve öğretmenin motivasyon ve doyumunda düşüşe neden olarak önemli bir problem halini almaktadır. Ayrıca, dersin başında veya ortasında teknik destek almadaki zorluklar, öğretmenlerin gelecekteki derslerinde teknolojiyi derse adapte etmek istememelerine neden olabilir. Bu çalışmada, mobile bir öğrenme uygulaması kullanılarak teknoloji ile alakalı problemlerin yüksek öğrenimdeki öğretim üyelerine ve araştırma görevlilerine etkileri araştırılmıştır. Sınıflarda yaşadıkları teknik problemlerin motivasyon, doyum ve kaygılarına etkileri ve teknolojiye yönelik tutumları incelenmiştir. Ayrıca, bu problemleri kendi başlarına çözmelerine yardımcı olması için geliştirilmiş mobil öğrenme uygulamasının kullanımının ne derece kolay olduğu analiz edilmiştir.

Teknik destek ofisinin önceki yıla ait problem ve çözüm kayıtları ile katılımcılarla yapılan ön görüşme sonuçları kullanılarak Android tabanlı bir mobile öğrenme uygulaması planlamış ve geliştirilmiştir. Orta Doğu Teknik Üniversitesi Eğitim Fakültesi'nden 10 katılımcı ile uygulamayı kullanma öncesi ve sonrası görüşmeler yapılarak bir araçsal durum çalışması gerçekleştirilmiştir. Katılımcılar yaklaşık altı hafta boyunca uygulamayı kullanmışlardır. Altı hafta sonunda, aynı katılımcılarla uygulama sonrası görüşmeler gerçekleştirilmiştir. Sonuçlara göre, uygulama motivasyon ve doyumdaki düşüşü engellemiş ve katılımcıların sınıfta teknoloji kullanımına yönelik kaygılarını azaltmıştır. Katılımcılar, uygulamanın yeterli içerik

ve ara yüz ile kullanımının teknik problemleri çözmede kolaylık sağladığını belirtmişlerdir. Ayrıca katılımcılar, mobil öğrenme uygulamasının teknoloji okuryazarlıkları üzerinde olumlu etkileri olduğunu ifade etmişlerdir.

Anahtar Kelimeler: Teknik destek, mobil öğrenme, araçsal durum çalışması, mobil uygulama, teknik problemler, ve teknoloji okur yazarlığı.

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TABLE OF CONTENTS

LIST OF TABLES

TABLES

LIST OF FIGURES

FIGURES

LIST OF ABBREVIATIONS

ICT: Information and Communication Technologies

EPSS: Electronic Performance Support Systems

OS: OS

IT: Information Technologies

TSO: Technology Support Office

MLA: Mobile Learning Application

CHAPTER 1

INTRODUCTION

In this chapter, topics, which are the background of the study, statement of the problem, research questions and significance of the study are presented. Information regarding the study is also given in keeping with current literature. At the end of this chapter, the organization of the study is explained.

1.1 Background of the Study

The use of new technologies, including mobile devices, has become more widespread in many areas. Nowadays using mobile devices is very common among people. According to Horizon Report (2009), a portable device that is able to make phone calls, take pictures, make records of audio and video, keep data, play sounds, music and movies and as well as access the internet is so common in our lives that it is very surprising for us when we learn that someone is not using such a device.

Because the use of technological devices has increased recently, the need for technical support has also grown. There are many technological tools in school settings and some courses are thought via online environments or computer laboratories. However, the use of these tools has caused some problems as well. These problems are related to the operation of these devices, such as technical problems related to their hardware or software. According to Jones (2004), computer malfunctioning leads to pauses during classes; and when there is poor technical support, and computers' maintenance is not performed regularly, it will result in teachers not being able to use the technology in the classroom.

Technology literacy of teachers is another important point when they decide to integrate technological devices to the classroom. If problems could be solved without waiting too long for support from an expert, classes would not be interrupted. Barley (1999) and Parker (1997) state that using technology in the classroom is complicated and time-consuming until it is mastered. Training and technical support are critical; however, most faculties have not had formal training sessions and have not made use of IT effectively for instructional and scholarly work. Buabeng-Andoh (2012) states that some factors like support, training, facilities and funding affect teachers' handling of ICT in their courses. Teachers' professional development is very important for integrating technology into the classroom successfully.

As technical problems occur, students' and instructors' motivation and satisfaction levels drop while waiting for these problems to be fixed. According to Huizenga (2009), technical problems may affect students' motivation badly. Many instances of disengaged behaviors were observed under the influence of these problems. Because technical problems break the flow of the course, the possibility of having a problem in the beginning or during class hours creates concerns in teachers. Jett & George (2003) explained that unexpected technological issues that direct the users to a different activity create stress.

There are differences in the instructional technology resources between fields of study and institution types. Some schools have the resources to invest more in classroom technologies while others with limited resources do not have the same capacity. Likewise, some subject fields, such as natural sciences, mathematics, and engineering areas, are working with high-tech tools, especially computers, longer than fields such as arts and humanities. Hence, the shift in higher education, in response to new technology, has been greater in some academic fields than in others (Baldwin, 1998). On the other hand, a review of the literature provides limited empirical research on the use of a faculty support system in higher education such as the use of mobile and web based applications. Despite the apparent success of mobile support applications, measured in terms of faculty members' and research assistants' satisfactions and

institutional growth, little research were conducted with respect to how such applications impact students' satisfaction (Wiesenmayer et.al, 2008). Therefore, this study was designed to explore the effects of a technical support system for faculty members and research assistants of the Faculty of Education.

In general, technical support systems have two components: human infrastructure and technological infrastructure. According to Zhao (2002), the term 'human infrastructure' is used for the organizational arrangement of resources to help faculty members and research assistants with technology integration and use in their classes. Human infrastructure consists of the technical staff who will communicate with people who need help in education environments and aid them in learning and using technology. There is need to have some policies and procedures available for human infrastructure in schools. Zhao (2002) says that a healthy human infrastructure would include institutionalized policies and procedures related to technology issues, such as hardware and software purchases, professional development, and student access to computers and the Internet. Technological infrastructure, on the other hand, includes the technological materials that can be used in classrooms for education. These materials may exist in regular classrooms, smart classrooms, computer labs and so on. For each type of infrastructure, there are the major problems that may occur frequently, especially when there is a lack of a support system.

To summarize, technical problems that occur because of the failure of technological devices in the classroom create problems such as motivation and satisfaction loss and concern for students and teachers. Moreover, these problems cause time loss, change in course plans and diminish the integration of technology into the classroom.

1.2 Statement of the Problem

Decreased motivation and satisfaction are important problems that could occur when there are technical support difficulties in schools. "When technical difficulties are present, it is clear that learners become isolated and frustrated, and learning is

adversely affected. In order to assist learners, there has been a movement toward the development and implementation of accessible, available, and reliable technical support for both learners and instructors/trainers" (Shamsy, 2014). Students get prepared before and during breaks for the lesson. However, in a learning environment experiencing problems with accessing course materials or course delivery system components such as computers, projectors, smart boards etc., and students could get demotivated and will not be able to concentrate during the course. Motivation is one of the key factors for learning to occur. Another important problem is the concerns of teachers during or before classes. Baldwin (1998) states that limited access to technical support can raise the concerns of instructor and students in classrooms. The technical support system must be able to minimize such problems that occur at the beginning, during or after the class.

There are some additional factors related to the quality of technical support of schools and classrooms. Distance, for example, may cause problems that necessitate urgency of technical support because speed and duration are important for preventing the effects of the inadequacy of technical support. When there is considerable distance in between, technical support can become extremely harder even though there may be an urgent need for it (Lowe, 2005). Especially, when there is a limited number of technical staff in a faculty, distance will be a much bigger problem for technical support. During classes in a faculty, there may be several problems because of technological devices. Because these problems have to be solved as fast as possible, the support staff have to act immediately for each problem. However, if there is not enough staff members or there is a considerable distance between classes experiencing a problem and technical support office, solutions will be delayed and as already mentioned under the first problem; motivation and satisfaction loss and concerns will occur for students and instructors.

Lack of technical support, an adequate number of support staff and long distances will cause a bigger problem, which is time loss. "Perhaps, the most easily identifiable and greatest negative to engaging in the technical support role is time loss" (Shamsy,

2014). The duration of a class is very important for a lesson because there will be a lesson plan for each course. If technological devices cause problems and in addition, technical support is not adequate to solve these problems quickly, time loss will affect learners and instructors. These effects will cause motivation loss and prevent effective learning.

While technology is used widely in higher education, technical support has significant importance for gathering the benefits of technology in the classroom. Several problems arise through technical support difficulties, namely a loss of motivation of learners and instructors, distance for technical support and time loss. Technical support does not affect learning directly but affects the learning environment where learners engage. As technology is increasingly used in classrooms, such problems will keep occurring. These problems cause people to avoid using technology in classrooms because of the time and motivation loss caused by technical problems.

1.3 Purpose of the study

The purpose of the study is to explore the effects of technical problems on faculty members' and research assistants' motivation, satisfaction and concerns when a Mobile Learning Application (MLA) is used. In addition, it is aimed to evaluate how easy it is to use in troubleshooting the problems.

1.4 Research Questions

The study aims to answer the following research questions:

1) How do technology related problems encountered in classrooms affect faculty members' and research assistants' attitude and emotion?

    a) How do the faculty members and research assistants attitudes toward technology use change after using the MLA?

b) How are motivation, satisfaction and concern levels of faculty toward technological problems affected by using the MLA?

2) What are the faculty members' and research assistants' opinions about the easiness of using the MLA?

1.5 Significance of the Study

Due to the developments in technology and technological devices that are used in the classroom, the findings of this study enlighten the benefits of a mobile learning application for presenting solutions on problems that are related to the most frequent observed problems of these devices. This study will contribute to society in terms of technology literacy, different points of view or opinions for solutions to technical problems and preventing time loss in classes by using the MLA. Moreover, by reducing the time for solving the technical problems, motivation and satisfaction loss and concerns due to technical problems will decrease, the quality of courses will be enhanced and learning will be enabled.

As the use of technology in the classroom increases, instructors and students are affected by problems related to these devices. Devices such as projectors, smart boards or PCs are included in the courses as media for the lesson. Instructors plan their courses and account for lecture time by using these devices. However, when a problem is encountered during or before the course, there will be motivation loss for the teacher and the students. Moreover, satisfaction of that course will decrease for both the students and the teacher. Cox et al. (2000) points out that technical problems occurring in the classroom affect students' and teachers' motivations negatively. If these problems are faced repeatedly, teachers will experience concerns over technical problems before the classroom. These concerns have the effect of making them unwilling to integrate technology into the classroom. As Cuban (1999) and Cox et al. (1999) state, insufficient technical support is likely to cause teachers to avoid using technology and make lessons unsuccessful.

This study was conducted at the Faculty of Education in METU; therefore, students are the prospective teachers. If technology is not integrated into classroom effectively, these students most probably will avoid using these devices in their future classes. For teaching students how to teach by using technology, teachers have to use it effectively in the classroom in the first place.

Mobile technology, on the other hand, has been used more frequently as early as 2005. As Laouris and Eteokleous (2005) state that in 2005, Google searches for mobile learning increased from 1,240 to 22,700. Mobile devices help users to access information anywhere and anytime. Mobile devices help learning to become portable, self-generated, private and sensational (Kukulska-Hulme & Traxler, 2005). For this study, participants were selected according to their ownership of mobile devices because the MLA was developed to be used on mobile devices such as smart phones or tablets. The main reason for helping teachers to learn and apply solutions for technical problems through a mobile device is to make the information available even when they cannot use a PC to search for the solutions to technical problems on the Internet. Moreover, by using the MLA, users can become familiar with the interface of mobile devices, which can contribute not only to their technology literacy with solutions but also with the use of the mobile devices.

In summary, since technological enhancements are now greater than ever, there will be many opportunities to use technological devices in many areas. Although there will be more developed devices to be used in the future, there will also be more problems as technical problems arise related to developed technology. Technical problems will cause obstacles like motivation and satisfaction loss and concerns for teachers and learning loss for students. A mobile learning application that is developed for presenting solutions to users can prevent these problems and increase the technology literacy of users. The outcomes of this study can be used not only in schools but also at other places where technological devices are used. A pattern for creating alternate applications was developed in this study along with the MLA.

1.6 Organization of the Study

This study includes five chapters; introduction, literature review, methodology, results, discussion and conclusion. In the first chapter, introduction, background of the study, statement of the problem, purpose of the study, research questions, significance of the study and organization of the study were explained in detail.

In the literature review chapter, the background literature related to this study was given. In this chapter, there is information about mobile learning, electronic performance support systems and the technology support system at the Faculty of Education. The development of mobile learning was explained in detail. Moreover, the need for technical support, advantages of the technology support system and the MLA for support are explained.

In the methodology chapter, there are explanations regarding the flow of the study. There is information about research questions, design of the study, justification of the study, application of the study including parts in the study, participants, data collection procedure and instruments and data analysis, researcher role, assumptions, limitations and delimitations of the study.

In the results chapter, outcomes of the interview results are explained in accordance with the research questions. There are explanations about participants, interview questions and the summary part.

Finally, in the discussion and conclusion chapter, the technical support office and the need for an application for technical problems, effects on motivation, satisfaction and concern, effects of application, implications and recommendations for future studies are explained. The research questions of the study are answered in this chapter.

CHAPTER 2

LITERATURE REVIEW

2.1 Technology Integration into Education

In the educational field, the term technology, which is used more frequently since the last quarter of the 20th century, has been defined in the dictionary as "information, including production processes and equipment, about an industry branch" (Bacanak et al., 2003 and TDK, 2003). During the adoption of ICT into education there have been improved new designs and developments of hardware and software. Lim & Hang (2003) state that, during the launch of the integration process of ICT in education, engineers, programmers and instructional designers planned and produced new hardware and software to be used in teaching and learning activities in schools. Technology has emerged in every point of students' lives (Green & Hannon, 2007) and various technology devices such as laptops, desktop computers, the Internet, iPads and smart boards are available for students' use in schools (Vaughn, 2012). In this technology integration process, according to Harris et al. (2009), there have been five different approaches in past and current efforts; demonstrations of sample resources, lessons, and projects; technology-based educational reform efforts; structured and/or standardized professional development workshops or courses and technology-focused teacher education courses.

Technology integration has been increasing in all over the world as well as in Turkey. As Uslu and Bumen (2012) clarified, Turkish schools have been investing for hardware and software installations lately. For students in Turkey, access to a computer technology has become easier (MoNE, 2009a, 2010b). According to the

results of Savery's research (2002), e-mail, chalkboard, overhead projector, videos and computers are the most common technologies used in the classroom for teaching.

The purpose of using technology in the classroom can be indicated as enhancing learning and creating an environment to increase the technology literacy for both students and teachers. Teachers are changing their education strategies; teaching from basic concepts to complex information to help students visualize constructs and pursue with adequate information (Groff & Mouza, 2008). If technology integration is effective, students can reach, analyze and apply information as well as increase their technology literacy by learning how to use devices (Vaughn, 2012).

2.2 Barriers to Technology Integration

Ertmer (1999) has proposed categorizing the obstacles to technology integration as first order and second order barriers. According to Ertmer; first order barriers include external effects such as lack of access, inadequate infrastructure, lack of time, training and technical support. Second order barriers include teachers' pedagogical beliefs, willingness to change and personal beliefs regarding the use of ICT. Tsai and Chai (2012), on the other hand, have described a third order barrier which is lack of design thinking by teachers.

Teachers can enhance their programs in order to be able to use technology in the classroom. According to Halderman's (1992) research, which is aimed at the use of computers at schools, most of the lecturers wanting to use technology more efficiently can develop favorable manners and increase their knowledge. However, studies show that most teachers are reluctant to integrate technology into the classroom and their course plans. According to a great amount of research, although computers are easily accessible, they are rarely used by most of the teachers (Çağıltay et al., 2001). There are some reasons for teachers not using technology in the classroom. The main reason of this failure is that teachers are not given adequate support on how to use technology in the classroom and to integrate technology into their lessons even though access to

technology at schools has been enhanced (OTA, 1995; Sheingold and Hadley, 1990). Individual access to ICT which teachers have (Ross et al., 1999; Cox et al., 1999; Guha, 2000), the amount of technical support (Cuban, 1999; Bradley and Russell, 1997), and the amount and quality of education (Pina and Harris, 1993; Lee, 1997) affect the degrees of confidence and also the degrees of ICT use. Degrees of ICT attainment is important while detecting the degrees of use of ICT by teachers (Mumtaz, 2000). Nonetheless, a school with low attainment does not necessarily have sufficient material (supply); the number of materials may be sufficient but inappropriately held in the school (Becta, 2004). The equipment should be held in such a way to make sure every user has max attainment. (Pelgrum, 2001; Fabry and Higgs, 1997).

On the other hand, teachers emphasize different points for the importance of ICT integration into the classroom. Experienced and fresh lecturers underline the need for technical abilities and aspects, modernist lecturers stress curricula and didactic competencies while prospective teachers refer to technical competence and pedagogical adeptness as important for including ICT in the educational processes (Buabeng-Andoh, 2012). Studies show that teachers are not willing to use ICT in the classroom. They generally avoid integrating ICT into the classroom most of the time. As for Ertmer (1999), even if the obstacles related to access, time and technical support issues are avoided, lecturers will not use technology in education system all the same. These technical problems are obstacles not only in classrooms but also in distance education. When a technical problem is confronted in a distance learning environment, education is broken. As Hobgood (2003) states, when there is a technical issue, distance learning makes the learner even more distant.

