

THE USE OF IMMEDIATE FEEDBACK SYSTEM IN COLLEGE  
CLASSROOMS: A MULTIPLE CASE STUDY

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CLASSROOMS: A MULTIPLE CASE STUDY**

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## ABSTRACT

### THE USE OF IMMEDIATE FEEDBACK SYSTEM IN COLLEGE CLASSROOMS: A MULTIPLE CASE STUDY

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The purpose of this study is to investigate the usage of a student response system, which was designed in line with the needs and suggestions of faculty members, in college classrooms in order to facilitate teaching and learning process. For this purpose a prototype system was designed, developed, and then piloted by four faculty members. The prototype was redesigned based on the input from these four faculty members. The actual data of the study were collected from three different classes of three different departments during the spring semester of 2012-2013 academic year. Data about the ways of using the system, the purposes of using the system, expectations from the system, efficiency of the system, and effects of the system on the classroom climate and learning of the students were collected. Interviews were the main data source of the study. Three repetitive interviews were conducted with three faculty members, and nineteen students from three departments. The results of the study showed that the system was used for several

purposes such as feedback, discussion, evaluation, motivation, active participation, and class preparation. Furthermore, the system had several advantages for both students and faculty members such as providing feedback, increasing student-student and student-instructor interaction, motivating students and faculty members, ease of use, and free of cost. Lastly, the results of the study revealed the improvement and utilization suggestions of faculty members and students.

Keywords: Feedback, Mobile Phone, SMS, Student Response System, Multiple Case Study.

## ÖZ

### ANLIK GERİ BİLDİRİM SİSTEMİNİN ÜNİVERSİTE SINIFLARINDA KULLANIMI: ÇOKLU DURUM ÇALIŞMASI

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Bu çalışmanın amacı öğretim üyeleri ve öğrencilerin ihtiyaçları ve görüşleri göz önünde bulundurularak geliştirilen anlık geri bildirim sisteminin üniversite seviyesindeki sınıflarında öğretme ve öğrenme sürecinin nasıl etkilediğinin araştırılmasıdır. Bu kapsamda geliştirilen prototip sistemin uygulaması önce dört öğretim üyesi tarafından yapılmış olup, sistem bu öğretim elemanlarının görüş ve önerileri doğrultusunda yeniden düzenlenmiş ve asıl uygulamaya geçilmiştir. Çalışmanın asıl verileri 2012-2013 akademik yılı bahar döneminde üç farklı bölümdeki üç sınıftan toplanmıştır. Çalışmanın ana veri kaynağı olarak görüşmeler kullanılmış olup, bu kapsamda üç farklı bölümden birer öğretim üyesi ve toplamda on dokuz öğrenci ile birbirini tamamlayan üçer görüşme yapılmıştır. Çalışmanın bulguları sistemin geri bildirim sağlama, tartışma, değerlendirme, güdüleme, derse hazırlık ve aktif katılım gibi pek çok farklı amaçla kullanıldığını ortaya koymuştur.

Ayrıca, sistemin hem öğrencilere hem de öğretim üyelerine geri bildirim sağlama, öğrencilerin hem kendi aralarındaki hem de öğretim üyeleri ile aralarındaki etkileşimi artırma ve motivasyonlarını sağlama, kullanım kolaylığı, anonim kullanım imkanı ve normalde bu tarz sistemlerde bir dezavantaj olan kullanım ücretlerinin olmaması hem öğrenciler hem de öğretim üyeleri tarafından sistemin avantajları olarak belirtilmiştir. Çalışmanın bulguları son olarak da öğrenci ve öğretmenlerin sistemin geliştirilmesine ve kullanılmasına yönelik görüş ve önerilerini ortaya koymuştur.

Anahtar Kelimeler: Geri Bildirim, Cep Telefonu, SMS, Anlık Geri Bildirim Sistemi, Çoklu Durum Çalışması

*To My Family...*

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## TABLE OF CONTENTS

ABSTRACT .....	v
ÖZ.....	vii
ACKNOWLEDGEMENTS .....	x
TABLE OF CONTENTS .....	xii
LIST OF TABLES .....	xvii
LIST OF FIGURES.....	xviii
CHAPTERS	
1. INTRODUCTION.....	1
1.1 Background of the Study.....	1
1.2 Statement of the Problem .....	5
1.3 Purpose of the Study .....	7
1.4 Significance and Originality of the Study .....	7
1.5 Research Questions .....	8
1.6 Definitions of Terms .....	9
2. LITERATURE REVIEW .....	11

2.1	Student Response Systems (SRSs).....	11
2.2	Components of SRSs.....	13
2.2.1	Projection System.....	14
2.2.2	Student Input Devices .....	14
2.2.3	Receivers .....	15
2.2.4	Software .....	16
2.3	Usage of Student Response Systems.....	17
2.4	Student Response Systems and Related Educational Theories.....	18
2.5	Advantages of Student Response Systems.....	21
2.5.1	Feedback .....	21
2.5.2	Participation / Interaction.....	25
2.5.3	Anonymity.....	26
2.5.4	Engagement / Encouragement.....	27
2.6	Disadvantages of Student Response Systems .....	28
2.6.1	Cost .....	28
2.6.2	Technical Problems.....	28
2.7	The Gap Found in the Literature.....	29
3.	METHODOLOGY.....	31
3.1	Purpose of the Study and Research Questions.....	31

3.2	Design of the Study .....	32
3.3	Researcher's Role.....	34
3.4	Selection of the Participants .....	35
3.4.1	Participants of the First Case.....	36
3.4.2	Participants of the Second Case .....	37
3.4.3	Participants of the Third Case .....	39
3.5	The System .....	41
3.6	Data Collection Process.....	48
3.6.1	Interviews .....	48
3.6.2	Observations .....	50
3.7	Data Analysis .....	51
3.8	Trustworthiness .....	52
3.8.1	Triangulation .....	53
3.8.2	Peer Debriefing.....	53
3.8.3	Rich Description.....	54
3.8.4	Intercoder Agreement.....	54
3.9	Limitations .....	56
3.10	Timetable of the Study .....	57
4.	RESULTS.....	59

4.1	Faculty Members.....	59
4.1.1	Usage.....	59
4.1.2	Advantages.....	69
4.1.3	Problems.....	78
4.1.4	Technical Suggestions.....	82
4.1.5	Concerns.....	85
4.1.6	Opinions.....	86
4.2	Students.....	88
4.2.1	Usage.....	88
4.2.2	Advantages.....	95
4.2.3	Problems.....	128
4.2.4	Technical Suggestions.....	131
4.2.5	Concerns.....	137
4.2.6	Opinions.....	138
4.2.7	In Class Technologies.....	148
4.3	Summary of the Chapter.....	149
5.	DISCUSSION AND CONCLUSION.....	155
5.1	Discussions on the First Sub-Question.....	155
5.2	Discussion on the Second Sub-Question.....	158

5.3 Discussion on the Third Sub-Question.....	167
5.4 Implications for the Practice.....	170
5.5 Recommendations for the Future Research.....	174
REFERENCES.....	177
APPENDICES	
A. INFORMED CONSENT FORMS .....	183
B. INTERVIEW QUESTIONS FOR FACULTY MEMBERS .....	185
C. INTERVIEW QUESTIONS FOR STUDENTS.....	187
D. PERMISSION OF ETHICAL COMMITTEE.....	189
E. CODING TABLE FOR FACULTY MEMBERS .....	191
F. CODING TABLE FOR STUDENTS .....	195
CURRICULUM VITAE .....	199

## LIST OF TABLES

### TABLES

Table 3.1 <i>Information about Student Participants of the First Case</i> .....	37
Table 3.2 <i>Information about Student Participants of the Second Case</i> .....	39
Table 3.3 <i>Information about Student Participants of the Third Case</i> .....	40
Table 4.1 <i>Themes, Sub-themes, Codes, and Sources</i> .....	150
Table 5.1 <i>The System Utilization Purposes, and Examples</i> .....	173
Table 5.2 <i>The System Utilization Suggestions</i> .....	174
Table E.1 <i>Coding Tables for Faculty Members</i> .....	191
Table F.1 <i>Coding Table for Students</i> .....	195

## LIST OF FIGURES

### FIGURES

Figure 1.1 <i>A most common clicker</i> .....	12
Figure 1.2 <i>A New version of a clicker</i> .....	13
Figure 1.3 <i>A Receiver for SRS</i> .....	16
Figure 3.1 <i>Login Screen of the system</i> .....	44
Figure 3.2 <i>Question Definition Screen</i> .....	45
Figure 3.3 <i>Question Asking Screen</i> .....	46
Figure 3.4 <i>Result Screen</i> .....	46
Figure 3.5 <i>Working Scheme of the System</i> .....	47
Figure 3.6 <i>Timetable of the Study</i> .....	57

## CHAPTER 1

### INTRODUCTION

In this chapter, introduction to the study is presented with the background of the problem, statement of the problem, purpose of the study, significance of the study, research questions, assumptions, limitations and definitions of terms.

#### **1.1 Background of the Study**

Now, more people than the past attend to universities due to increasing population of the world and changing needs for education. Related to this situation, size of classes is getting larger and larger. Most faculty and administrators of universities think that classic classroom setting or an auditorium is the best solution for large courses due to time limitations of faculty members (Wood, 2004). However, the problem could not be solved by just building new schools and raising more and more teachers. Increasing the efficiency of education by updating and simplifying curricula, enriching and enhancing books and teaching strategies would be the solution (Skinner, 1958).

Schools are the institutions founded to allow one educator to reach and teach more than one students at the same time. Nevertheless, along with the increasing number of students, the time and care allocated to each student were decreased

dramatically (Skinner, 1986) that the class size has an effect on individualized teaching and classroom management (Brühwiler & Blatchford, 2011). Although small classes are found to be more effective, governments try to put maximum number of students in a class for cost effectiveness (Barrett & Toma, 2013; Brühwiler & Blatchford, 2011). In many universities, a professor gives two or three hours of classes to more than a hundred students; in fact, the number of students may reach to more than two or three hundred in some cases such as physics, calculus, chemistry. In many cases, professors rarely pause to ask a question to students; and, only a very little number of students participate to class and answer the questions of professor (Lin, Liu, & Chu, 2011; Mayer et al., 2009). Interactions between the professor and the students are limited and inadequate. Moreover, rest of the class may deal with other occupations, which are not related with the course. This scenario is mostly repeated more than once a week throughout the semester (Mayer et al., 2009).

A number of pedagogical difficulties come together with teaching a large course due to physical environment and size of the course (Trees & Jackson, 2007). Large courses generally take place in large classrooms or auditoriums. In such place, teacher or professor stands at a central place that each student is able to see him or her, of course if they want this. The interaction not only between the professor and the students, but also between the students themselves dramatically increases. Moreover, as long as the population of the classroom increases, sense of responsibility decreases, anxiety to participate increases due to being stranger to most of the other students (Trees & Jackson, 2007).

Although the course books were originally published to relieve the burdens of teachers as a solution of increasing number of students, there are two major problems, which have not been totally solved yet. While the first problem is assessing a large number of students at the same time, second one is how a large group of students get ready to learn (Skinner, 1986).

Practice, feedback and active participation are three key elements of learning in a class medium. Nevertheless, traditional classroom structure, and large courses

restrict these elements (Trees & Jackson, 2007). At first, traditional classroom structure obstruct students to participate and to practice which leads to higher learning. Secondly, in a traditional classroom setting students generally have little chance to get feedback from a teacher except exams due to the teacher's lack of time to evaluate students' understanding individually and deeply. Thirdly, crowded classrooms constitute a barrier against to active participation of students (Trees & Jackson, 2007; Wolter, Lundeberg, Kang, & Herreid, 2011). As Majerich, Stull, Varnum, and Ducette (2011) mentioned that traditional teaching methods have long been correlated with passiveness of the students that endorse memorization instead of conceptual understanding. According to Trees and Jackson (2007), large enrollment courses destroy the active learning pedagogy. Instructors of large courses generally complain about passiveness of students, although they should be active participants. Involvement is the key factor being an active participant. Students actively participate to class as long as they feel involved. Otherwise, they do not want to work hard, to achieve the goals of the course and to perform as well as they can (Hunsinger, Poirier, & Feldman, 2008; Mayer et al., 2009).

What is the way of enhancing student – instructor and student – student interaction in a large enrollment course? Asking questions to students or questioning method is one way to improve interaction (Gier & Kreiner, 2009). Nevertheless, it generally occurs with a limited number of students, not with the whole class (Mayer et al., 2009; Trees & Jackson, 2007). Moreover, principles of individual learning cannot be useful in large courses as it is in smaller ones. So, different technologies or principles should be employed in large courses to increase interaction (Lin et al., 2011).

Technology has become a part of culture and a component of our daily life; and, the use of technology in classrooms with educational purposes has become widespread not only in college, but also all stages of educational system (Cope & Ward, 2002; Hunsinger et al., 2008). New technologies used in classrooms may promote active learning by enabling students to interact with instructors and themselves even if the

class size is large (Wood, 2004). The most epochal improvement in education is interactive technology (Bojinova & Oigara, 2011).

According to Mayer (2001) there are two approaches of using technology in educational settings. The first one is technology-centered approach, which focuses on a technology and searches the ways of using the technology in education. The second approach is learner-centered approach, which focuses on learners' cognitive process and search new tools to expand cognition levels' of students.

Even though using technology in education has several advantages, there are different issues to be considered. The way of using technology is one of these issues as it was pointed out by Skinner (1958). He stated that technology could be used as a supportive component of casebooks and classes that could help students to learn easier by presenting the content an easier and catch way, one of teachers' duties, if it is adequately used. On the other hand, if technology is just used to present the content without any interaction, and furthermore remove the interaction between teachers and learners, students would become passive recipients (Skinner 1958).

As stated before, active participation of students has a key role in learning (Trees & Jackson, 2007) and technology needs to support active participation, not to decrease. There are also different devices to support active participation of students. The origin of all these devices could be thought as the automatic test machines developed by Sidney L. Pressey in 1920's (Skinner, 1958). These machines were designed to test students' knowledge by asking multiple-choice questions. If a student answers the question, the machine asks another question. However, if the answer is wrong the machine keeps asking the same question until the correct answer is chosen. These machines also help student to learn by providing immediate feedback. Normally, students could receive feedback many days after the test and it might be so late to correct the mistakes. Although the feedback is given just after the test, it helps to correct the mistakes, and reinforce them (Skinner, 1958).

One of the current technologies can be used in classrooms to maximize student participation, interaction and engagement is Student Response Systems (SRSs), in general known as “clickers” (Hunsinger et al., 2008; Lowery, 2006; Mayer et al., 2009; Wolter et al., 2011; Wood, 2004). They have been the most promising technology of last decades (Duncan, 2006). The use of SRSs in large classrooms goes down to 1960s (Judson & Sawada, 2002) and they have been using efficiently in college classrooms since 1980s (Zhu, 2007). Many instructors from different institutions and schools have begun to use SRSs as a part of their courses to understand immediately whether students have learned what they have taught, or not (Caldwell, 2007).

SRSs have changed the dynamics of a traditional classroom structure by providing equal chance to all students to reply to instructor about their understandings and by supporting immediate feedback to students. By the way, while, the interaction between the peers and the instructor increases, sense of responsibility of the students increase. Eventually, learning is improved (Duncan, 2006; Hunsinger et al., 2008; Majerich et al., 2011; Wolter et al., 2011). The use of this technology mainly depends on short brakes during the traditional classes to ask questions to student to assess their understanding, to start a discussion, to give immediate feedback; and increasing interaction by the way (Caldwell, 2007).

## **1.2 Statement of the Problem**

Starting and carrying on a discussion in a classroom structure is always tough no matter whether the class size is large, or not. Even if the number of students in the classroom is very small, there is always someone who hesitates and does not want to participate in the class due to several reasons (Caldwell, 2007). Number of students enrolled to a course is permanently increasing, so level of both peer and student-instructor interaction is decreasing. Moreover, learning results are getting dwindled (Caldwell, 2007; Patterson, Kilpatrick, & Woebkenberg, 2010).

One of the most common and effective ways of participating students in the class is questioning method (Gier & Kreiner, 2009; Mayer et al., 2009; Wolter et al., 2011).

In this method, an instructor occasionally asks a question to whole class, one or two students answer the question, instructor and students explain the rationale of correct answer and instructor goes on the class (Mayer et al., 2009).

A crucial challenge of employing questioning method in a large class is to achieve the benefits of questioning method (Mayer et al., 2009). As long as the number of students is increasing, engaging whole class is getting more and more difficult (Caldwell, 2007; Mayer et al., 2009; Patterson et al., 2010). Moreover, each type of class normally has a different goal. Large courses generally aim at introducing general knowledge about several topics. Smaller courses deal with giving more detailed and deep information about a certain topic. Laboratory courses strive to instill methodological skills and knowledge to student (Lantz, 2010). Nevertheless, instructors are trying to attain the objectives of small courses in large courses due to lack of opportunities.

Furthermore, success of active learning strategy and discussions rely on the convenience of physical structure of the classroom (Patterson et al., 2010). Large classrooms are generally an obstacle to active learning due to its size and rabble. While all students are not able to hear each other during the course, instructors do not have chance to control whether all the students understand, or not (Wolter et al., 2011).

One solution to active learning problem of large courses is employing interactive educational technologies one of which is Student Response Systems (SRSs). By using SRSs, instructors are able to ask questions and receive answers instantly, to control level of understanding of student and to provide immediate feedback to students. In other words, SRSs support the use of questioning method in classroom setting (Mayer et al., 2009; Wolter et al., 2011). Moreover, SRSs help to engage all students to course even if they are shy and quiet (Sevian & Robinson, 2011).

Although SRSs have many advantages, there are several difficulties to imply them into our educational system. One of the obstacles, maybe the most important one, is cost of the system. Setting up such SRSs cost thousands of dollars for only a

classroom (Bojinova & Oigara, 2011). Moreover, students have to pay money to buy a handheld device (Crossgrove & Curran, 2008; Wood, 2004). Therefore, an alternative system that has no cost to students and a plausible cost to institutions may be developed.

### **1.3 Purpose of the Study**

The purpose of this study is to investigate the usage of a student response system, which was designed for this study based on the needs and suggestions of faculty members, in college classrooms in order to facilitate teaching and learning process; to investigate the advantages and disadvantages of such system; and to understand the expectations and needs of both faculty members and students.

### **1.4 Significance and Originality of the Study**

Using technology in education to enhance students' learning and to constitute an active learning environment is not a recently emerging topic. Moreover, nearly each technological device was pronounced as a revolutionary solution to educational problems and then adapted to educational system. For example, Thomas Edison claimed that educational system would totally change after motion picture; books would be useless and all data and information would be transferred with motion picture (Cuban, 1986; Reiser & Dempsey, 2002).

In the literature, there are several reasons why high-tech devices, such as motion picture, radio, television and computer, were not able to or partially succeed the mission that were responsible for. One of the reasons is top-down implementation which means that someone from the governance decided to implement that technology into education (Cuban, 1986). This process is similar with Mayer's (2001) technology-centered approach. However, in this study, User-Oriented Instructional Development process (Cuban, 1986) was utilized that a system was designed based on the actual needs and problems of faculty members and students experienced in class instead of adapting an existing system. Moreover, there was no

obligation on faculty members to use this system in class that they were volunteer to use the system.

Furthermore, when Turkish National Thesis Database of the Council of Higher Education, which keeps a copy of all finished thesis and dissertations from all around Turkey, there are two master thesis (Karakus, 2014; Yıldırım, 2008) conducted by using student response systems which were conducted by using a standard SRS. As a significance of this study, a SRS is designed and developed based on the needs and suggestions of actual users, instructors and students.

Moreover, another significance of the study is designing and developing a system that has no cost for students and a little cost to institutions. Several studies (Bojinova & Oigara, 2011; Crossgrove & Curran, 2008; Duncan, 2006; Kenwright, 2009; Wood, 2004; Zhu, 2007) showed that institutions should pay thousands of dollars per classroom to set up such systems, and students should buy a clicker, also they should pay for activation. The product of the study offers a low cost system for institutions and no cost for students.