2.3 The Need for Technical Support

The rapid development in every field and the increase in investments in technology in the field of education in the late 20th century have forced academicians to develop the educational system. According to Bacanak et al. (2003), there are two important obstacles before the change that is necessary for education systems; first of these is the

absence of teachers and administrators being informed of the suitability of technology use. Reasons for this include inadequate budgets and inexperienced academicians and administrators. Moreover, in institutions that raise teachers, technology is not used much throughout the education of teacher candidates. To use technology in educational activities at the desirable level, teachers should improve themselves. Therefore, the administrators should provide time and facilities for teachers. In addition, in the study of Çağıltay et al. (2001), the requirements for teachers using computers in their classrooms were found to be computer education for teachers, computer laboratories for general use, technical support staff and computers that will be used by teachers.

Technology use in the classroom increases the quality of education in a university. If universities are to compete effectively in the new millennium, they should efficaciously include technology in the classroom. The universities will need to improve cohesive training programs with attention towards learning and allow sufficient technical support that will help faculty members and research assistants with including technology in teaching (Rogers, 2000). The importance of technical support increases day by day. This support should be provided in an appropriate manner to be effective toward technical problems in classrooms. The inadequacy of accessible technical support may result in teachers declining ICT, because of the fact that there may occur a fault, which cannot be fixed, with the consequence that the lecture is ineffective (Cuban, 1999; Preston et al.., 1999). Clearly, when technical issues occur in the classroom, these issues directly predispose the teachers not to integrate technology into the courses. Frankly, these two technical barriers have a strong connection; the more the breakdowns occur, the more the teachers will refrain from using technology in classrooms (Jones, 2004). In addition, as Becta (2004) points out, if an inadequacy of technical support is experienced in a school, technical maintenance may not be conducted on a regular basis, which results in a greater risk of technical breakdowns.

Technical problems create negative effects on the members of the classroom. These effects are related to the motivation, satisfaction and concerns of teachers and students.

Cox et al. (2000) clarified that technical issues cause motivation and satisfaction loss. North, Strain and Abbott (2000) claimed that technical problems and satisfaction loss have a strong relationship. Jett and George (2003) stated that unexpected problems create stress and make workers focus on unrelated activities.

In summary, technical problems are one of the main problems of integrating ICT into the classroom. Results of technical problems were investigated by many researchers and some solutions were presented. The most important negative effects of technical problems are motivation and satisfaction loss and the creation of concerns for members of the classroom. Technology helps learning, participation and interactivity in the classroom. However, results show that most teachers are not using technological devices in their courses. In a school where technology is used there must be better support and information for teachers on how to use technology in the classroom. Nevertheless, technology should not be the focus of the education system. It should be used as a means of support with helpful aims (Doğan, 2015).

2.4 Just-in-Time Learning and Electronic Performance Support Systems

Just-in-Time learning is supplying quick solutions when it is necessary (Clark, 2010). As Sharma (2013) stated, people learn when they apply it immediately. Therefore, just-in-time learning helps learning to occur when the learners apply the task they learned immediately. Drews et. al (2003) explained the just-in-time learning as a training from which non-experts get information to solve the problem with the expertise.

Drews et. al (2003) used the just-in-time learning for a medical emergency situation. Pinson (2005) stated that if task is described clearly, the just-in-time learning becomes the most successful approach in situations.

Electronic Performance Support System (EPDS), on the other hand, is a computer software program or component that increases the productivity and efficiency of the workers. According to the general definition, EPDSs are structures that decrease the

time spent for the tasks, increase the performance, and provide correct information and numbers with details to the workers at the right time (Gery, 1991; Gery, 1995, Gustafson, 2000; Lawton, 1999; Raybould, 1995). Sleigth (1993) showed the characteristics of the EPDS under the following topics:

- Computer-based,
- Provide access to the discrete, specific information and tools needed to perform a task at the time the task is to be performed,
- Used on the job, or in simulations or other practice of the job,
- Controlled by the worker,
- Reduce the need for prior training in order to accomplish the task,
- Easily updated,
- Fast access to information,
- Irrelevant information excluded,
- Allow for different levels of knowledge in users,
- Allow for different learning styles of users and integrate information, advice and learning experiences.

As the computer use increased, the performance problems also increased in workplaces. For reducing the performance problems, EPSS is considered as a suitable approach. According to Sumuer (2015), EPSSs bring great opportunities for performance related problems in workplaces where the increased number of computer capabilities and availability are present. Moreover, with the EPSSs including infrastructure such as store, capture and distributing knowledge, learning is facilitated (Laffey, 1995; Raybould, 1995).

EPSSs have an increasing number of use in education field (Ozgur, 2013). In education field, Barker, Van Schaik and Famakinwa (2007) developed a software; whose name is Epsilon, for introducing the campus to the freshmen students. Miller et al. (2007) developed another software for creating solutions to the problematic behaviors in the classroom. According to Ozgur (2003), EPSSs are supposed to be effective when it is

needed in education environments especially for applying the new gathered information.

2.5 Mobile Learning

The definition of mobile learning was not clear until 2005. Laouris and Etoekleous (2005) state that they found 1,240 articles via the web, or rather Google; significantly, after searching the same terms in June 2005, Google provided them with 22,700 articles. Therefore, it has been stated that the term mobile learning became familiar in 2005 (Crompton, 2013). The mobile learning method is a new concept that uses mobile devices in education. Mobile learning is the latest type of learning. Mobile devices such as handheld computers, mobile phones and smartphones are the key for switching learning to portable, mobile devices, including handheld computers, mobile phones and smartphones that make learning portable, spontaneous, private and enthusing (Kukulska-Hulme & Traxler, 2005).

Using wireless mobile technology, mobile learning gives people the chance to search for and attain information and/or learning materials anywhere and anytime they want (Ally, 2009). This definition is most commonly given for mobile learning. Yet, since the beginning of studies in this field, there has been many arguments on mobile learning definitions and distinctions (Alnuaim, Caleb-Solly & Perry, 2012). Consequently, it is still not certain or clear what the definition of mobile learning really is (Rossing, Miller, Cecil, & Stamper, 2012). For instance, Kadirire (2009) describes m-learning as a type of e-learning that can be utilized anytime with the assistance of a portable communication device. On the other hand, Brown's (2005) definition of mobile learning is "an extension of e-learning" (p. 299). Lastly, Quinn (2000) identifies mobile learning as "the crossing of mobile computing and e-learning (electronic learning): attainable resources anywhere, strong facilities, affluent interaction, strong support for effective learning, and performance-based evaluation" (p. 8). In general, mobile learning includes anywhere and anytime features. There are classic examples such as mobile phones (or cell phones / hand phones), smartphones,

palmtops and handheld computers (Personal Digital Assistants or PDAs); Tablet PCs, laptop computers and personal media players are also considered within this context (Kukulska-Hulme & Traxler, 2005).

Koole (2009) defines mobile learning as the interactive relation of mobile technologies, capacity of human learning and the social aspect of learning (Kenny et al., 2009). Koole's Framework for the Rational Analysis of Mobile Education (FRAME) Model was adopted while developing the MLA for this study. In Figure 1, Koole's (2009) FRAME Model of mobile learning is presented.

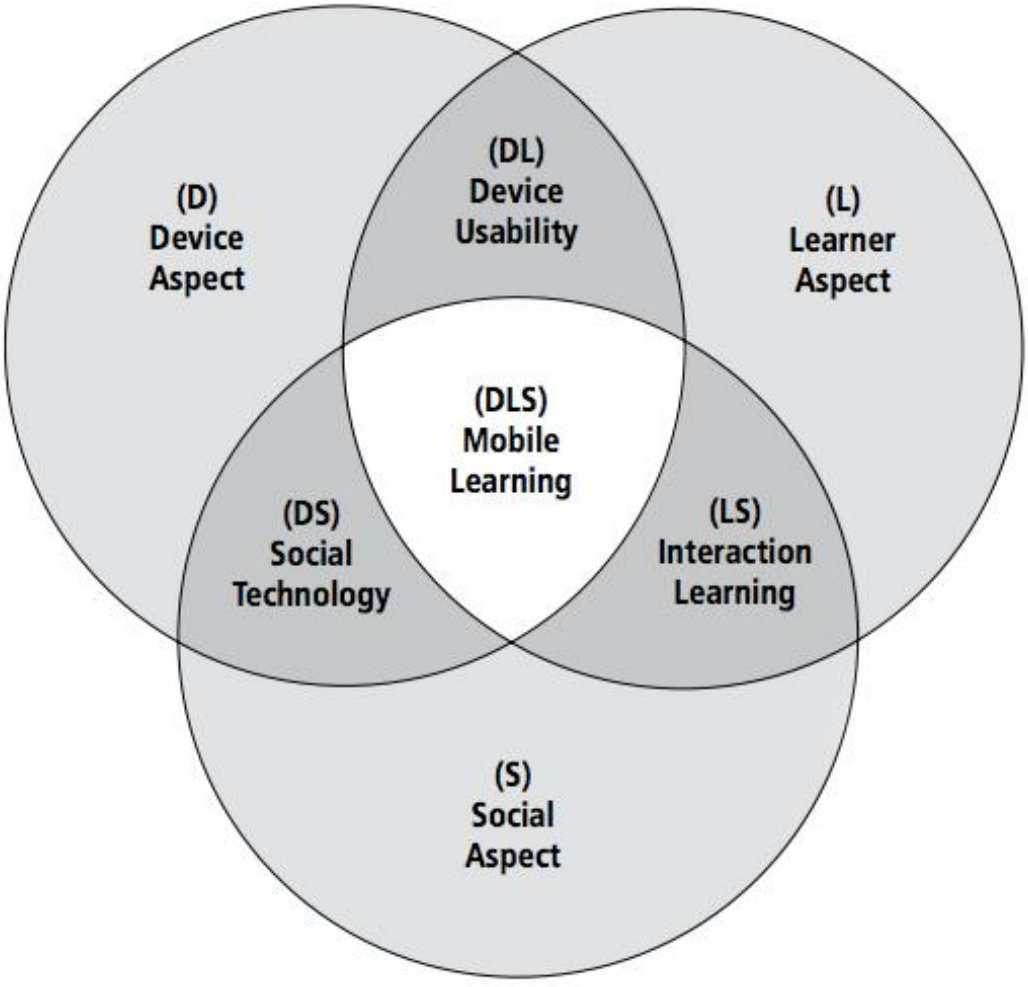

Figure 1 Koole's FRAME Model (2009).

In Koole's FRAME Model (2009), the Device Aspect (D), the Learner Aspect (L) and the Device Usability Intersection (DS) were used within this study. The Device Aspect focuses on the physical characteristics of the mobile devices such as input-output capabilities, file storage, processor speed etc. In this study, participants used their own devices to be able to work with the MLA. Therefore, their phones were compatible to install and use this application. The Learner Aspect focuses on the characteristics of the individuals such as technology literacy, prior knowledge, learning styles and cognitive abilities. In this study, participants were faculty members and research assistants in METU. The Device Usability Intersection represents the elements like portability, comfort and access to information. This intersection builds upon the Learner Aspect and the Device Aspect. In this study, device usability was adopted by providing the application for the portable devices of participants. Moreover, there was support for the ease of use of the application.

The Social Aspect (S) focuses on the process of conversation, collaboration and social beliefs. The Social Technology Intersection (DS) means networking or connectivity. The Interaction Learning (LS) explains how an individual is affected by and affects the community. These intersections and aspect were not explored in this study because the MLA does not have an interaction feature between users. Moreover, this application works offline; in other words, there is no need for an Internet connection.

Mobile devices are mostly capable of connecting to the internet. One of the important features of mobile learning is that it helps learners to step into an information network whenever it is needed via a portable learning gismo and a wireless connection (P. Seppälä & H. Alamäki, 2003). In mobile learning environments, students can access their course content, homework, and contact information via the internet by using mobile devices anywhere and anytime. As documents can be saved on these devices, students do not even need a constant internet connection. Mobile devices not only create opportunities for instant connection but are also devices for studying offline. In the light of this information, it can be deduced that mobile devices minimize the differences between formal and informal education.

There are some examples of using mobile technology in language learning. Web phones were used for students to reach distance learning materials by Ring (2001). Regan et al. (2000) used mobile phones for learning Spanish via e-mail, web and voice. English vocabulary materials were emailed to students' mobile devices by Thornton & Houser (2001).

On the other hand, student participation in the course is very important for effective learning. Supplying anonymity (e.g. nameless balloting) and supplying synergistic interfaces (e.g. when there is a quiz with only one selection) (Dawabi et al., 2004) can provide effective learning via mobile instruction. In addition, interactivity is another important factor that helps learning in the classroom. Interactivity is a useful factor for the educational atmosphere. In this case, a research was established by Markett et al. (2006) which helps learners and teachers to understand the concept of a message loop via determining interactivity as a loop from the learner's point of view.

To summarize, mobile learning is an adoption of recent developments in mobile technology, on which it is in turn predicated. It redefines teachers' and students' duties and while mobile learning implies adopting and building upon the latest advances in mobile technology it also dims the borders between formal and informal learning. This makes individuals understand what being a lifelong learner is and how to progress at work nowadays (McQuiggan et al., 2015).

2.6 Strengths and Limitations of Mobile Learning

Mobile learning is a very effective method in education; however, there are strengths and limitations that should be taken into consideration for this method. Elias (2011) and Crescente & Lee (2011) indicate the strengths of mobile learning in terms of cost, content delivery, and support for learning, improvement of literacy and ease of use of the device. The cost of mobile devices is significantly less than PCs and laptops; in addition, mobile learning reduces costs for training. Multimedia content can be

delivered and created easily by a mobile device. Mobile learning also supports continuous and situated learning of users. By using this method, learners can improve their literacy, numeracy and participation in education. Lastly, these devices make it easy to send media or texts, export audio or video files on to the device. Therefore, these files can be used anywhere and anytime.

Mehdipour and Zerehkafi (2013) indicate connectivity and battery life, bandwidth, supported file formats, security, OSs and mobile platforms as the limitations of mobile learning. Moreover, Elias (2011) mentions limited memory; Crescente and Lee (2011) point of obsolescence and Maniar et al. (2008) point out the screen and key sizes. Since mobile devices work with a battery, battery life is important for users. Devices must be charged repeatedly and finding a plug-socket may not be possible all the time. Service connection is also important for accessibility and reaching the internet environment for users. Screen and key sizes are small since these devices are pocket size. Therefore, some users may not feel comfortable using them. The bandwidth of these devices is lower than normal PCs and laptops; therefore, it is not possible to reach as high connection speeds as with other devices. Mobile devices may not support all types of file formats. These files should be reformatted so that they can be used in mobile devices. Security is another important aspect for users. Even though companies provide security services for mobile devices, these services may not be enough and files on these devices are possibly at risk. The memory of a device is limited and smaller than a PC's. There are alternatives for increasing the memory but the cost becomes an important obstacle for users. Finally, obsolescence is a risk for users as technology is developed very rapidly nowadays. Since newer versions of these devices are released, companies cease providing support for older versions and this situation creates a security vulnerability for devices.

To summarize, mobile devices have enormous advantages during the learning session; however, there are limitations of these devices for users. As noted earlier, there are limitations to mobile learning and its use in education, and these limitations should be considered.

2.7 Summary

Nowadays, technology is integrated into education more often. Numerous devices are used in classrooms; for example, smart boards, projectors, smart classrooms etc. Mobile devices such as tablets and smart phones enrich technology available in a classroom environment. By using these devices, learning becomes better and learners' motivation and satisfaction levels increase.

Mobile devices make learning anywhere and anytime because of their specifications. These devices help learners to become more active in a course and create a situated learning environment since they are portable devices. In addition, mobile devices demolish the drawn line between formal and informal education. Even though there are some limitations such as cost, battery life or screen size, mobile devices help learners reach information in more places.

Because technology use is increasing in educational fields, malfunctioning of technological devices occurs more frequently. In this situation, the need for technical support gains more importance. If a breakdown is not fixed quickly during a course, some problems such as loss of motivation, satisfaction and class time will come up and learning will not occur effectively. As some researches show, teachers are reluctant to integrate technology into the classroom and the main reason is indicated as technical problems for this inclination. However, by providing efficient technical support and technology education, universities can overcome this problem. Along with providing good support for technical problems, increasing the technology literacy of instructors becomes more of an issue.

CHAPTER 3

METHODOLOGY

This chapter of the study contains information about the overall design of the study, participants, data collection instruments and procedures, content analysis, design, development and implementation process and data analysis.

3.1 Design of the Study

This research is a case study research where the semi-structured interview method was adopted for collecting data. Because learning environment settings in higher education can be different in richness of technology, case study research was adopted to investigate the case of "faculty of education technology support". This study apply a mobile learning application prepared for supporting faculty members and research assistants in troubleshooting of technological problems faced during classroom sessions. Participants need to have an Android device (smartphone, tablet etc.) to be able to use this mobile learning application. The content in the application includes solutions for fundamental problems that occur in computers, projectors, smart boards, printers and scanners. The research questions that guided the study were as follows:

1) How do technology related problems encountered in classrooms affect faculty members' and research assistants' attitude and emotion?

   a) How do the faculty members and research assistants attitudes toward technology use change after using the MLA?

   b) How are motivation, satisfaction and concern levels of faculty toward technological problems affected by using the MLA?