## **1.5 Research Questions**

Throughout the study, following research question will be figure out to investigate the usage of an immediate system in college classrooms in order to facilitate teaching and learning process; to investigate the advantages and disadvantages of such system; and to understand the expectations and needs of both faculty members and students.

- How does an SRS facilitate teaching and learning process in classroom?
  - a. What are the faculty members' and students' experiences about using the Students Response System?
  - b. How do faculty members and students define the benefits and problems of the Student Response system in classroom?
  - c. What are the faculty members' and students' expectations and suggestions about the Students Response System?

## **1.6 Definitions of Terms**

Student Response System: “Student response systems (clickers) are small hand-held keypads that allow students to answer a multiple-choice (MC) question displayed on a projection system. A receiver on the instructor’s computer collects the information, and it is displayed as a graph of the students’ responses.” (Crossgrove & Curran, 2008).

Feedback: “Feedback is the communication of a response to a student’s performance in relation to a given task. This response can be written, oral, electronic or a combination of all or any of these. It can also include a mark” (<http://www.adelaide.edu.au>).

SMS: “Short Message (or Messaging) Service, a system that enables mobile phone users to send and receive text messages.” (SMS, 2015).



## **CHAPTER 2**

### **LITERATURE REVIEW**

In this chapter, related literature was reviewed in two main parts in order to lead the study and construct research questions. For the first part, Student Response Systems (SRSs) and component of such systems are examined. In the second part, utilization of SRSs, advantages and disadvantages of the systems are analyzed.

#### **2.1 Student Response Systems (SRSs)**

SRSs are mentioned with a variety of names such as classroom response systems, student response systems, audience response systems, electronic response systems, personal response systems, zappers, and clicker (White, Syncox, & Alters, 2011). Although, they are mentioned via different names and there are numbers of different brands, they are consisted of four components (Wood, 2004). The first component of the system is a projection system that is used to ask question and show the results to students. The second component is a small handheld device that students use to send their responses, anonymously. The third component is receivers, which collect the answers of students and transfer to computer. The last component of the system is software that collects data includes questions, responses and optionally, attendance. Moreover, it draws graphs to summarize and to visualize the data (Crossgrove & Curran, 2008; Duncan, 2006; Hunsinger et al.,

2008; Kennedy & Cutts, 2005; Lantz, 2010; Mayer et al., 2009; White et al., 2011; Wood, 2004).

The small handheld devices used by students as a part of SRSs to transmit their answers is generally called as “clickers” which is generally as a size of a TV remote controller (Crossgrove & Curran, 2008; Lantz, 2010; Wood, 2004). Students use their clickers to send their answers by clicking a button of clicker. Questions are generally multiple choice questions that clicking a single button is enough to send their answers (Crossgrove & Curran, 2008; Lantz, 2010; Wood, 2004).



Figure 1.1 A most common clicker

(<http://clc.its.psu.edu/classrooms/resources/clickers/started/students>)

Clickers generally have four or five buttons to choose an alternative. Besides, there are modern clickers that have an LCD screen, 10-digit numeric keypad, switch button and function buttons (Caldwell, 2007; Duncan, 2006; Tao, Clark, Gwyn, & Lim, 2010). While old clickers only transmit the answer of students, modern ones

allow two-way transmissions that students get a response about delivery status of their response. Although older systems were using wires or infrared (IR) technologies to get responses, recent systems use radiofrequency (RF) or wireless technologies (Caldwell, 2007; Judson & Sawada, 2002; Lowery, 2006).



Figure 1.2 *A New version of a clicker*

(<http://www.amazon.ca/I-clicker-2-I-clicker/dp/1429280476>)

## 2.2 Components of SRSs

Even though there are numbers of different SRSs by the means of architectural structure, all are nearly same. All are designed for the same aim: enhancing teaching and learning in a classroom by increasing interaction (Duncan, 2006; Hunsinger et al., 2008; Judson & Sawada, 2002; Majerich et al., 2011; Wolter et al.,

2011). Moreover, they all have nearly same components (Crossgrove & Curran, 2008; Judson & Sawada, 2002; Lantz, 2010; Wood, 2004).

SRSs are being used in classrooms nearly for four decades. Although the technology has been changing rapidly, the main elements of the system has not been changed so much (Judson & Sawada, 2002). A SRS is generally consisted of four components that work cooperatively (Crossgrove & Curran, 2008; Lantz, 2010; White et al., 2011; Wood, 2004). The component of a SRS can be listed as

- 1) Projection system,
- 2) Student input devices,
- 3) Receiver,
- 4) Software.

### **2.2.1 Projection System**

The projection system used in SRSs is firstly used to show questions to students at the beginning of implementation. Then, it is used to show the responses of the students. Moreover, they are used to show the graphs produced by the system based on students' responses. There is no need for extra, specific projection system, if there is already one such as a projector, smart-board, wide LCD screen, etc. (Lowery, 2006).

### **2.2.2 Student Input Devices**

There are many kinds of student input devices from very simple devices with single button to very complicated devices with screens, keypads and allow to texting. While traditional SRSs allow students to answer the questions during the class, recent SRSs employ virtual clickers that allow students to response via any kind of portable device from a smartphone to laptop computers by signing in a custom web site or an application. As personal computer and traditional clickers have become parts of educational system, virtual clickers have begun to be utilized at colleges and universities (Tao et al., 2010).

While there are several grouping about students input devices from their prices to direction of interaction, grouping based on their architecture is taken into consideration here.

**Infrared (IR) Keypads:** Infrared keypads are small devices with a limited number of buttons. There are generally four or five buttons to answer multiple-choice questions. They generally allow one-way interaction, which means that students are able to send a response, and they do not receive any feedback whether their answer was reached or not. They should generally control whether their response was received or not by following the number of their registration number of their keypads (Bojinova & Oigara, 2011; Lowery, 2006).

**Radiofrequency (RF) Keypads:** Radiofrequency keypads are small devices similar with IR keypads. However, RF keypads generally allow two-way interaction that means students receive a feedback if their response is received. Moreover, there is a screen and an alphanumeric keyboard that allows instructor to ask open-ended questions (Lowery, 2006).

**Virtual Keypads:** This category includes several different types of devices those can be used as an input device for SRSs such as mobile PDAs, smartphones, laptop computers. They are generally web based and need the Internet connection to connect a certain website or to use an application to be used in classrooms. They generally allow two-way interaction, texting and following the results on their own screen (Smith et al., 2009).

### **2.2.3 Receivers**

A receiver is generally defined as “a piece of radio or television apparatus that detects broadcast signals and converts them into visible or audible form” (Oxford Online Dictionary). However, it is used as a small device that is used to collect responses from input devices of students to transfer them to software used to store them (Lowery, 2006; White et al., 2011). Two of the mentioned student input

devices, IR and RF, need receivers to send data to software (Lowery, 2006; White et al., 2011).



Figure 1.3 *A Receiver for SRS*

(<https://www.it.umass.edu/audience-response-system>)

#### **2.2.4 Software**

The software used in SRSs has several functions based on the aim and content of the course. But, the main purpose of the system is collecting responses of the students via receivers, drawing charts and storing them (Lowery, 2006; Martyn, 2007; White et al., 2011). Furthermore, software is used to take attendance; storing SRS based quiz grades (Lowery, 2006).

### 2.3 Usage of Student Response Systems

SRSs are one of the most effective ways that offer instructors to reform their impersonal, passive, and anonymous classroom environment to personal, active, and responsible one. Especially in large enrollment courses, SRSs provide opportunity to and encourage each student to actively participate to course; and, let instructors to assess students' level of understanding immediately, theoretically (Trees & Jackson, 2007).

SRSs allow students to answer their instructors' questions quickly and anonymously via their input devices; instructors to control understanding level of students and to give immediate feedback to them (Lantz, 2010; Morling, McAuliffe, Cohen, & DiLorenzo, 2008; White et al., 2011). So, they are used as an active learning tool commonly in most classrooms today (Lantz, 2010).

As usual, new technology does not appear suddenly without any reason. It generally comes up from an existing technology to solve a recent problem. The nearly same thing happened to SRSs. The SRSs were started to be used in classrooms begun in 1960s after filmed instruction materials were employed by military in 1950s; and, they have been used with variety of purposes since then (Judson & Sawada, 2002).

SRSs are generally used to ask multiple-choice questions to students during within the ordinary flow of the classes. The sequence of asking a question via such systems' process could be arranged as,

- a) Asking question: Questions may be asked verbally, but mostly asked via projection system (Lantz, 2010; Tao et al., 2010; Wood, 2004). Generally, questions are prepared before class as a part of preparation part of lecture like preparing lecture notes and lesson plans. But, instructor can add more questions during the class based on the class environment (Caldwell, 2007).
- b) Receiving answers: A particular time is given students to answer the question. They answer the question by using their input devices. Duration changes depend on difficulty of the question.

- c) Results and discussion: After the time is up, results and graphs drawn by the system automatically are shown to class via projection system. Graphs allow instructor to see whole picture. If there are different answers given to same question, instructor could start a discussion. These discussions are one the most effective ways of learning. Furthermore, they allow instructors to analyze students' level of understanding and misconceptions (Bojinova & Oigara, 2011; Caldwell, 2007; Lantz, 2010; Tao et al., 2010; Wood, 2004).

The process generally occurs as it mentioned. Instructors usually employ such system without substantially change in their lecture format. They generally use SRSs as a small part of their lecture that supplements lectures with questions (Kennedy & Cutts, 2005). Although having several benefits and being easy to use, instructors do not employ SRS in their courses due to required time and effort to both preparing questions and learning an additional tool (Sevian & Robinson, 2011).

#### **2.4 Student Response Systems and Related Educational Theories**

SRS is associated with a number of educational theories such as generative learning, motivation of students, effective feedback using (Wolter et al., 2011), active learning (Fifer, 2012); and strategies, just in time teaching (JiTT) and peer instruction (Crossgrove & Curran, 2008), class-wide discussion (Kennedy & Cutts, 2005). The way of using SRSs effectively changes depend on the aim and concept of the course (Kennedy & Cutts, 2005; Lantz, 2010).

One of the most common purposes of using SRSs is peer instruction and discussion. Increasing students' interaction, engagement and effectiveness of a course by supporting peer instruction via SRSs could be intriguing for instructors (Smith et al., 2009). Peer instruction strategy requires students' individual preparation before the class. The lecture revolves around questions asked via SRS related with the topic that students studied before the class. The common steps, defined before, and two additional steps are followed to employ peer instruction during class. In this application, instructor asks a question, students respond individually, teacher shows

graphs and results, students discuss within small groups, students individually respond to same question, instructor explain the question and the correct answer and leads to another discussion if needed (Crossgrove & Curran, 2008; Kennedy & Cutts, 2005; Smith et al., 2009). According to Smith et al. (2009) most instructors reported that peer discussion increase percentage of correct answers and students' self-confidence.

Class-wide discussion is a way of using SRSs during the class similar with peer instruction. The difference from peer instruction, as seen from the name, is emphasis on class-wide discussion rather than small groups. In this case, instructor asks a question, students discuss with their peers, respond to question either individual or as a group. After voting finishes, instructor leads a class-wide discussion, gives feedback to different responses, and explains the most appropriate or the correct answer (Kennedy & Cutts, 2005).

Another way of using SRSs is assessing students' readiness to course (Sevian & Robinson, 2011). There are two sides one of which is controlling whether students have misconceptions about the topic, or not (Sevian & Robinson, 2011). The second side is to control whether students remember other courses' interdisciplinary content that they have learned before which is a prerequisite to current course. Using SRSs is a good way of control and activate students' prior knowledge (Kenwright, 2009; Zhu, 2007). Moreover, SRSs could be used at the end of the class to control student improvement (Sevian & Robinson, 2011).

According to Vanderbilt University, Center for Teaching (2015) there are number of different question types could be asked via SRSs, although they are capable of asking only multiple-choice questions. The main or most common question types could be listed as recall questions, conceptual understanding questions, application questions, critical thinking questions, student perspective questions, confidence level questions, monitoring questions, classroom experiments. Each question type has a different purpose and requires a different level of challenge.

Not only the purpose, but also how SRSs are used is important. They should be used by transparently integrating with the content. The flow of the lecture should not be interrupted by questions; they should be integrated to the class as a part of flow (Sevian & Robinson, 2011). Moreover, questions should not be so easy or very hard. They should direct students to think deeply. SRSs are more effective if they are challenging (Majerich et al., 2011).

Even though some of them were presented above, different purposes of using SRSs can be listed as:

- to increase interaction (Caldwell, 2007; Duncan, 2006; Kennedy & Cutts, 2005; Kulesza, Clawson, & Ridgway, 2014; Smith et al., 2009; Trees & Jackson, 2007; Zhu, 2007),
- to facilitate peer discussion (Crossgrove & Curran, 2008; Duncan, 2006; Kennedy & Cutts, 2005; Sevian & Robinson, 2011; Zhu, 2007),
- to assess students readiness (Caldwell, 2007; Duncan, 2006; Sevian & Robinson, 2011),
- to assess formatively (Caldwell, 2007; Duncan, 2006; Sevian & Robinson, 2011; Trees & Jackson, 2007; Zhu, 2007),
- to make lecture fun (Caldwell, 2007),
- to measure attitudes (Duncan, 2006),
- to find common misconceptions of students (Duncan, 2006; Trees & Jackson, 2007),
- to grade (Duncan, 2006),
- to increase attendance and participation (Duncan, 2006; Kulesza et al., 2014; Sevian & Robinson, 2011),
- to understand level of learning (Zhu, 2007),
- to prepare exams or quizzes (Fifer, 2012; Kennedy & Cutts, 2005),
- to give immediate feedback without waiting (Duncan, 2006; Sevian & Robinson, 2011; Trees & Jackson, 2007).

These are the most common ways of using SRSs. The list is not limited with only these purposes; SRS is a flexible tool that may be limited only by the imagination instructor and question format itself (Caldwell, 2007; Crossgrove & Curran, 2008).

## **2.5 Advantages of Student Response Systems**

SRSs are low cost and easy to use devices that have several advantages in classrooms (Duncan, 2006). They mainly aimed at improving students' learning in classroom environment (Lowery, 2006) by facilitating change in both students' and instructors' behaviors (Wood, 2004).

While there are numbers of different ways of using clickers, there are numbers of different advantages of SRSs. The most prominent and common advantages of SRSs are listed below. These advantages are not separate from each other; on the other hand, they are tightly connected with each other.

### **2.5.1 Feedback**

Teaching and learning process could be thought as a cycle consisted of three steps (Schartel, 2012). The first step of the cycle is defining the goals and objectives of education. While goals are more general statements define the purpose of education, objectives are more specific statements that define what needs to be taught and achieved at the end. The second step is students' process of reaching the objectives by teaching, studying and implementation. The next step is evaluation that investigates whether students reached the objectives, or not. There are two kinds of evaluation: formative and summative. Formative evaluation compares the performance with goals and provides feedback to support learning. Summative evaluation is used to determine the level of learning. In brief, formative assessment is used to support and increase the performance of user, summative assessment is used to determine whether a student is successful, or not (Schartel, 2012).

Feedback is a complementary component of education that reveals the gap between the objectives and the current situation of the student in order to help them to reach

educational goals (Schartel, 2012). In general, feedback could be defined as any of different procedures to tell a student whether the response is correct, or not. Feedback has two main duties. The first one is letting students know when they are correct. And, the second one is to correct or letting them correct themselves when they are wrong (Kulhavy, 1977).

Feedback is essential to the development of effective learning and has a powerful influence on the development of learning outcomes (Hattie & Gan, 2011). Students could learn faster and more effectively when they get clear and corrective feedback (Carless, 2006; Kulhavy, 1977; Scheeler & Lee, 2002; Thurlings, Vermeulen, Bastiaens, & Stijnen, 2013). Furthermore, providing feedback to students help them to improve their achievement and the level of reached goals; and, providing feedback for incorrect responses is much more important than providing feedback to correct responses (Kulhavy, 1977).

#### **2.5.1.1 Types of Feedback**

According to Brookhart (2008), feedback strategies may vary based on several different variables such as timing, amount, mode, and audience. Furthermore, the content of the feedback may vary in focus, comparison, function, valence, clarity, specificity, and tone (Brookhart, 2008).

##### *Timing of feedback*

Feedback could be categorized as immediate and delayed feedback based on timing (Brookhart, 2008). The main goal of immediate or slightly delayed feedback is to help students to fix their problems related with the topic, while they are still mindful about the topic, and while they still have time to apply the feedbacks (Brookhart, 2008). In a similar vein, Thurlings et al. (2013) stated that any kind of feedback is better than no feedback, and immediate feedback is better than delayed feedback. The best feedback should be immediate, specific, positive and corrective (Scheeler & Lee, 2002; Thurlings et al., 2013).

O'Reilly, Renzaglia, And Lee (1994), and O'Reilly et al. (1992) examined the effect of immediate and delayed feedback. In these studies they provide immediate feedback at the same day and delayed feedback in one to three days. Immediate feedback leads to faster acquisition of effective teaching behavior. Furthermore, Kulhavy and Wager (1993 as cited Mory, 2004)) stated the importance of both the content and the timing of the feedback that have influence on learning. While the content of feedback should be corrective instead of notifying just correct or wrong, even seconds could be crucial for the timing of feedback.

Thurlings et al. (2013) conducted a literature review in order to investigate the relationship between feedback and learning theories. According to their study timing of the feedback is one of the most important issues to be considered, and all theories suggested frequent, on-going and corrective feedback.

Moreover, in traditional school setting, learners are able to have feedback after one or two weeks later than test implemented. Moreover, many of them only control which of their answers were incorrect. They mostly do not have chance to question why their answer is incorrect due to time limitation. So, generally, feedback does not reach the aim of correcting misunderstandings and mistakes (Lantz, 2010). SRSs provide regular and immediate feedback for both students and instructors (Fifer, 2012; Kennedy & Cutts, 2005; Sevian & Robinson, 2011; Tao et al., 2010). These feedbacks may cover understanding of concept individually and class-wide, content covered prior classes, level of understanding or learning which often do not emerge during traditional classes, not before an assessment such as an exam which is too late to fix (Fifer, 2012).

#### *Amount of feedback*

One of the challenging aspects is the amount of feedback. The amount should be just right; nothing less, nothing more (Brookhart, 2008). The correct amount helps students to link what students already know and what they supposed to know, and takes them to the next level (Brookhart, 2008).

### *Mode of feedback*

There are different modes for feedback such as written feedback, oral feedback, and demonstration; and these modes may vary based on several components such as topic, assignment, and audience (Brookhart, 2008). While oral feedback is applicable in any age group, and for all topics, written feedback is more applicable in older age groups, and based on the topic and assignment. Furthermore, demonstration might be more effective for younger age groups, such as pre-schoolers, to teach or to correct a psychomotor skill (Brookhart, 2008).

Learning occurs best when corrective feedback provides to learner instead of giving correct answer lonely (Carless, 2006; Kulhavy, 1977; Scheeler & Lee, 2002; Thurlings et al., 2013). However, students mostly receive feedback in traditional classroom settings, and most of the feedback is inadequate or poorly used to correct the problems (Hattie & Gan, 2011).

### *Audience*

One of the most important specialties of SRSs is allowing instructor to ask questions to crowded groups; collecting answers immediately; showing results and graphs at the same time; and, providing immediate feedback with correct answer just after voting finishes, especially for whole class, instead of a number of students. By the way, learners are able to recognize drawback of their own knowledge, and have chance to fix them immediately (Caldwell, 2007; Kenwright, 2009; Lantz, 2010; Lowery, 2006; Sevan & Robinson, 2011; Trees & Jackson, 2007). The motivational part of feedback is telling people how well they are performing and this could be thought as an indicator of their future achievements (Kulhavy & Wager, 1993). Moreover, instructors are able to understand students' level of understandings, and misconceptions; so, they may assess students and design their further classes based on this information (Lantz, 2010; Lowery, 2006; Tao et al., 2010).