2) What are the faculty members' and research assistants' opinions about the easiness of using the MLA?

The current study is designed as an instrumental case study. Stake (1995) describes instrumental case studies as follow:

> "We have a research question, a puzzlement, a need for general understanding, and feel that we may get insight into the question by studying a particular case. … We may choose a teacher to study, looking broadly at how she teaches but paying particular attention to… [A particular aspect of her teaching]. … Case study here is instrumental in accomplishing something other than understanding this particular teacher, and we may call our inquiry *instrumental case study*. (p. 3)."

In this case, faculty members and research assistants in Faculty of Education were used as an instrument for investigating the effect of technology problems in classroom on motivation, satisfaction and concern levels of teaching staff in higher education classes. Technical support issues were examined and solutions were presented in a MLA to be used in classrooms or offices for troubleshooting problems.

Technology related obstacles could create barriers in education when there are technological devices such as projectors, computers, smart boards etc. being used to enhance learning. Moreover, these barriers can create an attitude toward technological devices, which will make instructors reluctant to use these devices and decrease technology literacy level. If an instructor cannot solve a technology related problem on time for his/her class, she or he will re-consider using these devices while planning the instruction. In addition, these problems could reduce the motivation and satisfaction of teachers and students, and could create concerns for teachers in their future class hours. This study aims to measure the importance of this IT problem on the attitudes of faculty members and research assistants, their motivation, satisfaction and concerns. The instrumental case study model is the most suitable for the purpose. This model is conducive to achieving the aims of the study.

3.2 Procedures

The ADDIE instructional design model was adopted to design and develop the mobile learning application for supporting troubleshooting. At the beginning of the study, user analysis and content analysis were conducted. For user analysis, faculty members and research assistants were invited to participate in a pre-interview about their experiences with technical problems.

For content analyses, the problems were gathered from the previous technical problems in the Technology Support Office (TSO) records of the Faculty of Education at METU. In these records, problems were listed according to their frequencies and categories. A pre-interview session was conducted with participants and they were asked about the problems they encounter while using technological devices in the Faculty of Education. The problems that were gathered from the records of the TSO and results from the pre interview were compared and listed according to their frequencies. The problems with the highest frequency were selected for the solution pages in the application. In pre interview sessions, the participants were asked about their expectations for a mobile application interface. In accordance with their suggestions, the MLA was prepared.

For the design and development part, MIT's App Inventor® was used as a development platform for the mobile learning application. By using this platform, an Android application was developed to be installed on the Android devices. The solution pages were placed according to the frequencies in the content analysis. Before the implementation process, the mobile application was tested and redesigned for formative evaluation to enhance the user interface design. In the implementation process, the mobile learning application was distributed to the participants' Android devices after the pre interview sessions. Participants used this application approximately six weeks. The time period to use this application lasted six weeks because the application was completed after the first 8 weeks of the semester, only six

weeks remaining for the semester to end. At the end of the study, this application was sent via e-mail to be used by the other members of the Faculty of Education.

3.2.1 Participants

There were ten faculty member from the Faculty of Education at Middle East Technical University (METU) participating to in this study. The academic positions of the participants were five research assistants, one assistant professors, three associate professors and one professor. Six of the participants are male and four of the participants are female. In Table 3.1, there are detailed information about the background of the participants.

Table 3.1 Background of the Participants

Code of Participant	Title	Year of Experience	Gender
P1	Asst. Prof. Dr.	3	Female
P2	Research Assistant	5	Male
P3	Assoc. Prof. Dr.	22	Male
P4	Research Assistant	6	Female
P5	Asst. Prof. Dr.	9	Female
P6	Asst. Prof. Dr.	2	Male
P7	Prof. Dr.	16	Male
P8	Research Assistant	3	Male
P9	Research Assistant	3	Male
P10	Research Assistant	3	Female

Four of the participants were from the department of elementary education, three of the participants were from the department of educational sciences, two of the participants were from the department of computer education and instructional technology, and one participant was from the department of physical education and sports (See Table 3.2).

Table 3.2 Department Distribution of Participants

Departments	f	%
Elementary Education	4	40
Educational Sciences	3	30
Computer Education and Instructional Technology	2	20
Physical Education and Sport	1	10

Sampling

In this study, the researcher applied purposive and convenience sampling. According to Creswell's (2006) definition of purposive sampling, researchers intentionally select individuals and sites to learn or understand the central phenomenon. The standard that is used to choose participants and sites is whether they are "information rich" or not (Patton, 1990, p. 169). Secondly, the researcher has used convenience sampling for the study. According to Marshall (1996), convenience sampling involves the selection of the most accessible subjects. In the Faculty of Education, there are people who meet the standards of being a participant. However, not all of them were accessible for this research. Therefore, convenience sampling was adopted to select the most accessible participants for this study by the researcher.

The main criterion for selecting the participants was having an Android device and teaching a class during the term. Having an Android device is important for the use of the MLA that was prepared for technical support. The second criterion, which is teaching a class, is important for the use of the application in a classroom when needed. Participants should be able to use this application when needed and see if this application serves its purpose.

All of the participants were interviewed at the beginning and at the end of the term. Interviews were recorded to be analyzed for gathering the results of the study. Participants were provided with information and support on both the study and the use of the MLA.

3.2.2 Data Collection Instruments

The main instruments for data collection were the interview protocols that were used to conduct the individual interviews. There were semi-structured pre and post interview sessions, both conducted with the participants in the Faculty of Education. There were seven questions in the pre interview and six questions in the post interview. For the validity and the reliability of the interview questions, expert review method was used. After preparing the interview questions, a pilot study was conducted with two field experts from the Faculty of Education for both of the interview sessions. Questions were revised according to the pilot results. . Interviews were transcribed and divided into codes and themes (See Appendices C and D). The interviews were prepared as semi-structured, Yes/No question interviews; multiple and leading questions were not used. The interview questions can be found in Appendices A and B. These interviews led to the study's research questions and helped the MLA to be upgraded according to the needs of the participants.

In the pre interview session, participants were asked questions about their experiences with the problems they encounter, the solutions to these technological problems, the effects of technical problems on their motivation, satisfaction, concerns and the quality of the TSO in the Faculty of Education. These questions were related to the first research question and for measuring the quality level of technical support. The quality level of TSO is important for determining the need for an application to solve the technical problems.

In the post interview session, participants were asked about the ease of use of the application, their and students' motivation, satisfaction and concern changes when this application was used and their attitudes toward technology use in classroom. First and second research questions were related to the results of the post interview.

Table 3.3 below lists the questions that were asked during interviews related to the research questions of this study.

Table 3.3 Research Questions and Related Interview Questions

Research Questions	Related Interview Questions
Research Question 1	- How did these problems affect your motivation and satisfaction during class? - How did these problems affect the students? - What kind of concerns did these problems create while you were preparing your course plans and classroom activities? - How were your motivation, satisfaction and concerns toward technological problems affected during the period that you used the application? - How were students' motivation and satisfaction affected?
Research Question 2	- If there were a mobile support application, would you use it? - How often did you use the application that was installed on your Android device? What were the contributions of this application for troubleshooting the technical problems without recourse to the TSO? - What are your opinions on the ease of use of the application? How can it be improved further?

Pre and post interview questions are provided in Appendices. In the following section, data collection procedure is explained in detail.

3.2.3 Data Collection Procedure

For data collection, the individual interview technique was employed. Participants were determined and asked questions related to technological problems and solutions in the classrooms and in their offices by the researcher. This collection process started in the middle of April. Participants were given the MLA for their Android devices at the end of April. At the end of the study, interviews were conducted with participants again. In the post interview, they were asked about using the application, constraints of application and the assistance of this application with technological problems. Interviews were conducted at the offices of the participants.

In the pre interviews, the participants received seven questions about technological problems, their solutions to these problems and results of these problems in terms of motivation, satisfaction, and concern for themselves and students. These interviews helped the study to be shaped according to the needs of the participants. The application design and content were also upgraded accordingly. Questions regarding the problems were prepared in accordance with the literature background of study. Answers were recorded with a sound recorder. Each interview lasted approximately 15 minutes for each participant.

In the post interviews, the participants received six questions on whether they used the application for solutions to the technological problems in classrooms and their offices. Moreover, benefits and constraints of the application were asked and recommendations were gathered. These recommendations can be used for upgrading this application and preparing a new solution application for all kinds of devices in the future. These interviews lasted approximately ten minutes for each participant. In the Figure 2 below, the data collection procedure used for the current research is summarized.

1 Week	6 Weeks	1 Week
Pre Interview Session	Implementation Process	Post Interview Session

Figure 2 Procedures of the Data Collection.

In the next part, the MLA will be explained in detail.

3.3 The Mobile Learning Application

In the following section, there are information about the analysis, design, development and evaluation phases of the Mobile Learning Application. These phases are given in the Figure 3 below.

3 Weeks	1 Month	6 Weeks	2 Weeks
Analysis Phase	Design and Development Phase	Implementation Phase	Evaluation Phase

Figure 3 Procedures of the ADDIE Process.

These phases are planned and applied according to the ADDIE Model.

3.3.1 Analysis

In the analysis phase, the problem reports obtained from the pre-interview with the participants and records of the TSO were used to determine the content of the MLA. The topics of the MLA were categorized into three parts; hardware, software and network. This section includes information about these parts that were developed for troubleshooting for technological problems in laboratories, classes and offices. The MLA contains solutions for problems that could be faced in these locations.

Several types of problems, which can be categorized as hardware, software and network related problems, were reported. There are thirteen problems related to these parts (See Table 3.4). The problem records were kept from the beginning of the first semester in the records of the TSO under the hardware, software and network topics; therefore, in this part of the study, the problems were categorized into these three topics. In selection process of the main problems, the most frequent records were specified.

Table 3.4 Information about Problems, Frequencies and Percentages

Case	Problem type	Name of problem	f	%
#1	Hardware Related Problems	Computer Peripherals	28	19
		Printer and Scanner Problems	12	8
		Projection Problems	4	3
		Smart board Problems	3	2
		Computer Case Start-Up Problems	3	2
#2	Software Related Problems	Format and Updates	26	17
		Programs (SPSS, Pgina, MS Office, etc.)	19	13
		Login Problems	16	10
		Web Site Problems	7	5
		Computer OS Start-Up Problems	6	4
#3	Network Related Problems	Internet Connection Problems	16	10
		Connector and Ethernet Card Problems	7	5
		IP Number Problems	3	2

From the log records of the TSO, 150 problems were identified. According to the analysis of these records, the most often faced problem is computer peripherals (f: 28, 19%), the second most often faced problem is format and updates (f: 26, 17%) and the least commonly faced problems are computer case start-up problems (f: 3, 2%), smart board problems (f: 3, 2%) and IP Number problems (f: 3, 2%). Detailed information about the records of the TSO can be reached in the Results section. During the comparing the results of the pre interview sessions and records of the TSO, some topics were not used in the application. These topics are Ethernet Card problems, format and updates, IP numbers problems and web site problems. These problems should be solved directly by the TSO because these problems require advanced solutions by an expert with appropriate tools. Therefore, only other problems were used in the MLA for presenting solutions to the participants.

3.3.1.1 Hardware Problems

In this part, the aim was to define the content that could help troubleshooting the hardware problems. These problems were Printer and Scanner Problems, Computer Case Opening Problems, Projection Problems, Smart board Problems, Computer Peripherals. These problems were mostly faced in offices and classrooms. In addition, printer and scanner problems were reported from printer rooms. These problems are the most serious problems for the maintainability of the course; therefore, the Technology Support Office has the quickest solutions for hardware problems.

In the application, there were solutions with pictures for most frequent problems occurring in classrooms. There is no telephone line in classrooms; therefore, instructors have to call the Technology Support Office either using their cell phones or have to physically go to the room of Technology Support Office in the building. The application aims to help instructors to solve the simple and frequent occurring hardware problems by themselves. It is aimed at increasing technology literacy, and prevent motivation loss and frustration when a problem occurs. Moreover, students' motivation and concentration loss will be prevented by taking care of these problems as quickly as possible.

3.3.1.2 Software Problems

Second most frequent problems are the software related problems that occur usually in the offices, laboratories or classrooms. Software problems could be listed as Login Problems, Computer Case Start-Up Software Problems, Format and Updates, Programs (SPSS, Pgina, MS Office, etc.) and Web Site Problems. Participants want to have the fastest solution for fundamental software problems that they experience in their offices or in classrooms.

Especially in laboratories, students cannot login into their accounts and open a session. Therefore, instructors have trouble assigning those students to other computers.

However, sometimes it is not possible to find enough working computers in a laboratory for all of the students. Most of the problems are related to hardware issues, but connections to the server also include software problems.

In classrooms, there are a few software problems. Mostly these are related to the application programs that teachers use during class such as SPSS or MS Office. These application programs are installed by the TSO. In offices, faculty members or research assistants usually have trouble with computer boot-up software problems. There are also fundamental solutions to such problems in the Android application.

3.3.1.3 Network Problems

Least frequent observed are the network problems, which are Connector and Ethernet Card Problems, Internet Connection Problems and IP Address Problems. These are faced in classrooms, printer rooms, laboratories and offices because all computers and printers have an internet connection. At METU, to have a wired internet connection for personal computers, users must have an IP address. The Technology Support Office assigns these IP addresses. Sometimes, users have problems related to this addresses. Therefore, the MLA have to provide solutions for such problems as well.

During class, students or instructors frequently need an Internet connection. Therefore, for the sake of the class time, network related problems need to be solved quickly. However, because of the concerns of having problems with technological devices or internet connections, faculty members and research assistants usually have an alternative solution. This study also aims to maintain the quality of education by solving network problems and maintain the class as it was planned initially by the instructor.

Physical Environment

There are three laboratories in the Faculty of Education at METU. Two of these laboratories are used for classes and one of them is for general use of students. The building in which faculty members' and research assistants' rooms are located has four floors. There are two floors containing normal classrooms (including computer, smart board and projector) and smart classrooms (including video conferencing, computer, smart board and projector). On each floor, there is one printer room. In these rooms, faculty members and research assistants can collect their print outs, scans and copies. They can send their files through network connections to these printers.

3.4 Design and Development of the Application

In this section, information will be given related to the stages of design and development of the MLA. The platform used for creating the mobile learning application is the MIT App Inventor®. This is an open platform to create Android based applications.

3.4.1 Mobile Application Development Tool

The MIT App Inventor® platform was used for developing the application. "MIT App Inventor® is a block-based programming tool that allows everyone, even novices, to start programming, and build fully functional apps for Android devices." (http://appinventor.mit.edu/explore/about-us.html). In other words, in this platform, there are simple interfaces to create an application for Android devices. By using the drag and drop function, users can apply codes for applications, and create different screens with images, texts or applications. This platform is free, and open to everyone. When an application is prepared, a virtual Android device or a smartphone can be used to test it. There is also an option to download the setup file via the website of the App Inventor. Users can either save the setup to hard drive or open it via an Android device.

In MIT App Inventor®, there are two main screens, which are design and code (See Figure 4 and Figure 5).

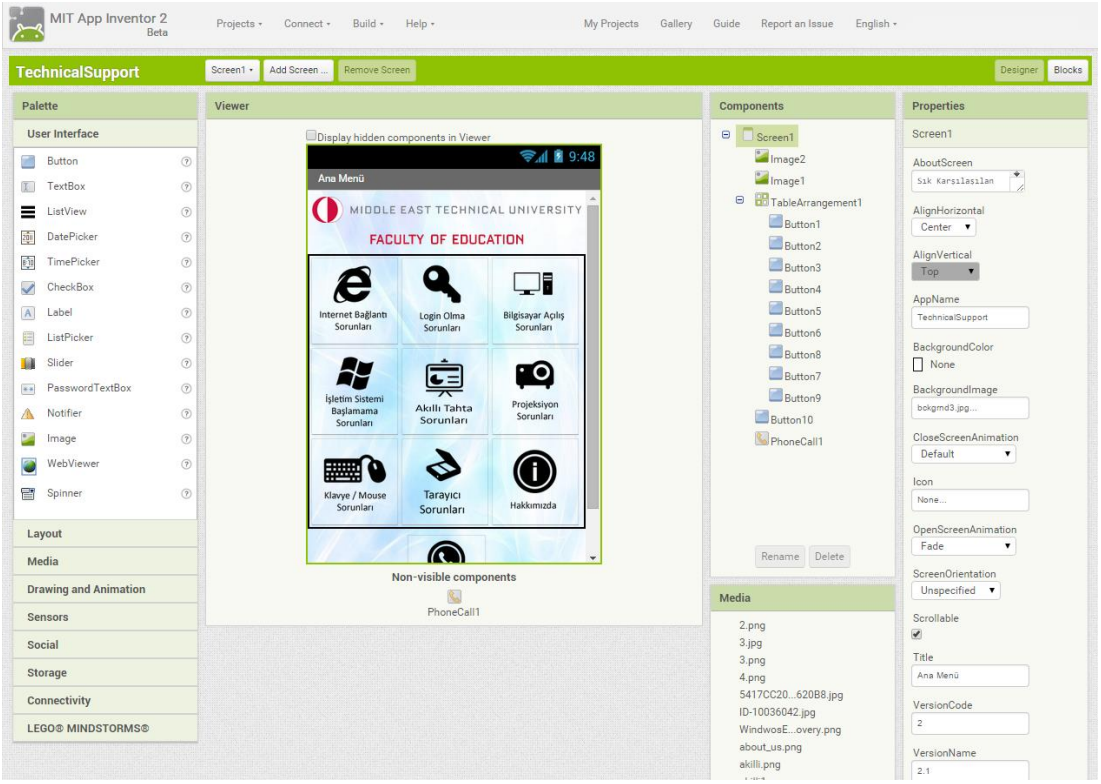

Figure 4 Main Page of the MIT App Inventor®.