Most of the teachers give feedback to groups instead of individuals, and students might think that the feedback is irrelevant to them (Hattie & Gan, 2011). On the other hand, SRSs give chance student to compare their level of understanding with their peers. Students mostly think that most of the class did not understand the lecture; while, it is actually not. Students recognize the gap between their and peers' level of understanding, if there is. This could motivate and lead students to study (Kenwright, 2009).

### **2.5.2 Participation / Interaction**

According to Bojinova and Oigara (2011), if students do not feel involved in the learning process, they are unwilling to work hard to understand lecture, and to be successful. In traditional classroom structure, only a small number of students has chance to speak during a discussion (Bojinova & Oigara, 2011). On the contrary, SRSs allow whole class to participate and improve interactive atmosphere of the class (Bojinova & Oigara, 2011; Caldwell, 2007; Duncan, 2006; Kenwright, 2009; Kulesza et al., 2014; Tao et al., 2010; Terrion & Aceti, 2012). Lowery (2006) states that better learning and enrollment retention are in direct proportion to active participation during the class. Actually, the format of traditional class inhibits learners' speaking. Students generally have a passive role during the lecture that their attention decreases in a while (Duncan, 2006). An interactive system such as SRSs could be employed to increase discussion and interaction (Duncan, 2006).

As a course of its nature, SRSs increase participation by giving chance all students to answer the same question. The governing idea of SRSs has been used since the time of Socrates, which is asking interactive and instructive questions to learners to allow them discuss (Caldwell, 2007). However, increasing number of learners in a classroom makes applying this method difficult, in some cases impossible. Students mostly unwilling to participate a discussion or to answer a question due to fear of public mistakes and humiliation (Caldwell, 2007).

SRSs help learners to actively participate in discussions held during the classes so they learn better, retain longer, and implement effectively (Tao et al., 2010). It

could be said that how much learners participate, that much they learn and use knowledge (Lowery, 2006). As a result, level of retention (Lowery, 2006; Tao et al., 2010; Trees & Jackson, 2007) and grades (Kenwright, 2009) increase. Furthermore, active participation in class allows students to get immediate feedback explained before (Lantz, 2010).

Employing SRSs do not allow students to sit quietly, passively in a class without any interaction. SRSs push students to come class prepared to be able to answer questions, to answer questions, and discuss with their peers (Terrion & Aceti, 2012; Zhu, 2007). Peer discussion and instruction is one of the best ways of learning supported by SRSs (Lowery, 2006; Terrion & Aceti, 2012; Trees & Jackson, 2007). Furthermore, SRSs not only support peer interaction, but also learner- instructor interaction, which is generally inadequate, missing or limited (Fifer, 2012).

### **2.5.3 Anonymity**

In class, discussions generally hold within a small group of students, generally limited with number of two or three. Furthermore, if the answers given by the students are correct, instructors generally move to next question or topic (Martyn, 2007). Using hand rising or response cards may increase the number of students who respond to question (Caldwell, 2007).

Students are generally unwilling to participate discussion or answer questions due to public risk (Martyn, 2007); in other words fear of public mistakes or embarrassment (Caldwell, 2007). Level of unwillingness generally increases parallel to increase in number of learners (Caldwell, 2007; Martyn, 2007).

Instructors may employ different strategies such as hand rising and response cards to increase the number of students who participate in discussions. But, a number of students still feel anxious to participate in discussion. Employing SRSs bring about more students' participation to discussions than using hand rising or response cards due to anonymity of SRSs. Students ask for responding anonymously that neither instructors nor other students know what their answer is (Lantz, 2010).

SRSs give chance students to answer questions anonymously without concerning about embarrassment about public speaking, giving wrong answer and humiliation (Caldwell, 2007; Hunsinger et al., 2008; Lantz, 2010; Martyn, 2007; Patterson et al., 2010). SRSs let students to response without anxiety about humiliation that may lead collaboration, active learning, peer instruction and interaction within students.

#### **2.5.4 Engagement / Encouragement**

One of the common active learning technique used instructors to engage students is questioning method. In questioning method, instructor asks several questions during the class and students try to answer them correctly. Generally, students do not want to speak in front of whole class, especially due to humiliation. Students should be engaged to the class to provide participation (Lantz, 2010).

SRS is a technology that supports engagement of the students (Bojinova & Oigara, 2011; Terrion & Aceti, 2012), while engagement is crucial for learning (Mayer et al., 2009; Terrion & Aceti, 2012). Mayer and Wittrock (2006) supposed that there is a positive correlation between learning and engagement. In other words, the more students feel engaged, the better learning and retention occurs (Lantz, 2010; Wood, 2004). Moreover, SRSs encourage instructor-student contact which is generally insufficient by providing and supporting an interactive environment (Fifer, 2012).

Apart from mentioned advantages there are several advantages such as raising concentration (Kennedy & Cutts, 2005; Lin et al., 2011), increasing student satisfaction (Lowery, 2006), improving attendance and preparation (Kenwright, 2009; Kulesza et al., 2014; Lowery, 2006), improving grades (Bojinova & Oigara, 2011; Crossgrove & Curran, 2008; Kenwright, 2009), improving effectiveness of learning (Lowery, 2006; Oswald & Rhoten, 2014; Terrion & Aceti, 2012), saving time (Martyn, 2007), and contributing to protection of nature by removing paperwork (Martyn, 2007).

## **2.6 Disadvantages of Student Response Systems**

### **2.6.1 Cost**

The biggest disadvantage of SRSs is the cost of the system for both students and institutions. While there several different types of SRSs are being used in classrooms, all have a cost for both students and institutions. The price of SRSs mostly depends on the type that purchased (Bojinova & Oigara, 2011; Duncan, 2006). A student input device sale for \$5 to \$30 depends on its type. Moreover, students should pay a registration fee each semester ranged from \$15 to \$25 per semester (Bojinova & Oigara, 2011; Crossgrove & Curran, 2008; Duncan, 2006; Wood, 2004; Zhu, 2007).

Furthermore, receivers should be placed in classrooms in relation to number of students. If IR input devices are being used there should be a receiver per fifty students that nearly costs \$250. If RF input devices are being used only one receiver is enough. If virtual clickers are being used, each student has to have a smartphone, a PDA or a laptop computer. The cost of a SRS is ranged from \$1000 to \$3000 based on the number of input devices and receivers (Bojinova & Oigara, 2011; Crossgrove & Curran, 2008; Duncan, 2006; Kenwright, 2009; Smith et al., 2009; Wood, 2004; Zhu, 2007).

### **2.6.2 Technical Problems**

One of the biggest problems of using technology in education is technical problems of the technology. In SRSs there may be some technical problems due to infrastructure of the system. Mostly, SRSs, which employ IR, input devices have technical problems. IR keypads require a straight line between input device and receiver with a specific angle. Input device should be directed to receiver and there should not be any obstacle between input device and receiver. Furthermore, distance between input device and receiver should be approximately twenty-four meters or less (Lowery, 2006).

## **2.7 The Gap Found in the Literature**

When the literature is examined it is seen that a huge number of studies have been conducted over four decades to examine the using of SRSs in classrooms. They mostly put forward that students have positive attitude towards using SRSs in classrooms and students believes that using SRSs helps them to better understand (Judson & Sawada, 2002). The most common research topics of the studies could be listed as learning effectiveness, academic achievements in grades, interaction engagement and students' perceptions. On the other hand, these studies did not employ a SRS designed by them according their needs. They used commercial products, which were designed with general usage. In this study, a specific SRS was designed based on instructors' and students' needs and suggestions.

In addition, there are limited numbers of studies conducted in Turkey. When Turkish National Thesis Database of the Council of Higher Education, which keeps a copy of all finished thesis and dissertations from all around Turkey, there are two master thesis (Karakus, 2014; Yıldırım, 2008) and these thesis were conducted by using standard SRSs. Moreover, while one of these studies was conducted to examine the use of SRS, and opinions of students; the other one examined the attitudes of pre-service teachers' attitudes towards SRSs.

Furthermore, there is a gap about how these systems should be used. What are the appropriate instructional strategies? For example, it is not definite that how much questions to be asked during a class, how frequently these systems should be used during a semester.



## CHAPTER 3

### METHODOLOGY

In this chapter, research procedure of the study is presented under these titles; design of the study, researcher's role, selection of participants, instruments of the study, data collection procedure, data analysis, and trustworthiness. Firstly, the purpose of the study will be described with research questions in the following section.

#### **3.1 Purpose of the Study and Research Questions**

The purpose of this study is to investigate the usage of a student response system, which was designed for this study based on the needs and suggestions of faculty members, in college classrooms in order to facilitate teaching and learning process; to investigate the advantages and disadvantages of such system; and to understand the expectations and needs of both faculty members and students.

The research question and the sub-questions of the study are given below

- How does a SRS facilitate teaching and learning process in classroom?

- a. What are the faculty members' and students' experiences about using the Students Response System?
- b. How do faculty members and students define the benefits and problems of the Student Response system in classroom?
- c. What are the faculty members' and students' expectations and suggestions about the Students Response System?

### **3.2 Design of the Study**

The qualitative, multiple-case study methodology was utilized to answer the research questions. Fraenkel, Wallen, and Hyun (2012) described the qualitative research as “studies that investigate the quality of relationships, activities, situations, or materials are frequently referred to as qualitative research” (p. 426). There are some reasons to employ qualitative research methodology within this study. Qualitative research studies, contrary to quantitative research studies, interested in describing all details of a situation and endow researchers to conduct in-depth studies (Creswell, 2007, 2009; Fraenkel et al., 2012; Yin, 2011). In this study, how a SRS facilitate teaching and learning process in classroom was analyzed in-depth. Furthermore, in qualitative studies data is generally collected in the real-world settings of the participants to get better understanding of the phenomena (Creswell, 2007, 2009; Yin, 2011). In this study, how a SRS facilitate teaching and learning process in classroom and what are the benefits and problems of Student Response System in classroom were investigated in real-world context. Also, qualitative research studies represent the views and perspectives of participants and covers conceptual conditions (Creswell, 2009; Yin, 2011). One of the main goals of this study is to understand the opinions and perspectives of the professors and students who actually use the system.