In the main page of the MIT App Inventor®, there are screens and visuals to integrate into the application design. Text, audio and visual files can be placed into the each screen. Moreover, there are adanced settings in the menu to arrange the size and functionality of each page.

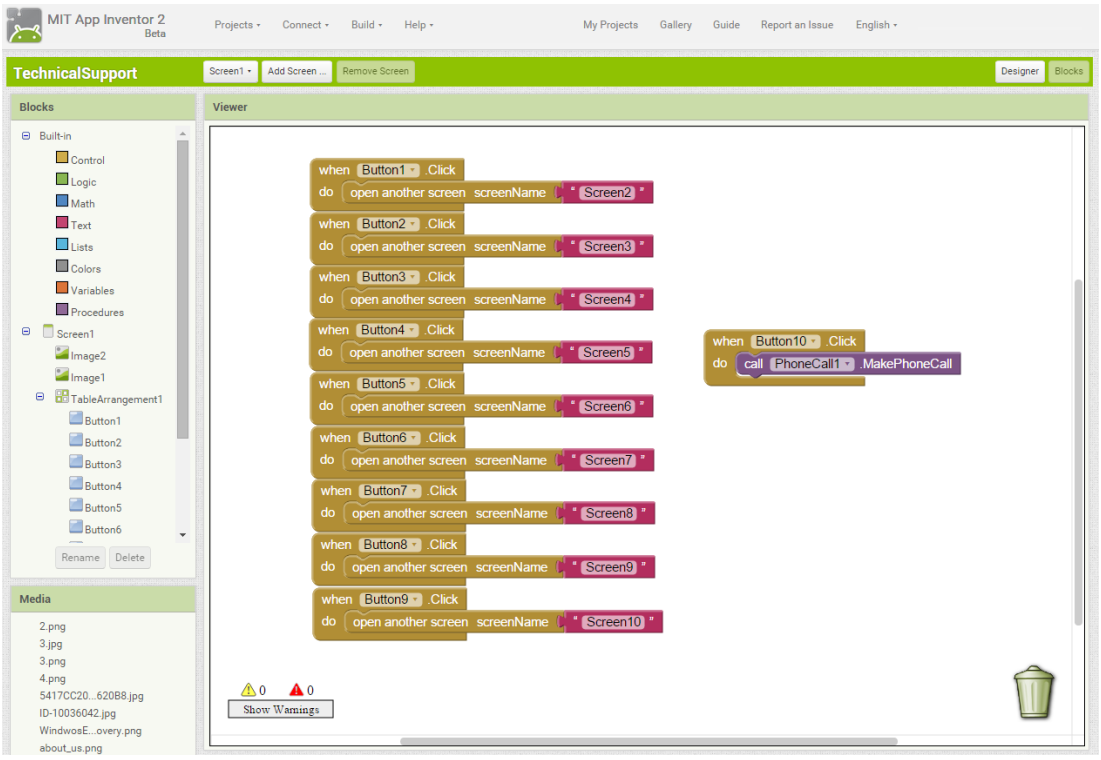

Figure 5 Code Page of the MIT App Inventor®.

In the Code Page of the MIT App Inventor®, there are categorized codes related to the functions that will be used in each page. Users can drag and drop these codes and create complex codes by adding related parts together as in Figure 4.

Even though this mobile learning application was developed using the MIT App Inventor®, there are different platforms that can be used for preparing Android applications. However, most of these platforms require professional coding to complete the application. Therefore, this platform is the most suitable one even though there are points open to improvement in interaction and design parts. By using these developing platforms, applications that can ease teaching and learning can be created and distributed. The MIT App Inventor® can be reached via http://appinventor.mit.edu.

Users can directly open the application and through its simple interface, they can choose the solution for a specific device problem. In addition to the solution pages, there are “About” and “Call” titles within this application. Under the “About” title,

there are e-mail addresses and telephone numbers for questions about problems to do with this specific application. If the user cannot fix the problem she or he can call the Technology Support Office and demand personal help with the problem by using the "Call" section.

3.4.2 Specifications of the Mobile Learning Application

There are nine screens in the application, which are the main screen, internet connection problems, login problems, computer case opening problems, OS problems, smart board problems, projection problems, keyboard and mouse problems, scanner problems and the "About" pages. Solutions are provided above the pictures on each problem page. All pages are scrollable; therefore, users can scroll the page to see the solutions that do not fit on the screen at a time. Users can also use the back button for returning to the main screen of the application. Figure 6 shows the main screen of the application. In the Figures from 7 to 14 there are the screenshots of each solution page, main screen and About page.

Figure 6 Main Screen and About Page of Application.

In Figure 5, there are Main Screen and About Page screen. In the Main Screen, there are the buttons for the solutions of each problem with About and Call buttons. In About page there is contact information and the purpose of the study.

Figure 7 Network Solution Screen.

In the Network Solution Screen, there are 4 steps with the images for the solutions of network related problems.

Figure 8 Login Solution Screen.

In the Login Solutions Screen, there are 6 steps with the images for the solutions of login related problems.

Figure 9 Computer Case Start-Up Solution Screen.

In the Computer Case Start-Up Solutions Screen, there are 6 steps with the images for the solutions of computer case start-up related problems.

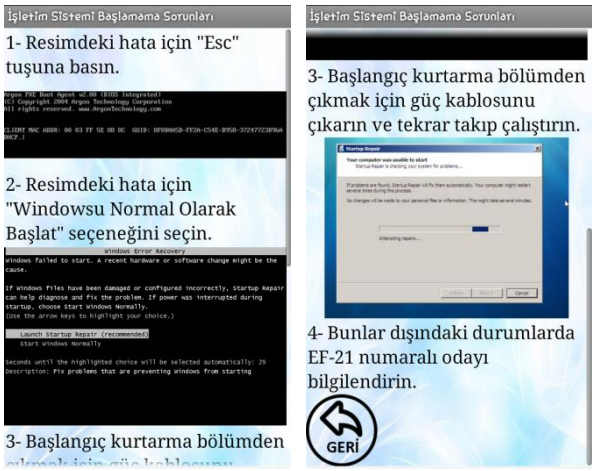

Figure 10 OS Solution Screen.

In the OS Solutions Screen, there are 4 steps with the images for the solutions of OS related problems.

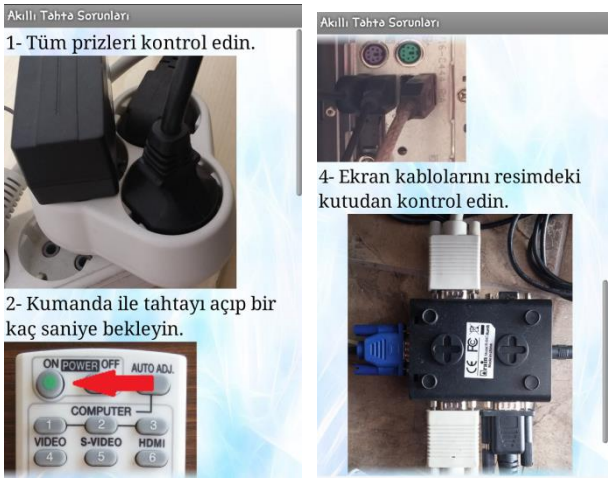

Figure 11 Smart Board Solution Screen.

In the Smart Board Solution Screen, there are 4 steps with the images for the solutions of smart board related problems.

Figure 12 Projection Solution Screen.

In the Projection Solution Screen, there are 4 steps with the images for the solutions of projection related problems.

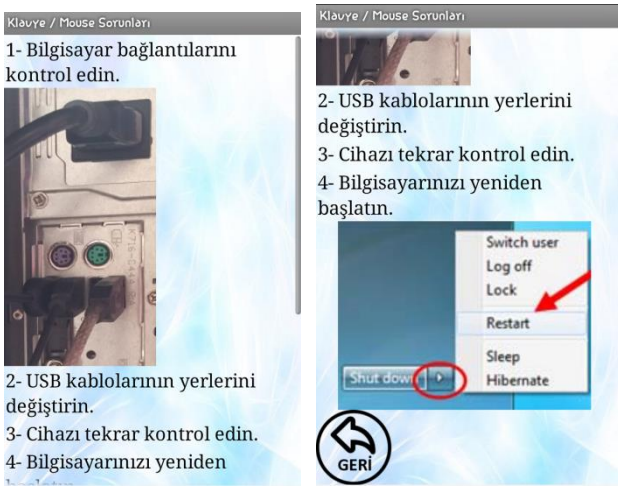

Figure 13 Keyboard and Mouse Solution Screen.

In the Keyboard and Mouse Solution Screen, there are 4 steps with the images for the solutions of computer peripherals related problems.

Figure 14 Scanner Solution Screen.

In the Scanner Solution Screen, there are 5 steps with the images for the solutions of scanner related problems.

In the solution pages, there are directions with the pictures for the problems. These solutions were prepared with a simple language and presented with the related screenshot of the problem. In About page, there are information about the researcher, Technical Support Office and contact. Lastly, by using the Call button, users can

immediately call the TSO in the Faculty of Education to demand help for the technical problems that they encounter and could not solve via the application's solutions.

3.5 Implementation Process

In the pre interview sessions, participants' ideas were gather for developing the content and interface of the MLA. In accordance with their ideas, the application was completed. In addition, they were asked if they want to use an Android MLA for troubleshooting the IT problems in the Faculty of Education. After completing the application, participants were distributed this mobile learning application to be used for second semester approximately 6 weeks. All participants' departments are in the Faculty of Education at METU. Because this application is designed to be used anytime and anywhere, participants are able to use it both in classrooms, in their offices and in the laboratories. At the end of the study, participants attended another interview. They were directed questions about the application and were asked for feedback about the troubleshooting process. During the use of this application, participants were provided adequate support for any kind of problem related to the MLA. The application was upgraded before it was distributed to the participants; therefore, they were not bothered to update the application during use time in the semester. Because the interface, content and language of the application is simple, participants did not report any problem to the researcher. The logging reports of TSO were also followed by the researcher during the implementation phase to follow the effects of the MLA to the records of the TSO. In the following Figure, there is the structure of the MLA.

Main Screen

Solutions Pages
Network Solutions
Login Solutions
Computer Case Start-Up Solutions
OS Solutions
Smart Board Solutions
Projection Solutions
Keyboard and Mouse Solutions
Scanner Solutions
About Page
Call Button

Figure 15 Structure of the Mobile Learning Application.

Structure of the application shows the contents' topics that are reached from the buttons in the main screen of the application. In the following topic, there is information about the Data Analysis part of the study.

3.6 Data Analysis

For data analysis, Creswell's (2003) six steps of analysis was employed in this study (See Table 3.5). These steps are for preparing and organizing the data for analysis, exploring and coding the data, coding to build description and themes, presenting and reporting qualitative findings, interpreting the findings, and validating the accuracy of the findings. According to these steps, the researcher has first collected the interviews as transcribed and has prepared these documents for coding. Then, the researcher has applied steps for the coding part on these documents. During this coding process, themes have appeared from codes that can be categorized in the same themes. After completing these themes, the researcher has drawn a correlation between the

participants' experiences. This correlation has created a chance of understanding the different experiences of the participants attending the study. By using this correlation, the researcher has made interpretations about the meaning of the study. These findings are given in the Results section. As a last step, the researcher has validated the study findings. For this step, detailed information is given in the Validity section.

Table 3.5 Qualitative Data Analysis Steps (Creswell, 2003)

Steps	Procedures to be followed
1. Step	Prepare and organize the data for analysis
2. Step	Explore and code the data
3. Step	Coding to build description and themes
4. Step	Represent and report qualitative findings
5. Step	Interpret the findings
6. Step	Validate the accuracy of the findings

Validity

For the validity of the data analysis, the researcher has employed the peer debriefing method. According to Creswell and Miller (2010), a peer review or debriefing is the review of the data and research process by someone who is familiar with the research or the phenomenon being explored. For inter-rater validity concern, another research assistant from the department of Computer Education and Instructional Technologies conducted the coding process as well. For this process, both raters coded the interview results independently. The purpose of these coding processes is to have at least 80% similarity between these two researchers. The advantage of peer debriefing is that the peer reviewer provides support, plays the devil's advocate, challenges the researchers' assumptions, pushes the researcher to the next step methodologically, and asks hard questions about methods and interpretations (Lincoln & Guba, 1985). At the end of the coding process, researcher and other expert had 85% of similarity with the main codes and themes. Upon obtaining sufficient similarity, the researcher completed the coding and building themes for the results of the study.

3.7 Researcher Role

In this study, the researcher did not have an active role while the participants use the application for technological problems. The researcher prepared the application, conducted interviews, and was ready to answer questions from participants about the application during the study. The purpose of the researcher is to create a usable application for the participants and help them when needed. At the end of the study, the researcher conducted another interview with the participants and prepared codes for these interviews. Because the researcher is a research assistant at the Technology Support Office, he was able to follow the log records related to technological problems reported by the faculty members and research assistants.

3.8 Assumptions of the Study

- The participants used the application whenever they had a technological problem in the classrooms or their offices.
- The MLA was adequate for the study's purposes and served the needs of the participants.
- The participants were informed before the study. They were expected to have information about the names of technological devices, such as an Ethernet cable.
- During the study, technological problems, which can be solved by using the MLA, occurred for the participants.
- The participants were honest while answering the interview questions, both at the beginning and at the end of the study.
- The content of the MLA was accurate for the use of any participant in the study.

3.9 Limitations of the Study

- Departments of the participants should be more diverse. There are ten participants from only four different departments in this study.
- The MLA is prepared only for the Android devices because of the platform the application was developed with. The application should also be compatible with other operating systems such as IOS and Microsoft® Windows.
- Duration of the study should be increased to at least one year so that better results can be gathered at the end of the study.
- Number of participants should be increased and the application should be upgraded during the study according to the feedbacks.
- The content of the application should be increased to address more problems.

CHAPTER 4

RESULTS

In this instrumental case study, an Android MLA was developed and distributed to the participants of the study. Two interviews were conducted with the participants who consisted of five research assistants and five faculty members in the Faculty of Education. The participants had approximately 6 weeks to use the MLA during the second semester. The pre interviews were conducted at the beginning of the study and the post interviews were conducted at the end of the study.

4.1 The Problems Faced by the Participants

For this study, participants were asked about the technical problems they had faced and their solutions for these problems during their classes. Technical problems were categorized into three parts; hardware, software and network. Solutions have been categorized into two parts; self-solutions and supported solutions.

According to the results, the participants have computer case start-up problems (n=3), printer problems (n=1), peripherals problems (n=4), computer speed problems (n=1), power cut problems (n=1), projector problems (n=6), hardware cable connection problems (n=1), sound problems (n=1) and smart board problems (n=3). Table 4.1 shows the related problems with the frequencies.

Table 4.1 Problems That Participants Encounter

Problem	f
Projector Problems	6
Peripherals Problems	4
Computer Case Start-Up Problems	3
Smart Board Problems	3
Printer Problems	1
Computer Speed Problems	1
Power Cut Problems	1
Hardware Cable Connection Problems	1
Sound Problems	1

The participants were asked about the solutions for these problems that they had faced. According to the answers of the participants, there are solutions such as a self-attempt to fix (n=9), using the internet and forums (n=8), using the help menu (n=1), asking the help of an expert (n=5), asking the help from the Technology Support Office (n=9), online/e-mail support (n=1) and asking students for support (n=3). Table 4.2 shows the related solutions with the frequencies.

Table 4.2 Participants' Solutions to the Technical Problems

Solution	f
Self-Attempt	9
Technology Support Office	9
Using Internet and Forums	8
Help From an Expert	5
Asking Students	3
Using Help Menu	1
Online/e-mail Support	1

These problems were compared and combined with the problem records of the TSO after the post interview process.

4.2 The Problems Gathered from the Records of the TSO

From the TSO in the Faculty of Education, problem records related to the technological problems recorded by the faculty members and research assistants were gathered. In Table 4.3, there are list of these records with number of reports and frequencies.

Table 4.3 Problem Records of the TSO

Reported Problem	Number of Reports	f
Peripherals, Connections and Computer Case Components	28	19 %
Format and Updates	26	17%
Programs (SPSS, Pgina etc.)	19	13%
Login Problems	16	10%
Internet Connection	16	10%
Scanner Problems	12	8%
Web Site Problems	7	5%
Ethernet Card	7	5%
Computer Start-Up Software	6	4%
Projector Problems	4	3%
Computer Start-Up Problems	3	2%
Smart Board Problems	3	2%
IP Numbers Problems	3	2%

According to the records of the TSO, peripherals, connections and computer case components problems (n=28), format and updates (n=26), programs (SPSS, Pgina etc.) (n=19), login problems (n=16), internet connection (n=16), scanner problems (n=12), web site problems (n=7), Ethernet card problems (n=7), computer start-up software problems (n=6), projector problems (n=4), computer start-up problems (n=3), smart board problems (n=3) and IP numbers problems (n=3) were reported.

4.3 Research Question and Related Interview Questions

For coding of the interviews, the participants were given symbols between P1 to P10. On the following Table 4.4, coding is presented related to the research question of the study.

Table 4.4 Main Codes Related to Research Questions

Research Question 1	A) Effects of Technical Problems 1) Self-Effects 2) Effects on Course 3) Effects on students as perceived by the instructor
Research Question 2	A) Effectiveness of the Mobile Learning Application B) Suggestions for the Development of the Mobile Device Application 1) Before Using the Application 2) After Using the Application

In Table 4.5, there are indicators of main codes and themes.

Table 4.5 Indicators of the Main Codes and Themes

A) Effects of Technical Problems	1) Self-Effects	Motivation /Demotivation Satisfaction Concern Stress Frustration Anxiety
	2) Effects on Course	Alternative Materials / Back Up Alternative Course Plans Losing Time

	3) Effects on students as perceived by the instructor	Attention Interest Concentration Focus Demotivation Learning
A) Effectiveness of the Mobile Learning Application		Prevent Demotivation/Keeps Motivation Confidence Decrease Concern Effective Solutions Technology Literacy Workload of TSO Design and Interface Time spend Classroom Management
B) Suggestions for the Development of the Mobile Device Application	1) Before Using the Application	You can... Critical for me.. The MLA should have.. May be beneficial..
	2) After Using the Application	You should... The MLA can be... ... Should be enhanced May be very useful...

In the next section, research questions are examined in detail according to the results of the interviews. Main codes of the interviews are given under related headers.

4.3.1 Results on Research Question 1

The effects of technological problems in attitudinal and emotional terms are explained below in three parts; self-effects, effects on the course and effects on students as perceived by the instructor. The related research question was:
How does technology related problems that are encountered in classroom affect faculty members' and research assistants' attitude and emotion?

4.3.1.1 Effects of Technical Problems

For investigating the effects of technical problems, interviews were conducted at the beginning and at the end of this study.

According to the interviews, some results have been determined and divided into three subthemes; self-effects, effects on the course and effects on students as perceived by the instructor. These subthemes include 14 codes, which are motivation loss, time loss, creates concerns, attention loss, psychosocial effects, getting stressed, frustration, obligation to create alternatives, effects on course plan, not using the tool anymore and obstructing learning. These codes are shown under the subtopics in the Table 4.6.

Table 4.6 Subthemes Related with Effects of Technical Problems

Effects of Technical Problems	**f (n=10)**
1) Self-Effects	
- Demotivating Instructors	6
- Creates Concerns	4
- Psychological Effects	4
2) Effects on the Course	
- Alternative Materials	8
- Effects on Course Plan	8
- Losing Class Time	6
- Not Using the Tool Anymore	1
3) Effects on students as perceived by the instructor	
- Attention Loss	7
- Demotivating Students	6
- Other	3

Since the effects of these problems occur on the instructors, course and students, codes were separated into these three categories. These categories are the subthemes of the study. Each subtheme include the codes related to the answers of participants in the interviews. The subthemes were created according to the content of the answers of participants.

4.3.1.1.1 Self-Effects

In this part, self-effects of technical problems on the participants will be explained in detail. Self-effects include the effects on instructors and topics related to this sub theme are explained below. The indicators for this subtheme are motivation/demotivation, satisfaction, concern, stress, frustration and anxiety.

4.3.1.1.1.1 Demotivating Instructor

In this topic, “motivation” and “demotivation” indicators were used to determine the related code. According to majority of the participants (n=6), technical problems in the classroom during the course demotivate instructors. One of the participants has stated:

“The flow of the course is suddenly broken, the plan [of the course] in your mind gets lost. Therefore, my motivation diminishes. I’m afraid that I wouldn’t know what to do.” [P4]

> *“Dersin akışı bir anda bozuluyor, sizin o kafanızdaki plan bir anda gidiveriyor yani. O yüzden benim de motivasyonum oldukça düşüyor. Ne yapacağım korkusu sarıyor.”* [P4]

Another participant has expressed:

“It’s important to complete the content; in such cases, we encounter motivation loss when there is a case of not being able to fulfil [the content].

> *“İçeriği yetiştirebilmek çok ciddi bir önem arz edebiliyor. Bu gibi durumlarda onu yetiştirememe gibisinden bir durum olunca ister istemez motivasyonda bir düşmeyle karşı kaşıya kalabiliyoruz.”*[P9]

Another participant has said:

“It definitely affects [the motivation] negatively because you create a plan in your mind on how to pursue the course and [technical problems] delay your time plan. When something goes wrong, your setup and motivation get distracted.” [P10]

> *“Kesinlikle olumsuz etkiliyor çünkü bir şekilde kafanızda bir plan kurduğunuz oluyor ders süresince. Bir şekilde sizin sürecinizi aksatıyor ve bir şeyler ters gidince var olan kurgunuz bozuluyor motivasyonunuz bozuluyor.”* [P10]

4.3.1.1.1.2 Creates Concerns

In this topic, “concern” indicator was used to determine the related code. This topic explains the effects of technical problems on concerns of participants. The indicators for this topic are According to the participants (n=4), they get concerned when they face technical problems in the classroom. One of the participants has claimed:

“There is a rush to complete the course and the anxiety becomes intense. … Only the time and keeping up problems cause a little concern.” [P2]

“Dersi yetiştirememe yani acele etme durumu oluyor bu anxiety dediğimiz o endişeyi biraz artıyor. … . Sadece süre ve yetiştirme problemi o da endişeyi biraz artırıyor.” [P2]

Another participant has expressed:

“When time passes I worry about keeping up [to the plan of the course] and it affects me negatively.” [P5]

“Zaman geçtikçe yetiştirme derdine düşüyorum, o açıdan iyi olmuyor benim için.” [P5]

Another participant has stated:

“Those concerns are already with me while I’m planning. I’m trying to be cautious. One can always face such problems while working within technology.” [P7]

“O kaygı ben planlarken zaten bende var oluyor. Ben tedbirli olmaya çalışıyorum. Teknolojiyle çalışıyorsan o tip aksilikler olabilir.” [P7]

4.3.1.1.1.3 Psychological Effects

In this topic, “satisfaction”, “stress”, “frustration” and “anxiety” indicators were used to determine the related code. One of the participants (n=1) has claimed that technical problems cause attention loss. The participant has stated:

“When you’re going to start the lecture, a technological problem that can’t be solved distracts you.” [P3]

“Derse başlayacağız ama çözülemeyen teknolojik bir sorun var önünde, ilgini dağıtıyor.”[P3]

One of the participants (n=1) has explained that technical problems cause psychosocial effects. The participant has claimed:

“I solve the problems during the class; however, if these problems occur at the beginning of the class, one’s psychosocial state declines.” [P3]

“Ders sırasında çözmüş oluyorum ama ders başında sıkıntı olursa insanın psikososyal durumu biraz bozuluyor.” [P3]

Participants (n=2) have claimed that technical problems cause stress on themselves. One of the participants has expressed:

“Sometimes, it becomes a little stressful when you cannot keep up to the course plans or there is a tight course schedule.” [P7]

“Bazen ders yetişmediği durumlarda veya sıkışık bir takvim olduğu zamanlarda biraz stresli olabiliyor tabi.” [P7]

Another participant has stated:

“At first, I get stressed that the flow of the course will be broken when that problem occurs. When, for instance, if we are to show the results of the homework to the students on LMS or give them feedback, I wonder how I will show them these results or feedback without internet and I get stressed.” [P4]

“Ben ilk başta stres oluyorum o problem ortaya çıktığı zaman. Lms üzerinden ödevlerin sonuçlarını öğrencilere göstereceksek, feedback vereceksek, bunu öğrencilere nasıl göstereceğiz bunları diyorum internet olmadığı zaman, çok stres oluyorum.” [P4]

One of the participants (n=1) has claimed that technical problems cause satisfaction loss. The participant has expressed:

“Instead of the course process, solving the problem becomes more important. Everyone focuses on the problem, at some point ending the lesson. Therefore, both motivation and satisfaction are lost.” [P4]

> *“Dersin işlenmesinden ziyade problemin çözümü ön plana çıkmaya başlıyor yani bir yerde dersi bitirip herkes o anda o probleme odaklanmak zorunda kalıyor. O yüzden hem motivasyon hem de memnuniyet oranı düşüyor açıkçası.” [P4]*

One of the participants (n=1) has claimed that technical problems cause frustration. The participant has stated:

“They [technical problems] affect you of course. You get frustrated… while giving a lecture excitingly, which is what I usually do, you click a video and it doesn’t work” [P1]

> *“Etkiliyor tabi ki. Sinirleniyorsunuz, frustration yaşıyorsunuz... anlatırken heyecanlı bir şekilde ki ben öyle anlatıyorum genelde, videoya tıklıyorsunuz açılmıyor.” [P1]*

4.3.1.1.2 Effects on the Course

In this part, the effects of technical problems on the course will be explained in detail. Effects on the course include obstacles on the course created by technical problems and topics related to this sub theme are explained below. The indicators for this subtheme are alternative plans/ back up and losing class time.

4.3.1.1.2.1 Alternative Materials

In this topic, “alternative materials” and “back up” indicators were used to determine the related code. According to majority of the participants (n=7), technical problems make them create alternative plans in case they face a technical problem in the classroom. One of the participants has stated:

“From the perspective of the instructor, you have made a fast decision at that moment [when you face a technical problem] and you need to create something alternative.” [P1]

> *“Öğretmen açısından çok hızlı karar vermeniz gereken bir an oluyor ve orada alternatif bir şey yapmanız gerekiyor.” [P1]*

Another participant has expressed:

“I have a backup [in case a technical problem], I print it out. I use paper as an alternative.” [P5]

> *“Onun için bir tane back up’ım var, çıktısını alıyorum. Kağıda dönüyorum alternatif olarak.” [P5]*

Another participant has claimed:

“I save the videos, especially in alternative formats that I’ve created just in case one them doesn’t work.” [P6]

> *“Özellikle videoları farklı alternatif formatlarda kaydediyorum kendi oluşturduğum videoları ki biri çalışmazsa biri çalışsın.” [P6]*

Another participant has remarked:

"I have to go to class with a back up in order to have something to give the students until I am able to fix the problem or find somebody to fix it."[P8]

> *“Problemi çözene kadar ya da çözdürecek birini bulana kadar öğrencilere anlatabileceğim bir şey olsun diye back up’lı gitmem gerekiyor.” [P8]*

Another participant has stated:

“Actually, I tend to use extra materials, considering that there might be a problem, I tend to alternative materials.” [P10]

> *“Aslında ben problem çıkabileceğini düşünerek ekstra şeylere yöneliyorum kendimce, alternatif şeylere yöneliyorum.” [P10]*

4.3.1.1.2.2 Effects on Course Plan

In this topic, “alternative course plans” indicator was used to determine the related code. The participants (n=8) have expressed that technical problems affect course plans. Their plans change when they face a problem during class session. One of the participants has expressed:

“For instance, you have to change your plan [when you face a technical problem]. It’s not creating a huge satisfaction loss but it just creates boredom.” [P1]

“Orada mesela plan değiştirmek zorunda kalıyorsunuz. O da bir can sıkıntısı yaratıyor.” [P1]

Another participant has claimed:

“For example, you cannot give the lecture that is normally in the course plan which I prepared for one week. Next week, I try to give that missing part and this situation affects other weeks’ course plans.” [P2]

“Sadece diyelim ki 1 hafta dersi anlatamadım belli bir kısmını, normalde ders planını hazırladığım kısmı anlatamadım orayı, ertesi hafta o kalan kısmı koyuyorum yani sonraki gelen haftalardaki o ders planları değişiyor.” [P2]

Another participant has expressed:

“We have concerns that we won’t be able to introduce the plans which we design for a purpose.” [P9]

“Belli bir şekilde dizayn ettiğimiz planları tam anlamıyla uygulamaya koyamayacağımızdan endişe duyduğumuz zamanlar tabi ki olabiliyor.” [P9]

Another participant has remarked:

"You create some sort of plan in your mind regarding what you are going to discuss during the lesson. They [technical problems] delay your process and when something goes wrong your setup collapses."[P10]

> *"Bir şekilde kafanızda bir plan kurduğunuz oluyor ders süresince işte şunu anlatıcam sonra bu sonra bu diye. Bir şekilde sizin sürecinizi aksatıyor ve bir şeyler ters gidince var olan kurgunuz bozuluyor." [P10]*

4.3.1.1.2.3 Losing Class Time

In this topic, "time loss" and "losing time" indicators were used to determine the related code. Majority of participants (n=6) have explained that technical problems cause losing class time during the course. One of the participants has expressed:

"I usually spend my time solving the problem instead of pursuing the course."[P2]

> *"Dersi anlatacağım süreyi genelde bilgisayarın sorununu çözmeye harcıyorum" [P2]*

Another participant has claimed:

"If I want to use a multimedia content in some way and I can't show it, they [technical problems] cause time loss." [P6]

> *"Eğer herhangi bir şekilde bir multimedya içeriği kullanmak istemişsem derste bunu gösteremediğim zaman bir kere zaman kaybına yol açıyor." [P6]*

Another participant has said:

"We lose time during course when the hardware doesn't work." [P7]

> *"Donanım bazen açılmadığı zaman derste biraz vakit kaybediyoruz." [P7]*

Another participant has expressed:

"[Technical] problems cause time loss." [P9]

"Bu problemler genelde zamandan çalması gibi durumlar ortaya çıkarıyor." [P9]

4.3.1.1.2.4 Not Using the Tool Anymore

One of the participants (n=1) explained that, when they face technical problems in the classroom, they do not want to use that specific technological device or tool anymore. That participant has claimed:

"And next time, you consider not using that video for the next lesson or if you remember, you go to the Technical Support Office and try to tell them that computers' updates or browsers are so old that some tools don't work." [P1]

"Ve bir sonraki sefere ya o videoyu koymamayı düşünüyorsunuz ya da hatırlarsanız bilgisayar destek ofisine gidip bu bilgisayarın update'i ya da browser'ları çok eski olduğu için bazı şeyler çalışmıyor demeye çalışıyorsunuz." [P1]

4.3.1.1.3 Effects on students as perceived by the instructor

In this part, the effects of technical problems on students will be explained in detail. The technical problems affect students in classroom, as well. In this part, the effects of students that were observed by instructors will be explained. The students were not asked about the effects of technical problems directly. The indicators for this subtheme are attention, interest, concentration, focus, demotivation, learning.

4.3.1.1.3.1 Attention Loss

In this topic, "attention", "interest", "focus" and "concentration" indicators were used to determine the related code. According to majority of the participants (n=7), technical problems cause attention loss on students. One of the participants has explained:

"Course following diminishes for students because they [technical problems] reduce their attention, their interest. They start to care about something else." [P2]

"Ders takibi azalıyor öğrencide, çünkü dikkatini azaltıyor. İlgisini azaltıyor. Başka şeylerle ilgilenmeye başlıyor." [P2]

Another participant has stated:

"It is already hard to get them to concentrate on the lecture, on top of that after having to deal with technical problems it becomes even harder to get the class to focus on the lecture again." [P6]

"Zaten dikkatlerini zor topluyoruz bir de oturup da teknolojiyle şunla bunla uğraştığınız zaman yani bu problemlerle uğraştığımız zaman sonrasında tekrardan sınıfı toparlamak o ders ortamını o dinleme pozisyonuna getirmek gerçekten zor oluyor." [P6]

Another participant has expressed:

"Students are affected negatively and their attention is lost. When you're giving the lecture and giving some examples, you'll try something [with technological devices] and it's not working. Someone is having trouble [with technology] and you're trying to solve that problem. At that moment, everything you told is forgotten, their focus shifts." [P10]

"Öğrenciler de olumsuz etkileniyor bu durumdan ve bir anda odakları kayıyor. Bir şekilde siz konuyu anlatıyorken örnekler veriyorken bir şey deneyeceksiniz, olmuyor, biri problem yaşıyor. Onu çözmeye çalışıyorsunuz, o anda sınıfta anlattığınız her şey bozulup gidiyor bir anda o var olan düzeni bozuluyor, odakları kayıyor." [P10]

4.3.1.1.3.2 Demotivating Students

In this topic, "demotivation" indicator was used to determine the related code. The participants (n=6) have claimed that technical problems during class create motivation loss on students. One of the participants has stated:

"Their motivations at that moment diminishes and they are distracted through that problem." [P4]

"O andaki var olan motivasyonları bir anda geriye kayıp dikkatleri başka bir yöne doğru gidiyor. O probleme kayıyor." [P4]

Another participant has expressed:

"Their motivations drop, as well. And when there are technological problems in the classroom, motivation loss is apparent from the students' faces." [P6]

"Onların da motivasyonu düşüyor ve sınıf içerisinde teknolojik problemler olduğu zaman öğrencilerin de zaten yüzlerinden belli oluyor bir motivasyon bozukluğu olduğu." [P6]

Another participant has claimed:

"At that time, when the course stopped, students' motivations drops, too." [P8]

"O anda aksadığı zaman doğal olarak öğrencilerin de motivasyonu düşmüş oluyor." [P8]

4.3.1.1.3.3 Obstructing Learning

In this topic, "learning" indicator was used to determine the related code. One of the participants (n=1) has claimed that technical problems obstruct learning for students. That participant has expressed:

"Learning does not take place properly. When that [technical problem] happens, they are asking me the subject again because they are not following on their own. Both following the course is diminishing for students because they're distracted, losing attention and start taking care of something else and even though they follow, they don't understand the course." [P2]

"Öğrenme tam olarak gerçekleşmiyor. Öyle olduğu zaman da bana bir daha bir daha sormak zorunda kalıyorlar. Onu nasıl yapıyorduk şunu nasıl yapıyorduk diye çünkü kendileri de takip etmiyor. Hem ders takibi azalıyor öğrencide çünkü dikkatini azaltıyor, ilgisini azaltıyor. Başka şeylerle ilgilenmeye başlıyor. Hem de dersi tam olarak anlayamıyor takip etse de." [P2]

4.3.2 Results on Research Question 2

In this part, interview results on the effectiveness and suggestions on the development of the Mobile Learning Application are given. Results of interviews are divided into two categories; the effectiveness of the Mobile Learning Application, suggestions for the development of the Mobile Learning Application. The related research question is: *What are the faculty members' and research assistants' opinions about the effectiveness of the MLA?*

4.3.2.1 Effectiveness of the Mobile Learning Application

Participants were asked their opinions in the post interview about the mobile learning application that can help them solve the technological problems that they face in the classrooms or their offices. According to interview results, answers were grouped under the eleven topics as shown in the Table 4.7. The indicators related to the effectiveness of the application are prevent demotivation/keeps motivation, confidence, decreases concerns, effective, solutions, technology literacy, workload of TSO, design and interface, time spent and classroom management.