Case study research is one of the qualitative approaches that researchers conduct in-depth investigation of a single or multiple cases over time by employing several different data collection methods such as observations, interviews, or scanning documents or reports in order to understand a real life phenomenon, which embrace

a unique situation (Creswell, 2007, 2009; Yin, 2009). Case studies could be generalizable to theoretical propositions, not to population (Yin, 2009).

The case study is one of the several ways to conduct social science research. There are several different research methods; and, each method has its own advantages and disadvantages based on type of the research question, the control of researcher and focus on whether the phenomena is contemporary or historical (Yin, 2009).

According to Creswell (2009), case studies could be distinguished by the size of the bounded cases, or the intent of the case analysis. Based on the size, there would be one individual, several individuals, a group, an entire program, or an activity. Based on the intent of the case analysis, case studies maybe distinguished in three variations: the single instrumental case study, the collective or multiple case study, and the intrinsic case study. In a single instrumental case study, the researcher focuses on a single issue, and selects just a single case to illustrate the issue. In a multiple-case study, the researcher selects an issue or concern, and selects multiple bounded cases to illustrate the issue. The researcher might choose these cases from different areas, or from within a single site. The researcher generally choses multiple cases to show different perspectives on the same issue. The third case study design is an intrinsic case study that focuses on the case itself.

Case studies are generally preferred when (a) Researchers ask “why” and “how” questions, (b) researchers has little or no control, and (c) the focus is on a contemporary phenomenon. These three situations distinguish case studies from other methods, but there is no distinct line and there are gray areas as always (Yin, 2011). In this study researcher employed case study, because he tried to understand how such system affects classrooms, how could such system be used; and, he almost had no control over the participants or the classroom setting during the study. Furthermore, data of the study were based on a contemporary and unique phenomenon that the system was developed for this study, there was no similar system being used in familiar situations and the participants were experiencing the system for the first time.

### 3.3 Researcher's Role

According to Creswell (2009) and Yin (2011), researcher is the key instrument in qualitative studies. Qualitative researchers collect data via several methods, such as interviews, observations, and document analysis from variety of resources. Although researchers use different instruments and follow their protocols to collect data, they are the actual data collection instruments. During a qualitative study researchers collect and analyze data, and represent the results from their perspective. These overloaded duties brings some challenges and researchers have to have some technical such as listening, asking adequate questions, expertise on topic, caring about data, parallel processing and persevering (Yin, 2011).

While qualitative researchers have the leading role within the study, their role may influence the study called as “reflexivity”. Yin (2011) defined reflexivity as “*the dynamic interplay whereby participants (i.e., those being studied) may be influenced by the presence and actions of the researcher, and conversely the influence on the researcher’s thinking and observations resulting from the presence and actions of the participants*” (p. 132). Similarly, Creswell (2009) defined the “reflexivity” as “*researchers reflect about how their biases, value, and personal background such as gender, history, culture and socioeconomic status, shape their interpretations formed during a study*” (p. 233). According to Yin (2011), reflexivity increases when researcher involved in real-world settings of a participant due to presence as a foreigner; so, researchers should minimize the reflexivity, if they could not eliminate it. The role of researcher was explained in two ways to minimize the reflexivity.

At first, biography of the researcher is presented. Researcher is a Ph.D. candidate and research assistant of College of Education, Computer Education and Instructional Technology Department at a public university in Turkey. He got his M.S. and B.S. degrees from the same department of a different public university in Turkey. He took several course related instructional technology and educational research. In addition, researcher completed Collaborative Institutional Training Initiative at the University of Miami (CITI Program), and attended a two-day

Institutional Review Board training at University of Oklahoma, USA. Secondly, each participant was informed about the researcher's role during the data collection process. Moreover, informed consent form (as seen in Appendix A) was given to each interviewee at the beginning of interviews. For observations, researcher attended the courses that the system was using just to help professors in case they need help related with system usage. The role of researcher in the classroom was told to students in order not to cause anxious behaviors. In addition, researcher shared all findings and concerns with his advisor and Thesis Monitoring Committee.

Furthermore, the researcher has a key role for the design and development of the system. As stated before, the researcher collected all the data of the study. So, he was responsible for the design of the system, communication with the company developing the system, and controlling the system. In addition, as stated before, the researcher was a research assistant, and a faculty member candidate in the same university. As a part of his role, he tried to be part of design and development process as the way that he would implement his own classes. The researcher would like to use this system in his all possible classes via different ways such as using at the beginning of the class in order to gain attention, to asses prior knowledge; during the class to start and carry on discussions; at the end of the class to review and, to evaluate.

### **3.4 Selection of the Participants**

Data of the study were collected from three different cases and two groups of participants for each case. Purposive sampling was utilized to determine the participants of this study. Purposive sampling is one of the non-random sampling methods that the researchers select participants based on their characteristics (Creswell, 2007, 2009; Fraenkel et al., 2012; Miles & Huberman, 1994). According to Creswell, (2007, 2009), the main sampling method used in qualitative studies is purposive sampling that helps researchers to better understand the problem and research questions. A more limited universe and logical social process make purposive sampling more adequate than random sampling for qualitative studies.

Besides, sampling involves decisions not only participants, but also settings, events and social processes (Miles & Huberman, 1994). College level courses were selected as the limited universe of the study based on some reasons. At first, students should be mature enough to understand the study, to not to make fun of it, to attend the sections and to answer interview questions responsively. Secondly, Ministry of National Education (MoNE) has some strict rules about mobile phone usage in schools. Although MoNE distributes tablet PCs to students, they are not allowed to use mobile phones in K-12 schools, in Turkey (MoNE, 2007). Lastly, Internet connection and a projector are must for system usage. Although MoNE distributed smart boards and provide Internet connection to most of schools, there are some schools or classroom with no Internet connection and/or projector. On the other hand, each college classroom has Internet connection and a projector, at least.

#### **3.4.1 Participants of the First Case**

The first case of the study was a course from College of Education. The purpose of this course is to “*provide the students with general understanding of basic principles of guidance; functions of guidance programs in schools; roles and functions of school counselors; process of helping relationship*” (METU Academic Catalog, 2015). This course was a must course offered to all senior level College of Education students during the spring semester of each academic year. This course had several sections and there were around 40 students attended to each section. There were 37 students attended to this section of the course from three different departments, which were Computer Education and Instructional Technolog (CEIT), Elementary Education (ELE), and Foreign Language Education (FLE). Attendance and active participation had 10% ratio in total grade of the course. Actually the faculty member employes different practices in order to obtain and maintain active participation such as collecting responses of students via small piece of papers as polling.

There were two groups of participants for the first case. There was just one faculty member participant in the first group. The faculty member was an associate professor. She graduated from the Department of Psychological Counseling and

Guidance in 1990, got her M.S. degree in 1993 and Ph.D. in 1999 from the same department. She had been working as a faculty member since 1999. The second group of the participants was consisted of six undergraduate students from two different major. Unique codes were assigned to each participant to hide their identity. A code is consisted of two parts, and each part has two components. The first part had one letter and a number such as “C1”. “C” meant case, and “1” showed the number of case. The second part had one letter and a number, too. In the second part “S” meant student, and number showed the number of participant (Table 3.1). There was a small variation for the faculty members. In the second part, “F” represented faculty member, but there was no need to allocate a number for faculty members, because there was just one faculty member for each case.

Table 3. 1  
*Information about Student Participants of the First Case*

Code	Major	Year	Gender
C1_S1	Compt. Ed. & Inst. Tech.	4	Male
C1_S2	Compt. Ed. & Inst. Tech.	4	Male
C1_S3	Compt. Ed. & Inst. Tech.	4	Male
C1_S4	English Language Teaching	4	Female
C1_S5	Compt. Ed. & Inst. Tech.	4	Female
C1_S6	Compt. Ed. & Inst. Tech.	4	Male

### **3.4.2 Participants of the Second Case**

The second case of the study was a course from College of Arts and Sciences. The content of the course is to “*review of current knowledge and theories concerning differential treatment of men and women at work, leadership through a gender lens as well as gender issues relevant to managing career and nonwork. Topics include but not limited to gender role stereotyping, different forms of inequalities and*

*discrimination in the workplace, women and men in management and leadership, and gender as it relates to work-family interface*” (METU Academic Catalog, 2015). This course was an elective course offered to senior level students during the spring semester of each academic year. This course had one section and there were around 25 students attended. The classes were really interactive, because students were supposed to read two to four articles each week before the class, and they are supposed to discuss these articles under the leadership of a group of students. The faculty member just had a role of facilitator. The leader group was responsible for the lecture, and they are supposed to start, and carry on a discussion by asking questions, and finalizing the topic. The class proceeded based on the questions. The faculty member paid attention to active participation and track the students during the classes. She used the system to ask questions at the beginning of the class in order to ensure that the students, who knows several questions will be asked at the beginning of the class, read the articles.

There were two groups of participants for the second case, too. One participant in the first group was the faculty member teaching the course. The faculty member was a full professor. She graduated from the Department of Psychology in 1985, got her M.S. degree in 1988 from the same department. Furthermore, she got her M.A. degree in 1991 and Ph.D. degree in 1996 from U.S. universities. She had been working as a faculty member since 1999. The second group of the participants was consisted of six undergraduate students from department of psychology. Unique codes were assigned to each participant to hide their identity. A code is consisted of two parts, and each part has two components. The first part had one letter and a number such as “C2”. “C” meant case, and “2” showed the number of case. The second part had one letter and a number, too. In the second part “S” meant student, and number showed the number of participant (Table 3.2). There was a small difference for the faculty member. In the second part, “F” represented faculty member, but there was no need to allocate a number for the faculty member, because there was just one faculty member for each case.