Table 4.7 Main Codes Related with Effectiveness of the Mobile Learning Application

Benefits of the Application	f
Prospective Use of the Application	8
Prevent Demotivation	7
Creates Confidence/Decreases Concerns	7
Effective to Use	6
Ease of Instruction	5
Increases Technology Literacy	4
Decreases the Workload of the TSO	3
Simple Designed Interface	3
Saves Time	2
Encourages the Use of Technology	2
Made Classroom Management Easier	2

In the following part, the answers of the participants are given under the related topics.

4.3.2.1.1 Prospective Use of the Application

The participants (n=8) have claimed that if they are given an Android application, they would use it for solutions to technical problems. According to one of the participants:

"Nowadays, most people have smartphones. If there is such an application about the solutions of technical problems, first of all, I would look at it. If I cannot solve the problem, then I would need technical support [from the Technology Support Office]." [P2]

> *"Günümüzde çoğu insanda akıllı telefon var. Böyle sorunların çözümüyle ilgili bir uygulama olursa ilk başta ona bakarım. Eğer sorunu çözemediysem, o zaman teknik desteğe ihtiyacım olur." [P2]*

Another participant has expressed:

“When we cannot reach via telephone [the Technology Support Office], online support is very rational. If it’ll be compatible with all kinds of phones, I clearly would use it. Now I’m using Android, actually, as you said, it will be Android based. It can be used and for instant solutions it definitely should be used.” [P4]

> *“Telefonla ulaşamadığınız zaman çevrimiçi destek sistemi çok mantıklı aslında. Eğer her telefona uygun bir uygulama olursa ben açıkçası kullanırım. Şu anda Android kullanıyorum gerçi bahsettiğin kadarıyla o da Android tabanlı olacak. Kullanılabilir ve yani anında çözüm için kesinlikle kullanılır.” [P4]*

4.3.2.1.2 Prevent Demotivation

In this topic, “prevent demotivation” and “keeps motivation” indicators were used to determine the related code. According to the participants (n=5), this application prevents demotivation when a technical problem occurs during the course. One of the participants has claimed:

“Being able to solve some problems quickly by using application, not giving a break to demand support from the technology support office is affecting their motivations, I guess it will affect positively.” [P1]

> *“Derste bazı problemleri hemen çözebiliyor olmamız, programı kullanıp hemen anında orada çözüp bir daha teknoloji ofisine gidip hadi ara verelim gibi olmaması bence motivasyonlarını tabi ki etkiler, olumlu yönde etkileyeceğini düşünüyorum.” [P1]*

Another participant has claimed:

“I become happy to solve my problem very fast when I use [application]. I can continue the course and my motivation is lost little. It [application] keeps the motivation level stable because the problems are solved with it. It affects positively. [P2]

> *“Kullandığım zaman problemimi çözdüğümde hem çabuk ve hızlı çözdüğüm için mutlu oluyorum yani derse tekrardan geri dönebiliyorum, oradaki motivasyonum en az şekilde bozuluyor, mesela karşılaştığım sorunları çözebildiği için motivasyonu aslında bir nevi azaltmıyor. Şey yapıyor daha olumlu etkiliyor.” [P2]*

Another participant has stated:

"When technological problems are solved quickly, students' motivation and satisfaction is at least not descending. But I realize that when I wait for a technological problem to be solved in the classroom, the longer it takes time the more motivation is descending. However, by checking from my phone, because I solved problem quickly, the motivation was not lost. It [solving problem quickly] did not increase motivation but at least the students' attitudes disappeared." [P6]

> *"Teknolojik sorunlar zaten hızlıca çözüldüğü zaman öğrencinin motivasyon ve doyumunda en azından düşüş olmuyor. Ama şunu fark ediyorum yani ben her zaman teknolojik bir sorun olduğu zaman sınıfta onun çözülmesini beklerken, o ne kadar uzarsa teknolojik sorunun çözülmesi, sınıfta o kadar doyum ve motivasyon düşüyor ama ben bu sayede sadece telefonuma bakarak kısa süre içerisinde sorunu hallettiğim için düşme olmadı, yükselme değil ama en azından hani aman gene mi bozuldu üff falan deyip gözlerini yuvarlamaları olayı en azından ortadan kalkmış oldu." [P6]*

4.3.2.1.3 Creates Confidence / Decreases Concerns

In this topic, "confidence" and "decreases concerns" indicators were used to determine the related code. According to the participants (n=7), the MLA has increased the level of confidence and has minimized the concerns about the technical problems. According to one of the participants:

"I start the course more positively because I say that I can solve a problem somehow if any occurs. I'm not afraid of any problem. It [application] has such an effect, a positive effect. It decreased my concerns." [P2]

> *"Yani nasıl olsa çözerim bir sıkıntı çıksa da deyip daha olumlu başlıyorum derse. Herhangi bir sorunda korkmuyorum yani. Öyle bir olumlu etkisi oldu yani artırma etkisi oldu. Yani endişelerimi düşürdü kaygılarımı düşürdü." [P2]*

Another participant has claimed:

"I'm happy to carry this application in my phone because it gives me more confidence. I think that I can check it if anything [technical problem] happens. [P5]

"Ben genel olarak bunu telefonda bu app'i taşımaktan mutluydum. Çünkü daha güven veriyor oradan bakabilirim ne olduğuna diye düşünüyorum." [P5]

Another participant has stated:

"Knowing that I have this application made me comfortable. Of course, there is a reflexive attitude to call technical support for instance, when the projector doesn't work but when I'm up to that attitude, trying this application and knowing that I have it made me feel comfortable [against technical issues]. It really made me feel safe." [P6]

"Kesinlikle bu programın olduğunu bilmek beni daha rahat hissettirdi. Tabi insan refleks olarak ya işte çalışmıyor projeksiyon teknik şeyi çağırın gibi daha önceden öğrenilmiş bir şeyimiz var ama hani onun üstesinden gelebildiğim zaman ya dur bir dakika bir de şu programı da deneyelim. Bir de onların programını deneyelim şeyine ulaştığım zaman hani bunun yanında olduğunu bilmek hani programın olduğunu bilmek beni rahat hissettirdi. Gerçekten daha güvende hissettirdi." [P6]

Another participant explained that:

"Instead of calling or asking someone, I created a solution on my own. Because I knew how to solve a problem if any occurs, I started the course much safer and positively." [P10]

"Hemen işte birilerini aramak ya da sormak yerine önce kendim çözüm ürettim. Sınıfa girerken de işte bir sorun olursa da nasıl çözeceğimi bildiğim için daha güvenli daha olumlu başladım derse." [P10]

4.3.2.1.4 Effective to Use

In this topic, "effective" indicator was used to determine the related code. According to the participants (n=4), the application has been very helpful with the technical problems faced in classrooms. One of the participants has stated:

“I used the application for 4-5 weeks and it really responded to my needs.” [P4]

“Onun için şöyle diyebilirim bir 4-5 hafta o uygulamayı kullanmak durumunda kaldım ve gerçekten uygulamanın da ihtiyaçlarıma cevap verdiğini düşünüyorum.” [P4]

Another participant has claimed:

“I believe it is very useful application and it’ll serve the purpose, especially for instructors whose technology literacy levels are not high.” [P6]

“Ben çok yararlı bir program olduğuna inanıyorum. Ve özellikle teknoloji bilgi seviyesi düşük öğretim elemanlarında gerçekten çok işe yarayacağını düşündüğüm bir program.” [P6]

4.3.2.1.5 Ease of Instruction

In this topic, “solutions” indicator was used to determine the related code. The participants (n=5) have claimed that the application has an easy instruction. As one of the participants has claimed:

“It made me find practical solutions to the problems and when we encountered a problem, we could find the solution from the interface. Because there are pictures related to those problems, we could compare it. Therefore, we could use technology much better.” [P2]

“Sorunlara pratik çözümler buldurdu hem, hem de karşılaştığımız sorunlarda da o ara yüzünden istediğimiz sorunu bulabildik o sıkıntılarla ilgili fotoğraflarla falan desteklediği için bir karşılaştırabildik. O sayede teknolojiyi daha iyi kullanabildik yani.” [P2]

Another participant has stated:

“Visuals are very advantageous. There are problems only in one or two visuals. Especially, there is a box which projector’s cables are connected in every computer desk. The visual does not include all cables, there might be an explanation about it.” [P4]

"Görsellerin bu konuda çok büyük avantaj sağladığını düşünüyorum. Sadece bir iki görselde sıkıntı var, özellikle projeksiyon kablolarının bağlandığı bir kutu vardır her bilgisayar masasında. Orada her bir kablonun nereye bağlanacağı o görselde görünmüyor mesela, o konuda belki altına açıklama yapılabilir öyle geliştirilebilir." [P4]

Another participant has claimed:

"I can say that I found solutions for these situations [technical problems]. The application is detailed, in other words, step by step. It helped us by showing what kind of solutions we can find." [P9]

"Hani bu durumlar için açık şekilde çözüm bulabildiğimi söyleyebilirim. Program gayet detaylı şekilde yani adım adım ne gibi çözümler bulabileceğimizi gösterme konusunda yardımcı oldu bizlere." [P9]

4.3.2.1.6 Increases Technology Literacy

In this topic, "technology literacy" indicator was used to determine the related code. According to the participants (n= 4), such a MLA as this would increases the technology literacy for faculty members and research assistants. One of the participants has expressed:

"I think it increased technology literacy. I feel in that way at least. I solved login problems and that information stayed in my mind. For instance, I got that solution [from the application]." [P2]

"Teknoloji okur yazarlığını bence artırdı ya ben öyle hissediyorum en azından. Login olma sorunlarını falan orada çözmüş oldum ve o benim aklımda kaldı mesela onu edinmiş oldum o bilgiyi." [P2]

Another participant has stated:

"As I gained such a habit [using a smartphone], when I encounter such a problem in the classroom, I can solve it myself." [P5]

"Ben kendim de öyle bir alışkanlığa başladığıma göre sınıfta bir problemle karşılaştığımda sınıfta açıp onu çözebilirim". [P5]

Another participant has claimed:

"Both for us and our instructors, I guess we'll have gained technology literacy to handle such conditions [technical problems]. [P9]

"Hocalarımız için de olsun bizim için de olsun bu tarz durumlarla baş edebilme açısından, teknoloji okur yazarlığıyla alakalı bir getirisinin de olacağını düşünüyorum." [P9]

Another participant has stated:

"Because I checked the application one time, when I meet [same problem] again, I created solutions to check without looking somewhere else. That's because I learned from it [application]." [P10]

"Programı daha önce gördüğüm için daha sonrasında tekrar karşılaştığımda önce bir şunu kontrol edeyim şuna da bakayım gibi kendim çözümler ürettim hiç bir yere bakmadan. Mesela oradan öğrendiğim için." [P10]

4.3.2.1.7 Decreases the Workload of the TSO

In this topic, "workload of TSO" indicator was used to determine the related code. According to the participants (n=3), such an application would decrease the workload of Technology Support Office. One of the participants has claimed:

"It decreases the workload of the TSO. When their workload decreases, they respond to the more important failures faster." [P2]

"Bilgisayar destek grubunun işini azaltır. İşi azaldığı zaman, iş yükü azaldığı zaman daha önemli sorunlarda daha çabuk müdahale ederler." [P2]

Another participant has remarked:

“If such an application directs me, at least I demand help only when I surely cannot solve the problem. Of course, the workload for supporting me will decrease.” [P3]

“Böyle bir program beni yönlendirirse en azından hakikaten çözemeyeceğim bir konuda giderim o zaman destek grubuna. İş gücü azalır tabi bana destek verecek.” [P3]

Another participant has stated:

“In such cases, instead of occupying the technical support with problems, such an online application will help us to see and handle the problem on our own.” [P6]

“Bu durumlarda teknik desteği bu gibi şeyler için meşgul etmektense böyle bir online şey sayesinde kendimizin görüp yapabilmesi bize çok yardımcı olacaktır.” [P6]

4.3.2.1.8 Simple Designed Interface

In this topic, “design” and “interface” indicators were used to determine the related code. According to the participants (n=3), the application has a simple designed interface to use. According to one of the participants:

“I really liked the interface of the second version. There were many developments.” [P6]

“İkinci versiyonunun ara yüzünü gerçekten çok beğendim. Yani gelişmeler çok fazla.” [P6]

Another participant has declared:

“The application is very simple and clear to understand in terms of user interface. Therefore, it is not hard to use.” [P9]

“Program kullanıcı ara yüzü açısından gayet basit ve anlaşılır bir durumda o açıdan çok zorlayıcılığı yok.” [P9]

Another participant has expressed:

"When I installed the application for the first time, I liked the main screen like icons. Everything is in order and categorized." [P10]

"Programı ilk kurduğum zaman ilk ana ekranı benim çok hoşuma gitmişti simgeler falan. Her şey çok düzenli ve kategorileştirilmişti." [P10]

4.3.2.1.9 Saves Time

In this topic, "time" indicator was used to determine the related code. According to the participants (n=2), using this application has saved their time during the course, because there has been no waiting for a technical support when a problem has occurred in the classroom. One of the participants has declared:

"I think it decreased the time spent for it [solving the problem] and my time to prepare and begin the course. Therefore, it helps me to start the course faster." [P4]

"Benim derse başlama süremi işte derse hazırlanma süremi oldukça azalttığını, o sürede harcanan zamanın azaldığını düşünüyorum. Böylelikle daha hızlı derse başlama konusunda bana yardımcı oluyor." [P4]

Another participant has stated:

"Because application is related to the standard encountered problems, it's easier to find [the solution]. The main topics are obvious; you'll check by clicking on them." [P8]

"Standart karşılaşılan problemlerle ilgili olduğundan dolayı bulması daha rahat. Ana başlıklar belli, girip altına bakacaksın, süreci kısaltıyor." [P8]

4.3.2.1.10 Encourages the Use of Technology

According to the participants (n=2), the application encourages participants to use technology more often. One of the participants has expressed:

"In [other] schools, there is more technology than ours. In Turkey, technological devices must be in schools through government investment. This situation can affect

it [encourage to use technology]. Because I think there are technical infrastructure and support in schools. In some places where that infrastructure and support are missing, this application can be more useful." [P1]

> *"Bazen okullarda bizdekinden daha fazla teknoloji de var yani şimdi Türkiye'deki teknolojik şeyler, devletin yaptığı yatırımlar, dolayısıyla da zaten olmak zorunda. Böyle durumlarda bence etkileyebilir evet. Çünkü okullarda getirdiği teknik alt yapı ve destek olduğunu. O desteğin eksik olduğu yerlerde özellikle devlet okullarında bence faydalı olabilir." [P1]*

Another participant has stated:

"I saw a different way to use technology [with this application]. Therefore, my attitude is positive. I bring my phone [to the classrooms] because of your study." [P5]

> *"Teknolojiyi kullanmanın farklı bir yönünü görmüş oldum. O yüzden de yani benim tutumum olumlu. Senin çalışman için cep telefonunu götürdüm." [P5]*

4.3.2.1.11 Made Classroom Management Easier

In this topic, "classroom management" indicator was used to determine the related code. According to the participants (n=2), the MLA has helped them manage the classroom easier. One of the participants has stated:

"If I cannot start the course and trying to solve a technological problem, it means students are waiting for it as well. It creates problems for classroom management. It [application] affects the using time in classroom for instructor or assistant, accordingly it becomes useful for student, too." [P3]

> *"Ben derse başlayamıyorsam teknolojiyle uğraşmaya başlıyorsam çocuk da bekliyor anlamına geliyor sıkıcı bir ortam olur. Sınıf yönetimi anlamında problem olur. Sınıf yönetimindeki zaman kullanımını daha etkiler hale gelir öğretim üyesi ya da elemanı için o da dolaylı olarak öğrenciye yarar getirir." [P3]*

Another participant has claimed:

"If I encounter a problem, then the course is disrupted, students' learning process is disrupted and their motivations drop. I can say that it [application] caused everything to be alright. Because I didn't encounter a problem, the courses were not disrupted and students' motivations did not drop." [P10]

> *"Bir şekilde ben problem yaşamış olsaydım orada işte ders bölünecekti, öğrencilerin o öğrenme süreci bölünecekti ve motivasyonları bence düşecekti hani her şeyin yolunda gitmesine sebep oldu diyebilirim. Ben bir şekilde sorun yaşamadığım için dersler de gayet bölünmeden işte öğrencilerin motivasyonu da bir şekilde bozulmadan ilerledi." [P10]*

4.3.2.2 Suggestions for the Development of the Mobile Device Application

The participants were asked to make suggestions for the improvement of the application. In both interviews, there were questions related to this topic. Results were divided into two categories; before using the application and after using the application. The participants were asked about their expectations in the pre interview. Their answers given in the pre interview are provided under the Suggestions topic alongside their suggestions after having used the application, which were given in the post interview. The post interview is mostly related to the development and the constraints of the MLA. Codes can be found in Table 4.8.