Table 3.2  
*Information about Student Participants of the Second Case*

Code	Major	Year	Gender
C2_S1	Psychology	4	Male
C2_S2	Psychology	4	Female
C2_S3	Psychology	4	Female
C2_S4	Psychology	4	Female
C2_S5	Psychology	4	Female
C2_S6	Psychology	Graduate-First Semester	Male

### 3.4.3 Participants of the Third Case

The third case of the study was a course from College of Engineering. The content of this course included “*Production, types, uses in construction, properties and tests for these materials: lime, gypsum, hydraulic cements, mineral aggregates, concrete, clay products, ferrous metals, polymers, bituminous materials, timber. Constituents, theories of mix design, principal steps in production, physical and mechanical properties of concrete.*” (METU Academic Catalog, 2015). This course was a must course offered to all junior level College of Engineering, Department of Civil Engineering students during the spring semester of each academic year. This course had several sections and there were around 30 students attended to each section. Although there were 23 students attended to this section, the number of students decreased to 14 during the semester. Although attendance was not mandatory, the faculty member wanted that students attend and participate to the class. Thus, he used the system in order to gain attention of the students to increase attendance and participation. The course was mostly a verbal course due to covering structures of materials, and having no calculation, although it was an engineering course.

There were two groups of participants for the third case. One participant in the first group was the faculty member teaching the course. He graduated from the Department of Civil Engineering, got her M.S. degree from the same department. Furthermore, he got his Ph.D. degree from a U.S. university. He had been working as a faculty member since 2003. The second group of the participants was consisted of seven undergraduate students from department of civil engineering. Unique codes were assigned to each participant to hide their identity. A code is consisted of two parts, and each part has two components. The first part had one letter and a number such as “C3”. “C” meant case, and “3” showed the number of case. The second part had one letter and a number, too. In the second part “S” meant student, and number showed the number of participant (Table 3.3). There was a small difference for the faculty members. In the second part, “F” represented faculty member, but there was no need to allocate a number for faculty members, because there was just one faculty member for each case.

Table 3. 3  
*Information about Student Participants of the Third Case*

Code	Major	Year	Gender
C3_S1	Civil Engineering	3	Male
C3_S2	Civil Engineering	4	Male
C3_S3	Civil Engineering	3	Male
C3_S4	Civil Engineering	4	Male
C3_S5	Civil Engineering	3	Male
C3_S6	Civil Engineering	3	Male
C3_S7	Civil Engineering	3	Male

### **3.5 The System**

The system used in this study was designed by the researcher and his Ph.D. advisor based on the actual needs and suggestions of faculty members of Middle East Technical University; and developed by a company working in collaboration with GSM companies. The Ph.D. advisor of the researcher is the director of Instructional Technology Support Office (ITS) of the University. The ITS was requested to get an SRS to be used in college classroom by faculty members who were especially got their graduate degrees from the U.S. universities and used similar systems there. Providing such system in Turkey is a problematic issue because of several reasons such as there were not enough reseller of the systems that both owning and maintaining costs were high. Furthermore, such systems, on the contrary to foreign ones, were sold integrated with a smart-board with a limited number of clicker device, twenty-four or thirty-six. These devices could be used just in the classroom where the smart-board was placed due to matching between them. Moreover, those clicker devices belonged to classroom that they should be kept in classroom or professors should carry and hand in them to the students at the beginning of the lesson and collect them back at the end. Lastly, these systems were designed for a limited use and users could not modify them. While the researcher and his Ph.D. advisor were searching for a solution, they recognized that each college student has a mobile phone and it could be used for this purpose. Even though it was thought that smartphones could be used for this study, the student demographics showed that each college student had a mobile phone, but they all did not have a smartphone. For this reason, it was decided to use mobile phones and the ability of the basic mobile phone has, short messaging service (SMS), as a necessity; instead of using smart phones or other devices based on the idea of “No child left behind”.

During the design and development process user-oriented instructional development process (UOID) of Burkman (1987) was employed. There were several reasons to adopt this model. If the history of Instructional Technology was examined, it was seen that each technological device was admitted as a revolutionary solution to educational problems and was adapted to educational system. Nevertheless, none of

these devices were reached to expected high goals (Cuban, 1986; Reiser & Dempsey, 2002).

In the literature, there were several reasons why technological devices could not achieve their goals in educational setting. Although there were numbers of common reasons, two of them were really important for this study: top-down implementation, and inappropriate software and content (Alkan & Mehmet, 2007; Cuban, 1986; Reiser & Dempsey, 2002). The biggest problem is top-down implementation. Decision of using a technology in classroom is generally given by policy makers, instead of who will actually use them, teachers. Before implementation of technology into classroom, the needs should be defined, and then decision should be made based on those needs. Secondly, inappropriate software or content was a big problem. Although the teacher was qualified enough, the system will not be used if it does not fit the needs of teachers (Chadwick, 2002; Cuban, 1986; Reiser & Dempsey, 2002).

According to Burkman (1987) instructional designer should be so careful to design and develop user oriented products and support their utilization. An instructional designer should always seek ways to make products more effective and efficient, to find better ways to communicate with users, to provide better instructions in order to support the utilization of instructional design. Adoption of a new technology is always a tough process that supplying better quality products do not always mean better adoption. Adoption mostly depends on personal perceptions. Even if a product is un-user friendly, but useful, it could be mostly accepted by users (Burkman, 1987). Burkman (1987a) identified 5 steps of user-oriented instructional development process in order to provide better utilization. These steps could be listed as (1) identifying potential adopters, (2) measure relevant potential adopter perceptions, (3) design and develop a user friendly product, (4) inform the potential adopter, and (5) provide post adoption support (Burkman, 1987).

The first (pilot) version of the system had limited features. Faculty members were able to define just one question on the system that they needed to define question during the class, if they want to ask more than one. Furthermore, default response

time was determined as 15 minutes for each question, but faculty members can terminate it anytime. The system was designed based on the professors needs and piloted by four faculty members. While two of faculty members were from College of Education, from Department of Computer Education and Instructional Technology and Department of Educational Sciences, two of them were from College of Engineering, from Department of Civil Engineering and Department of Industrial Engineering. They used the system during the spring semester of 2011-2012 educational year. While one of four courses was a graduate level course with 14 students attended, three of them were undergraduate level courses, and the numbers of students were as following: 20, 27 and 65. After faculty members used the system in their classrooms, the researcher conducted interviews with them in order to understand how they used the system, what problems did they face with, and what were their suggestions. Each interview was transcribed and analyzed by the researcher and a second coder. Pilot study showed that the faculty members found the system usable. The advantages of the system were listed as being anonymous, available and suitable for crowded classroom. On the other hand, there were some limitations of the system such as being time consuming, the novelty effect and design issues. The system was updated based on the needs and suggestion of faculty members before actual data collection process of this study. The update covers defining multiple questions, thus faculty members were able to define more than one question before the class. Furthermore, the response duration limited with five minutes.

Furthermore, the system was updated and improved during the implication process based on the suggestions of students and faculty members that were mentioned in the interviews, and based on the notes taken by the researcher during the observations. These updates and improvements cover the change in design such as increasing the text size, and placement of the objects; defining course names to use the system in different courses, and defining the week of the question that allows faculty members to define questions way earlier than the class.

At the final version as all former versions, the system was used via its web interface. Faculty members could login to system via their user names and passwords (Figure 3.1).

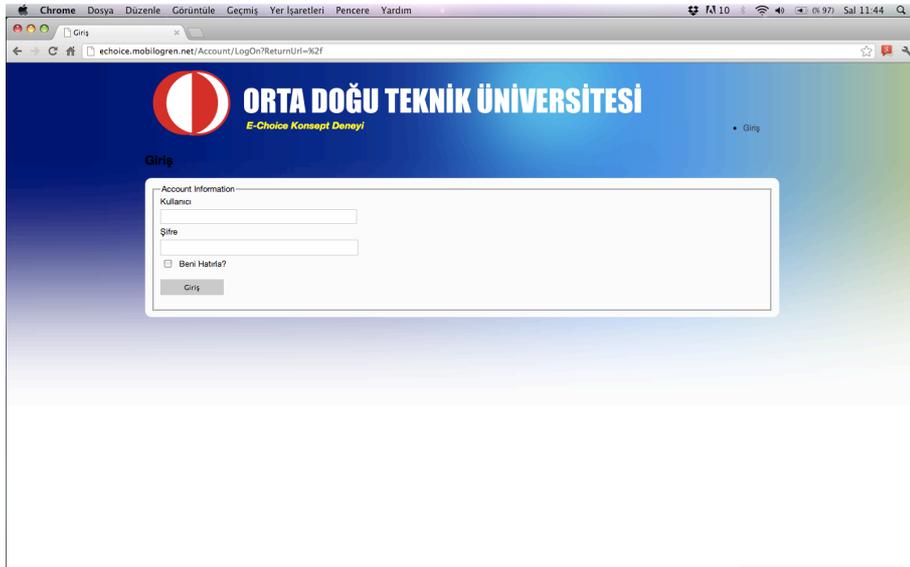


Figure 3.1 *Login Screen of the system*

When they first logged in to the system, the system warned them to not have any defined course. Faculty members should define courses, so they could use the system in several different courses. After defining the courses, faculty member could write and ask questions (Figure 3.2).