Table 4.8 Main Codes Related with Suggestions

	Suggestions	f
Before Using the Application	Search Option	2
	Simple Design and Instruction	2
	Include FAQs	2
	Other	1
After Using the Application	Content Upgrade	5
	Interface Upgrade	3
	Advanced Solutions	3
	Search/Help/F.A.Q. Button	2
	Students Use	2
	Instant Messaging	3
	Remote Controls' Functions	3
	Logging the Problems More Often	2
	QR Code	2
	Different Platforms	1

For this part of the study, some indicators were determined by researcher. These indicators are consisted of statements of participants. These indicators are "You can…", "…critical for me", "The MLA should have …", "… may be beneficial", "you should …", "The MLA can be…", "… should be enhanced", "… may be very useful". These indicators are used for all topics of this part.

4.3.2.2.1 Before Using Application

The participants suggested some features for the development stage of the mobile learning application in the pre interview. These suggestions are explained in details below.

4.3.2.2.1.1 Search Option

The participants (n=2) have suggested that this MLA should have a Search part. One of the participants has declared:

"Especially if that application has a search option. It was so critical for me when I was working in my former workplace. If you're having a problem and there is a search button, it might be helpful in directing by entering the keywords." [P1]

> *"Özellikle de search opsiyonu varsa, hani eski şirketimde çalışırken de çok hassastım bu konuda. Orada bir problem yaşıyorsanız ve search butonu varsa, var olan şeyler üzerinden keyword'le girip o problemi en azından şuraya gidin buraya gidin demesi bile bence faydalı olabilir." [P1]*

Another participant has suggested:

"It would be useful to have a search button." [P8]

> *"Yani arama butonu olsa güzel olur." [P8]*

4.3.2.2.1.2 Simple Design and Instruction

According to the participants (n=2), the MLA should have a simple design and instructions for solutions for the problems. One of the participants has stated:

"Those application's guidance must be simple, as well. You must understand it when you read it." [P3]

> *"Ama o programların da yönergelerinin basit olması gerekiyor. Okuduğunuzda anlayabilmeniz gerekiyor." [P3]*

Another participant has suggested:

"Maybe there might be pictorial representation." [P4]

> *"Belki resimli anlatımların olduğu şeyler olabilir." [P4]*

4.3.2.2.1.3 Include FAQs

The participants (n=2) have stated that MLA should include a Frequently Asked Questions part. One of the participants has claimed:

"In that application, there are frequently encountered problems pages. If there will be such a feature in the main screen, it may be beneficial to use it." [P4]

"O uygulamada şöyle çokça karşılaşılan sorunlar sayfaları falan var. O tarz bir şey olsa ana ekranda mesela onun kullanımı benim işime yarayabilir." [P4]

Another participant has expressed:

"There might be a frequently asked questions part." [P8]

"Sık sorulan sorular gibi bir kısım olabilir, frequently asked questions." [P8]

4.3.2.2.1.4 Other Suggestions

One of the participants (n=1) has declared that the MLA should include solutions for printer problems. That participant has claimed:

"Instructors are usually having printer problems. For example, they cannot connect to the printer or they cannot print out from it. Maybe, there might be some solutions in application related to these problems." [P2]

"Hocaların genelde karşılaştığı printer'lar mesela. Printer'a bağlanamıyorlar ya da oradan çıktı alamıyorlar, onunla ilgili bir sıkıntı oluyor. Belki onunla ilgili bir şeyler olabilir o programın içinde." [P2]

One of the participants (n=1) has stated that the MLA should include solutions for virus problems. That participant has expressed:

“Instructors are usually having virus problems on their computers. Computers are slowing down.” [P2]

“Bilgisayarda genelde virüslerle ilgili sıkıntı yaşıyorlar hocalarımız. Bilgisayar yavaşlıyor.” [P2]

4.3.2.2.2 After Using the Application

The participants have pointed out constraints of the MLA in the post interview. At this stage, the participants had already used the application in their Android devices.

4.3.2.2.2.1 Content Upgrade

According to the participants (n=5), the content of the MLA should be enhanced. One of the participants has stated:

“Maybe we get used to complicated applications in technology world. I think expectations are in this direction. Installing number [of this application] will increase when the content is enlarged or present solutions for more problems.” [P1]

“Belki de biz bu teknoloji camiasında şu aplikasyonlara çok alışmışız ya, komplike aplikasyonlara. Galiba beklenti bu yönde yani biraz böyle baktığın zaman içerik anlamında dediğin gibi senin, içeriğin biraz dolgunlaşması, daha fazla soruna yönelik fikir sunması, adım sunması bence kurulumu artıracaktır diye düşünüyorum.” [P1]

Another participant has claimed:

“Content can be enhanced. Usually, you completed [solutions] in 4-5 steps. Each step can have sub steps, as well. I guess, you keep the records of common problems. For instance, Google records instances of you face a problem like when the page crashes. If you have such statistics, you can configure it [application] better. [P3]

“Content geliştirilebilir. Ya 4-5 basamakta genelde bitirmişin. Her basamağın alt boyutları da olabilir ya en çok çıkan sıkıntılar. Sizde heralde depolanıyordur mesela google’ın bir şeyi var ya sıkıntı çıktığında rapor ediyor nerede donduğuyla ilgili. Eğer böyle bir istatistiğiniz olursa onu daha yapılandırabilirsiniz.” [P3]

Another participant has expressed:

"I thought that this application would help me, for instance, about virus problems, other complex problems and internet connection or infrastructure problems. However, I think this application solves the general problems." [P4]

> *"Bu programla ilgili virüs sorunlarıydı, diğer daha kompleks teknolojik sorunlar işte internete bağlanamama sorunları ya da altyapı sorunları gibi şeyler olduğunda, benim daha farklı ihtiyaçlarım olduğunda bana yardımcı olacağını düşündüm. Ama genel geçer sorunlara sadece genel görülen sorunlara hitap ettiğini düşünüyorum programın." [P4]*

4.3.2.2.2.2 Interface Upgrade

According to the participants (n=3), the application's interface should be upgraded. The simple interface should be replaced with a more complex one. One of the participants has claimed:

"Maybe interface can be changed at the screens where we click problems. For instance, in some applications have steps like first step then second. Step by step they go downward." [P2]

> *"Belki ara yüz şey olabilir, ilk problemlere tıkladığımız zaman gelen kısımlarda mesela bazı aplikasyonlar, uygulamalarda şey oluyor işte birinci adım ikinci adım üçüncü adım aşağı doğru hepsi yer alıyor." [P2]*

Another participant has stated:

"If users like me have high expectations, then I think the interface should be improved a little more." [P4]

> *"Benim gibi beklentisi yüksek insanlarsa kullanıcılar, o konuda ara yüzün biraz daha geliştirilmesi gerektiğini düşünüyorum." [P4]*

Another participant has expressed:

“I think font sizes are big so the page is going downward. Maybe, the font size can be decreased and more quality or big pictures [can be replaced] or we can pass to a new page for the new step of the solution with the next button. For that step, you put a picture in the application but that picture is different than the real one or something else, you’re not able to see the same device. Maybe, there might be different images under the topic of same problem or same step of solution.” [P10]

> *“Çok fazla aşağı aşağı iniyor yazılar, bence biraz büyük. Biraz daha yazılar küçültülüp daha kaliteli ya da daha büyük resimler. Ya da problemin her bir adımı için yeni bir sayfaya next butonuyla geçilebilir ve o problem için evet bir tane resim koyuyorsunuz oraya ama o resim o an kasanın modeli farklı oluyor ya da başka bişey oluyor aynı şeyi göremeyebiliyorsunuz. Bir kaç farklı resim olabilir belki aynı problem başlığı altında ya da aynı adım altında.” [P10]*

4.3.2.2.2.3 Advanced Solutions

The participants (n=4) have stated that solutions should be more advanced because with this content and steps, solutions are very simple and do not include further problems. One of the participants has claimed:

“In this application, you check if the cable is plugged or where it should be plugged. This is natural because the purpose of application is like this. However, this information is so basic for me. I would use this application if it has further steps.” [P1]

> *“Burada sadece kablosu takılı mı, kablonun nereye takılması gerektiği, belki de niyeti bu olduğu için zaten doğal da olabilir ama bana bu bilgiler çok basic geliyor. Bundan daha ileri adımlar olursa ben bunu kullanırım.” [P1]*

Another participant has declared:

“There may be some more diversity [about solutions] for increasing the technology literacy of people. Viruses affect your PC and you don’t know how to fix or you’re

trying to download something during setup, other different applications are installed [without control] and the PC is crashing." [P10]

> *"Biraz daha çeşitlilik sağlanabilir orada. Birazcık insanların teknoloji bilgisini artırmak açısından hani ne bileyim bilgisayarınıza virüs bulaşıyor nasıl temizleyeceğinizi bilmiyorsunuz ya da bilgisayarda işte kurulum yaparken bir şey indirmeye çalışıyorsunuz, yanısıra bir sürü farklı şey kuruyorsunuz ve bilgisayarınız hop çöküveriyor." [P10]*

4.3.2.2.2.4 Search/Help/FAQs Button

According to the participants (n=2), the application should also include Search, Help and Frequently Asked Questions parts. One of the participants has expressed:

"I think everyone is using the search option. Most of the instructors are searching from Google when they have a problem on the PC. It may be very useful if such a service were placed in this application." [P1]

> *"Bence herkes search kullanıyordur diye düşünüyorum yani hocalarımız bile artık biliyorlar ki bilgisayarla ilgili bir problem olduğunda da google'a gidip search ediyorlar. Bunda da bu aplikasyonun içinde böyle bir hizmet olursa bence baya bir kullanışlı olabilir." [P1]*

Another participant has stated:

"It can be some kind of frequently asked questions. If there were such a title, we could solve the occurring extreme problems that are unlikely to encounter, with this application instead of contacting the person himself. Therefore, this would relieve not only us, but also you. Because it takes longer to reach out to an expert and wait for him to solve the problem. [P8]

> *"Sık sorulan sorular tarzında olabilir. O tarz bir başlık olsa onun altında çok böyle ekstrem karşılaşması zor sorunlar çıktığında kişiyle irtibata geçmek yerine direk bu programdan bakıp çözmüş olabiliyorsak hem sizi rahatlatmış olur, hem bizi. Çünkü sonuçta bir kişiye ulaşıp onun çözmesini beklemek daha uzun sürüyor." [P8]*

4.3.2.2.2.5 Students Use

According to the participants (n=2), students should be distributed the application so they can use it in laboratories and classrooms for technical problems. One of the participants has stated:

"Actually, the application must be available for not only instructors but also students. Students should use it, as well because, for example, when a problem occurs, I have already started the course. The student comes and complains about not opening computer, not connecting to the internet. Then, the course stops at that point. If students have the application, they can themselves see the solution." [P2]

> *"Aslında programı sadece öğretim üyeleri değil öğrencilere de açmak lazım. Öğrencilerin de kullanması lazım çünkü mesela ders sırasında bir sorun olduğunda ben derse başlamış oluyorum. Öğrenci geliyor, hocam ben bunu açamadım, bu çalışmıyor, internete bağlanmıyor gibi şeyler söylediği zaman mesela o ders bölünmüş oluyor orada. Mesela program kendisi öğrencide de olsa oradan görebilir." [P2]*

Another participant has expressed:

"This application can also be given to students. It's downloaded or placed into the faculty's website. Then students can download and install. Accordingly, I think when they encounter a problem, they can solve it on their own." [P5]

> *"Bence öğrencilere de verilebilir bu app. İndirilir ya fakülte web sitesine konabilir mesela ve oradan öğrenciler indirebilirler yükleyebilirler. Dolayısıyla kendileri de bir sorunla karşılaştıklarında bunu çözebilirler diye düşünüyorum." [P5]*

4.3.2.2.2.6 Instant Messaging

The participants (n=3) have stated that the application should include an instant messaging feature on which users can consult when they are trying to solve a problem. One of the participants has claimed:

“If there was a line for your phone, can it be installed with some application like Whatsapp or Hangout which operates with Gmail? For example, could Hangout be added into it for direct messaging from mail address?” [P2]

> *“O telefona bir hat olsa Whatsapp gibi eklenebilir mi ya da Hangout gibi mesela, o maille çalışıyor, Gmail’le çalışıyor. Mesela Hangout gibi bir şey eklenebilir mi oraya da direk anlık mesajlaşma mail adresinden? Belki öyle bir şey de olabilir.” [P2]*

Another participant has stated:

“A chat option could be added like a hotline button. Or what if there is a button that will directly call technical support when these solutions are not enough [to solve the problem], calling would appear on your phone.” [P6]

> *“Canlı yardım butonu gibi bir Chat opsiyonu eklenebilir. Veyahut bunların yetersiz kaldığı noktada doğrudan teknik desteği çağır butonu gibi bir şey olsa da size de çağrı düşse, sizin telefonunuza çağrı düşse mesela.” [P6]*

Another participant has claimed:

“An instant messaging application can be a matter of sharing problems that is not present among the problems [which are already in the application]. [P9]

> *“Bu sorunlar dışında kalan sorunları paylaşabileceğimiz bir anlık mesajlaşma tarzı uygulama söz konusu olabilir.” [P9]*

4.3.2.2.2.7 Remote Controls’ Functions

The participants (n=3) have claimed that the application should include the functions of remote control devices in classrooms. One of the participants has stated:

“I have 3 remote control devices. You look for which one is for which device. Their compatibilities seem chaotic. 3 remote controls stay on the desk, what are they for?” [P3]

"Elimde 3 tane kumanda var. Hangisi nereye hani bakıyorsun filan nerden gelse diyorum. Uyumları orada kaotik gibi duruyor. 3 tane kumanda masanın üstünde duruyor yani neyin kumandası." [P3]

Another participant has stated:

"Remote controls. How are they activated, what do those symbols on the air conditioner mean? The air conditioner, projector and curtains, these are also technologies in a classroom. They may not be there for educational purposes but they make us feel comfortable in classroom." [P5]

"Kumandalar, klima, nasıl çalıştırılır, ne demek istiyor klimadaki semboller bize. Klima, Projeksiyon evet. Perdeler ondan sonra yani bence bunlar da sınıftaki teknolojiler ha öğretmeye yönelik olmayabilir ama sınıfta daha rahat etmemizi sağlayan teknolojiler." [P5]

Another participant has expressed:

"In some classes, there are two or three remote controls. There is a problem finding out which controller does what. You need to check on it for the brand name, then you check projector which brand it is. To match the controller." [P8]

"Bazı sınıflarda iki üç tane kumanda var, hangi kumanda ne işe yarıyor bunları bulmakta sıkıntı çekiliyorsa üstüne bakmak lazım, ne marka yazıyor, gidip projeksiyona bakıyoruz ne marka, hangisi hangisinin kumandası diye." [P8]

4.3.2.2.2.8 Logging the Problems More Often

The participants (n=2) have claimed that technical problems that are encountered in classrooms should be logged on more often. One of the participants has stated:

"If I were you, I would give instructors a notebook and ask them to take note whenever they encounter a technical problem." [P3]

"Yerinde olsam öğretim elemanlarına birer tane not defteri veririm. Ve her teknolojiyle sorun çıktığında oraya not almasını isterim." [P3]

Another participant has claimed:

“It can become more useful application if there is a background that can update the solutions all the time together with the existing solutions.” [P9]

> *“İnsanların iletebilecekleri ve bu sorunlara sunulan çözümlerle beraber bunu sürekli güncelleyebilecek bir alt yapı olması halinde daha verimli kullanılabilecek bir program olur.” [P9]*

4.3.2.2.2.9 QR Code

The participants (n=2) have stated that the application should include a QR Code system to be more useful. One of the participants has remarked:

“A QR code can be placed in classrooms, then a student can download it from his/her device. If there is something to remind this application, it can be useful. That QR code can give an access link for their devices.” [P7]

> *“Sınıfa bir kare kod konur, oradan bir öğrencinin de olsa cihazından girip. Yani orda böyle bir çözüm olduğunu hatırlatan bir şey olsa bir artı olabilir. Hani sınıfta şu kare kodla bununla ilgili bu cihazlarla şu programa erişim linki verir o kare kod.” [P7]*

Another participant has claimed:

“There can be code. A code can be attached and when the phone gets the code, the application says what this controller does, how is it used or if there is a problem what should be done.” [P8]

> *“Kod da olabilir. Üstünde bir kod yapıştırılır, telefon o kodu gördüğünde hemen bu kumanda nedir ne işe yarar nasıl kullanılır ya da sorun varsa ne yapmak lazım gibi bir şey olabilir yani.” [P8]*

4.3.2.2.2.10 Different Platforms

One of the participants (n=1) has declared that the application should be installed on various OSs. According to this participant:

"If only it could be used with IOS, could it be available for the OS of Apple or all of the OSs? Because some use Windows and Windows Phone, some use iPhone and Apple products, and some use Android. People mostly use Android but there are also people who use Apple, and this application could be available for Apple too. There could be a small application for the computers in the Labs." [P2]

> *"IOS'ta falan da olsa mesela, o Apple'ın işletim sistemine uygun uygulama olabilir mi diye bütün telefonlara. Mesela bugün az olsa da Windows kullanan da var Windows phone kullanan, Iphone'un Apple'ın telefonunu kullanan da var Android de var. Genel olarak Android fazla ama bunlar da var kullanan. Apple'ın onlarda da mesela olsa şey olabilir. Bilgisayar bir de evet mesela laboratuvarlardaki bilgisayarlar için ufak bir aplikasyon uygulama olabilir." [P2]*

4.4 Summary

An application that will help teaching staff of the Faculty of Education to solve technical problems without needing to contact support from the technology support office was developed and used for approximately 5 to 6 weeks. Five research assistants and five faculty members attended the study by installing the application on their mobile devices and using it whenever they encountered a technical problem in classrooms, laboratories or offices. Pre and post interviews were conducted with participants.

In the pre-interviews, participants explained the technical problems they have experienced in their classes and the solutions they used to overcome those. They were asked about their opinion on the quality of the technical support service when problems occurred. They also contributed to the design of the mobile learning application the with their suggestions and expectations. As the results revealed, faculty members and research assistants encountered software, hardware and network problems. They have

self and supported solutions for these problems. As the participants mentioned, there is a need for an application that could help in troubleshooting technical problems easier and could also increase the service quality of TSO in solving other problems. The participants declared that these technical problems affect their and students' motivation and satisfaction negatively. Moreover, these problems create concerns on technology integration.

The participants used the MLA that was provided them by the researcher for six weeks. According to the results of the post interview, even though there are some suggestions and constraints of the MLA, the participants were mostly pleased with the effectiveness of it. As they mentioned, the application prevented motivation and time loss, affected their and students' satisfaction level positively, increased their self-confidence, and decreased their concerns about encountering a technical problem during class. They also stated that this application has a simple design and instruction, increased the technology literacy, and made classroom management easier. The participants mentioned that their attitudes toward technology use changed positively in the classroom.

The MLA was reported to have some issues about content, interface and distribution. The participants suggested that content and interface should be enhanced and the application should include advanced solutions. In addition, the application should include Search, Help, and FAQs buttons, instant messaging, remote control functions and more logging process for technical problems. Finally, this application should be available for the students on the faculty website or a QR Code should be generated for a download link in the classrooms and laboratories for students' use.

CHAPTER 5

DISCUSSION AND CONCLUSION

This chapter contains explanations and interpretations of the results of this study. In this part, there is a brief conclusion of the thesis. There is a Recommendations part at the end of this chapter to deliver main suggestions for future studies in this field. There is no contradiction in the current literature related to the content and results of this study. In addition, there are some unique findings, which will contribute to the literature.

This study aims to find out the effects of technical problems on motivation, satisfaction and concerns of teaching staff, and the effectiveness of an application designed for solving the technical problems without taking support from the TSO in the Faculty of Education. Five research assistants and five faculty members from the Faculty of Education at the Middle East Technical University participated to this study as users of the Mobile Learning Application.

In the pre interview, the participants were asked about the technical problems and their solutions for those problems. Additionally, the effects of these problems on the motivation, satisfaction and concern were asked to the participants. They were told about an application designed for possible solutions for the technical problems that they face during classroom sessions, and the researcher gathered their recommendations for improving the content and design of the application. Finally, the participants evaluated the quality of Technical Support Office in their faculty building and made suggestions for improving the quality of the TSO. After the pre interview, the participants were distributed the application to be used on their Android devices approximately for 5-6 weeks.

In the post interview, the participants were asked about the changes of their and students' motivation, satisfaction and concerns, and their opinions about the effectiveness of the MLA. Moreover, they suggested some points for improving the mobile learning application.

5.1 The Technical Support Office and the Need for an Application

In this part, suggestions for improving the quality of the TSO in the faculty building and the need for an application that can solve the problems related to technological problems are explained. In the pre interview, the participants' opinions related to the quality of support in the faculty building were gathered. As results demonstrated in pre interview, most of the participants (n=9) are satisfied with the quality of the TSO. In pre interviews, questions related to the quality of the TSO were asked to the participants and the result are inserted into the codes and themes table in Appendix C with the topic of the quality of the technical support. In addition, there were some recommendations on how to improve the quality of the technical support. Results have indicated that the start of shift time, finding an expert in the TSO, physical distance of the support offices, the number of the employees and not being able to solve problems are the main issues related to the problems of the TSO.

The participants also suggested some recommendations related to the development of the TSO. According to their needs, being accessible, providing better guidance and a manual for technical issues, support for some specific areas, and having spare parts are the main points of their recommendations. When the functionality of an application that will support users is compared to these suggestions, it can be seen that there are enough criteria to develop such an application for mobile devices for reducing the inadequacy of the TSO. A mobile application does not have a shift time, is updatable and is only as far as one's pocket. However, there are other points that create needs for such an application, as well.

The TSO is still needed for different problems that needs to be solved by experts, for instance for changing Ethernet cables or distorted OS issues. However, an application that will help the TSO could minimize the workload, and by showing the troubleshooting methods of technical problems, technology literacy of the teaching staff could increase. If the application is shared with not only the staff of the faculty of education, but also the students, the results will partially affect them in a positive way, as well. As this study was conducted in the Faculty of Education, students who are prospective teachers in the future will learn technology efficiently and will be able to use it effectively in their future courses. According to Myers and Halpin (2002), teachers' attitudes are an important factor and predictor for future computer use in classroom. Individual access to ICT which teachers have (Ross et al., 1999; Cox et al., 1999; Guha, 2000), the amount of technical support (Cuban, 1999; Bradley and Russell, 1997), and the amount and quality of education (Pina and Harris, 1993; Lee, 1997) affect the degrees of confidence and the degrees of ICT use.

It would not be correct to state that the existence of a TSO would affect the technology literacy improvement of faculty members and research assistants because it helps solving the technical problems without giving opportunity to them to learn the solution of the problems. Even though the staff of the TSO step in to solve the problems, users are still trying to solve them by themselves at the first place. As the participants claimed in the pre interview, the self-solution method is highly common. Moreover, as some participants stated, they consult the TSO only as a last resort. It can be said that an application can help to solve the technical issues and increase the technology literacy of the users by showing how to solve such problems.

As a result, a mobile application that support troubleshooting technical problems has many benefits to restrain the problems as related to the TSO. Moreover, technology literacy could increase because users will be able to learn and perform the solution by themselves. Workload for the TSO will decrease and this will create a chance for solving other more complicated problems faster. If students use the application, their technology literacy could also increase and they could benefit from it at their future

schools as teachers. In the coming parts, the effects of this application on participants and effectiveness of the application itself will be discussed.

5.2 Effects of Technical Problems on Motivation, Satisfaction and Concerns

In this part, the effects of technical problems in classrooms on motivation, satisfaction, and concerns are discussed. During both interviews, the participants were asked about their motivation, satisfaction and concerns. Results show that technical issues has a potential to affect both the instructor and the students in the classroom.

In a classroom, motivation can be affected by many different parameters. Technical issues are one of these. When a technical problem occurs in the classroom and it takes too long to be solved, as participants stated, motivation loss is observed on both instructor and students in the classroom. Both the instructor and the students are affected directly during this waiting time. Because experienced instructors guess that such a problem may occur at the beginning or in the middle of the lesson, they create alternative teaching materials. However, this situation affects course plans, triggers motivation and attention loss. As Cox et al. (2000) have stated, when a technical issue occurs in a classroom, students' and teacher's motivations drop.

Satisfaction can also affected by these problems. Especially in the middle of the course session, if a problem occurs related to technology, learning could be obstructed and satisfaction level can drop. As some participants have stated, students tend to focus on the problem instead of the course itself. There is a strong relationship between technical problems and satisfaction loss (North, Strain, & Abbott, 2000).

Participants have some concerns regarding technical issues. Instructors plan the courses according to the lesson duration. If a problem occurs, this duration might not be enough for completing those plans. Therefore, the participants stated that they have concerns about completing the course on time. Even though they create alternatives for a situation such as this, these alternatives might not be enough to ignore the results

arising from the technical problems. In addition, participants have stated that they are stressed whenever they face a technical problem in the classroom during the lesson. According to Jett & George (2003), unexpected problems, which make workers engage in unrelated activities, can cause stress.

The developed mobile application has the potential to overcome these problems and provide benefits to instructors, students and learning. It can prevent the decrease in motivation, satisfaction and increase of concerns. Creating a helpful application would not only affect motivation, satisfaction and concern, but also could help in planning the course, prevent attention loss, and help students in focusing on the lesson. Moreover, such an application will decrease the problems of instructors such as the need to create alternative teaching materials, obstruction of learning and the creation of stress to a minimum level.

To sum up, this application was helpful for faculty members and research assistants for solving the technical problems in the classroom. It can be concluded that such a mobile application has benefits to the instructors and students in a classroom where technological devices are used for teaching. Moreover, according to the findings of the study, this application was a beneficial step for solving the technical problems and other issues that occur related to the technical problems. There are still some points for improvement in the application.

5.3 Implications

This study was conducted to investigate the case of technical problems in the Faculty of Education with ten participants. Therefore, as in all case studies, for generalizing the findings, one should be careful due to the limitations of the study. This research has contributed to the literature in terms of a guide for an application design and content for the solutions to the technical problems.

This study created a main structure for developing an application related to the technical problems' solutions. From the results of the interviews, conclusions can be deduced about the specifications of application design and content. By using the feedback from the users, this application can be considered as a helpful tool to use in troubleshooting the technical problems.

By using the data derived in this study, the effects of technical problems that are faced in the classroom on motivation, satisfaction and concern can be understood. Faculty members' and research assistants' opinions about the effectiveness of the application, the effects of the technical problems on teachers and students and problems related to technical support can be gathered by using the results of the pre and post interviews. Moreover, this study includes participants' ideas for developing an application such as the one used in this research and technical support requirements in a university environment.

This study contributed to the technology literacy of the participants from the Faculty of Education. By learning and performing the solutions by themselves, this application created a chance for mobile learning. As content was gathered not only by using log reports of the TSO, but also by getting the opinions of the participants, subjects that will contribute to the technology literacy of the participants were determined appropriately. Moreover, this application can raise students' technology literacy so that sophisticated prospective teachers can be graduated from the Faculty of Education, who understand the logic of solutions to the technical problems and integrate technology effectively into future classes.

Finally, this application was useful for the TSO in faculty building. Because of the support given to self-solutions for the technical problems, the workload of the Technical Support Office decreased. Therefore, the quality of support in the Faculty of Education increased by means of this application.

To summarize, this study has benefits on understanding the effects of technical problems on instructors and students, and can provide a guidance for design and development of an application for solutions to technical issues. Additionally, there will be advantages for the support quality and the technology literacy of both students and instructors.

5.4 Future Studies

In this research, an application for Android devices was developed for creating solutions to technical problems occurring in the Faculty of Education. The purpose of this study is to investigate the effects of these problems on motivation, satisfaction and concern changes of faculty members and research assistants and to measure the effectiveness of this application by interviews conducted with the participants.

This research was conducted only in the Faculty of Education with ten participants. Therefore, for future studies, such an application can be distributed to different faculties, and can be conducted with more participants to gather better data in this field. Moreover, by taking the suggestions on the development of the application into consideration, a more useful application can be created for a study similar to this.

Finally, researchers should be careful about the availability of the application for any kind of device so that they can get useful and detailed data. For this research, because of the limitations of the platform on which the application was developed, there was only Android OS compatibility. Therefore, this issue should be regarded in future researches and the platforms that new applications will be developed should be compatible with more OSs such as IOS or Windows.

To sum up, by using the suggestions on the development of this application, more useful and improved designs can be derived in future studies. Moreover, content can be upgraded and the area of application for the study can be widened.

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APPENDIX A

A: QUESTIONS OF PRE INTERVIEW

1. What kind of technology related problems have you had in the classroom?
2. How do technological problems affect your motivation and satisfaction during class?
3. What are your concerns about technological problems in the classroom?
4. How do you solve technological problems in your classroom during the lesson?
5. How do technological problems during your classroom affect your lesson plans?
6. What do you think about the technology support level in your faculty?
7. If there were an application for technical problems, would you use it? What would you expect to see in this application?

APPENDIX B

B: QUESTIONS OF POST INTERVIEW

1. For which technological problems did you use the Mobile Learning Application?
2. How often did you use the MLA? Did it help you to solve the technological problems without needing to the Technical Support Office?
3. What are your opinions about the ease of use of the MLA? How can it be improved?
4. How were your motivation, satisfaction and concern affected during you used the application?
5. How were students' motivation and satisfaction affected?
6. How did your attitudes toward technology use change after using the MLA? (Did it encourage you?)

APPENDIX C

C: THEMES AND CODES OF THE PRE INTERVIEW

Table C.1 Themes and Codes of the Pre Interview

Technical Problems	Hardware	Projector Problems (P4, P5, P6, P7, P8, P9)
		Peripherals Problems (P2, P3, P5, P7)
		Computer Case Start-Up Problems (P2, P4, P9)
		Smart board Problems (P1, P5, P6)
		Other (P2, P3, P5, P6)
	Software	Login Problems (P1, P3, P7, P8, P10)
		Administration Permission (P1, P2, P3)
		Update Problems (P1, P3)
		Other (P2)
	Network	Internet Connection Problem (P1, P2, P4, P8, P10)
Solutions	Self-Solutions	Self-Attempt to Fix (P1, P2, P3, P5, P6, P7, P8, P9, P10)
		Searching Internet and Forums (P1, P2, P4, P6, P7, P8, P9, P10)
		Other (P1)
	Supported Solutions	Technology Support Office (P1, P2, P3, P4, P5, P6, P7, P8, P9)
		Asking An Expert (P2, P4, P8, P9, P10)
		Asking Students for Support (P1, P4, P10)
		Other (P1)

Table C.1 Continued

Effects of Technical Problems	Self-Effects	Demotivating Instructors (P1, P4, P6, P8, P9, P10)
		Losing Class Time (P2, P3, P5, P6, P7, P9)
		Psychological Effects (P1, P3, P4, P7)
		Creates Concerns (P2, P5, P6, P7)
	Effects on Course	Alternative Materials (P1, P3, P5, P6, P7, P8, P9, P10)
		Effects on Course Plan (P1, P2, P4, P6, P7, P8, P9, P10)
		Other (P1)
	Effects on Students by Perceived from Instructor	Attention Loss(P1, P2, P4, P5, P6, P9, P10)
		Demotivating Students (P4, P5, P6, P8, P9, P10)
		Other (P2)
Quality of the Technical Support		Satisfying (P1, P2, P3, P4, P5, P6, P7, P9, P10)
		Good Timing (P3, P4, P6, P9)
		Supportive (P1, P4)
Problems of the Technical Support Office		Shift Start Time (P1, P5)
		Other (P2, P4, P7)
Suggestions for Development of the Technical Support Office		Being accessible (P1, P7, P10)
		Provide Better Guidance (P1, P5, P9)
		Provide a Manual (P2, P5, P8)
		Follow Up the Problems (P5, P7)
		Other (P3, P4, P6)
Mobile Learning Application		Prospective Use of the Application (P1, P2, P3, P4, P5, P6, P8, P10)
		Increases the Technology Literacy (P2, P5, P6, P9)
		Decreases the workload of the TSO (P2, P3, P6)

Table C.1 Continued

Suggestions for the Mobile Learning Application (Before Using the Application)	Search Option (P1, P8)
	Simple Design and Instruction (P3, P4)
	Include FAQs (P4, P8)
	Other (P2)

APPENDIX D

D: THEMES AND CODES OF POST INTERVIEW

Table D.1 Themes and Codes of the Post Interview

Solved Problems with the Mobile Learning Application	Hardware	Projector Problems (P5, P6, P8)
		Smart board Problems (P5, P6)
		Other (P2, P10)
	Software	Login Problems (P2, P4, P8, P9, P10)
		Other (P5)
	Network	Internet Connection Problems (P6, P8, P9, P10)
Effectiveness of the Mobile Learning Application	Prevents Demotivation (P1, P2, P3, P4, P6, P9, P10)	
	Creates Confidence / Decreases Concerns (P2, P4, P5, P6, P8, P9, P10)	
	Effective to Use (P2, P4, P5, P6, P8, P9)	
	Ease of Instruction (P2, P3, P4, P6, P9)	
	Increases the Technology Literacy (P2, P7, P9, P10)	
	Simple Designed Interface (P6, P9, P10)	
	Encourages the Use of Technology (P1, P5)	
	Saves Time (P4, P8)	
	Makes Classroom Management Easier (P3, P10)	
	Other (P4)	

Table D.1 Continued

Suggestions for the Development of the Mobile Learning Application (After Using the Application)	Content Upgrade (P1, P3, P4, P6, P10)
	Interface Upgrade (P2, P4, P10)
	Advanced Solutions (P1, P6, P10)
	Instant Messaging (P2, P6, P9)
	Remote Controls' Functions (P3, P5, P8)
	Search/Help/FAQs Button (P1, P8)
	Student Use (P2, P5)
	Logging the Problems More Often (P3, P9)
	QR Code (P7, P8)
	Different Platforms (P2)