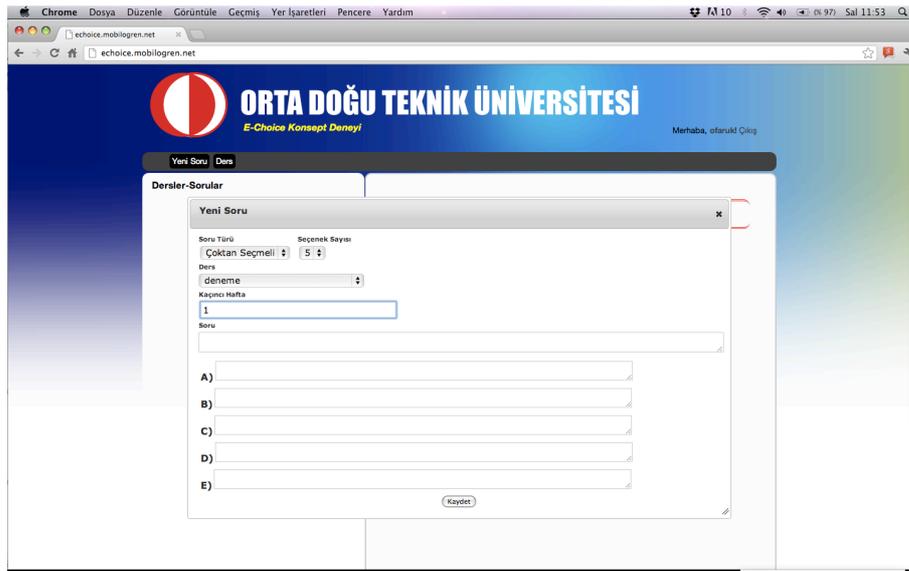


Figure 3.2 *Question Definition Screen*

Only multiple-choice questions, two to eight choices, could be asked with this system. Faculty members could prepare their questions before the class or during the class. Furthermore, if faculty members wanted, they could prepare all the question of that semester at the beginning because system let them define the week when the question would be asked. When faculty member select or write a question and hit to “ask” question, system got activated to gather responses for five minutes. Five minutes was the default duration of each question, and faculty member could shorten or extend the duration. While a question was asked, there were the question, choices, timer, and service numbers on the screen (Figure 3.3).

Reponses of students could be seen simultaneously, if the page scrolled down. But it was hidden consciously, in order not to affect students’ decisions. Results could be seen as bar or pie chart (Figure 3.4). Faculty members could see the results of old questions, edit or ask them again. Moreover, faculty members could provide feedback based on the results. The system provides immediate feedback based on timing, oral feedback based on mode, and group or class wide feedback based on audience according to Brookhart (2008)’s categorization.

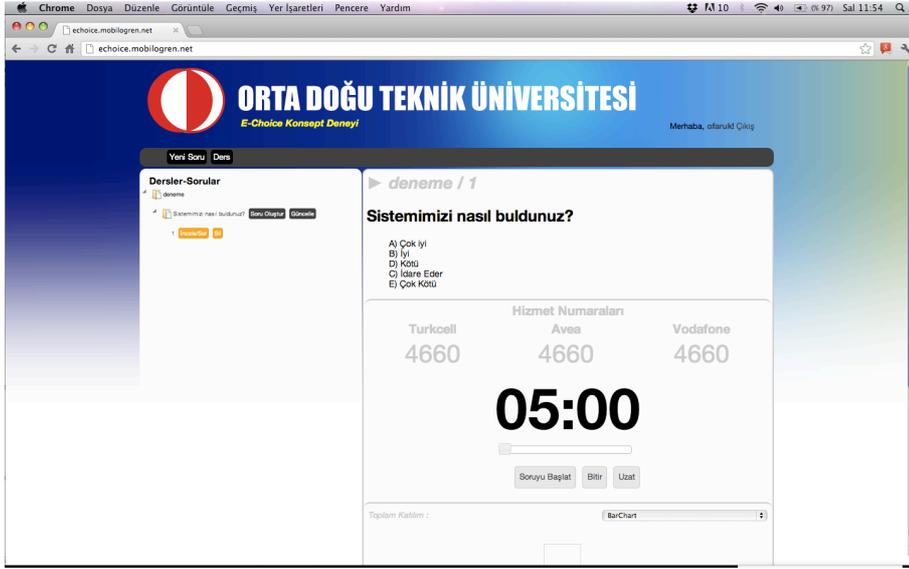


Figure 3.3 Question Asking Screen

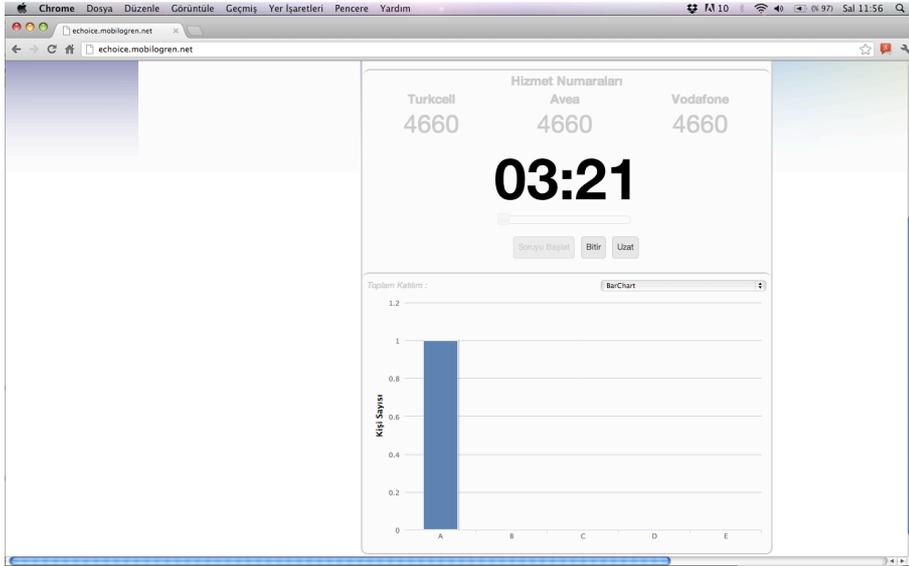


Figure 3.4 Result Screen



### **3.6 Data Collection Process**

Data of this study were collected in the spring semester of 2012-2013 academic year via interviews and classroom observations. According to Creswell (2009) collecting data from several resources is one of the characteristics of qualitative research, and it is valid for the case studies, as well (Yin, 2009). The details about the data collection process are given below.

#### **3.6.1 Interviews**

In this study, interviews were used as the main data collection instrument of the study in order to understand why and how the faculty members used the system, what are the opinions of both faculty members and students, and what are the usage suggestions. Interviewing is one of the most important data sources of case studies, and there are two main issues to be considered while conducting an interview: satisfying the need of research inquiry and maintaining a friendly conversation to not to constraint the interviewee. In other words, interviews should be guided conversations instead of structured queries or just question-answer sessions (Yin, 2009).

Yin (2009) differentiates interviews into three categories: in-depth interviews, focused interviews and surveys. In in-depth interviews, the interviewees are asked about the facts of a matter along with their opinions. In-depth interviews may take place as several sessions to gather more data. The second type, focused interviews, take place in a short amount of time; and, aims at collecting data in a conversational manner by following a set of questions. The last one, survey, follows a more structured way and mostly collect quantitative data.

In this study, interviews were mostly a mixture of in-depth interviews and focused interviews. The researcher tried to gather data from interviewees about some facts and their opinions about the system via three contiguous interviews convenient to in-depth interviews and conducted interviews in a short amount of time by following a set of questions convenient to focused interviews.

The researcher prepared two different interview protocols for the faculty members and students to gather as much as possible data from each participant group. Both protocols were prepared in Turkish, because the mother tongue of all participants was Turkish. Although there were some similar questions in both interview guides, there were specific questions for each group based on the information trying to gather from that group. The first draft of the interview questions was prepared based on the related literature. The first interview protocol draft was sent to two experts to be controlled in terms of quality and properness of the questions. Based on the suggestions of experts, former questions were revised and additional questions were added. For example, one of the experts suggested adding questions about the current technologies had been using in the classroom, purposes of those technologies, and effects on classroom climate. Revised protocol was sent to five experts to be controlled in terms of correctness and validity. Some grammar errors were corrected based on expert reviews and the interview protocols were finalized.

Although two different interview protocols were prepared for faculty members (Appendix B) and students (Appendix C), each protocol had two versions to be used in the iterative interviews. The first version of faculty member interview protocol had eight questions to learn how they adapt the system, their opinions about the system and their suggestions. The second version of faculty member interview protocol had four more questions in addition to first version to learn how their opinions had changed during the semester, what problems had they experienced, what were their adaptation suggestions. The first version of student interview protocol has four demographic and thirteen open-ended questions to understand their opinions about the system. The second version of student interview protocol had nine additional questions to understand their opinions about the system, how their opinions changed during the semester, how they wanted to be system used, and their suggestion about the system.

After preparing the interview protocols and related documents, the researcher applied to the Middle East Technical University, Human Subjects Ethics Committee to get approval for the study. The Human Subject Ethics Committee approved the

study to be conducted in Middle East Technical University (Appendix D), the researcher started data collection process.

Interviews were the main data collection method of this study. The researcher conducted three semi-structured consecutive interviews with each participant in order to get deeper data, and to understand the change in opinions during the semester. The interviewing process was started after a month of the beginning of the study; and then an interval of one month was given between each interview. While interviews with faculty members were conducted in their office and each interview took between half an hour to forty five minutes; interviews with students were conducted at a quiet and cozy place where students want to meet after the class or their suitable time and each interview took between ten to fifteen minutes. All interviews were sound recorded with the permission of the interviewees.

### **3.6.2 Observations**

If the phenomenon is contemporary, not historical, observations are chance for researchers to better understand and analyze the case due to case studies take place in natural setting of the case (Yin, 2009). According to Yin (2011), observations are priceless data sources to better understand a case, because there is nothing else between the data and the researcher. Researcher collects the data with own eyes and perceives with own senses, instead of anyone else's. For instance, even if there is an interviewee, researcher collect data filtered by the interviewee and represented by the interviewee's perspective.

The data gathered from observations are generally useful to provide additional information (Yin, 2009). Researcher might have different roles from non-participant to complete participant during the data collection process of observations based on the purpose (Creswell, 2009; Yin, 2011), and takes field notes about the content, context, participants, and their behaviors and activities (Creswell, 2009). Observations were used as the secondary data collection method of this study in order to support and empower the data gathered from interviews, due to working on contemporary cases. The researcher had a totally passive role during the data

collection process. The main purposes of observation were to understand how faculty members actually used the system, how students reacted and to detect the problems related with the system. The researcher did not use an observation form, and just took some field notes.

As Yin (2009) stated, if a case study is about a new technology, observations may help researchers to understand the actual use of technology and potential problems. So, the researcher attended to all classes of three cases, which the system was used, to better understand how faculty members adapt the system to their courses, how students responded to the system and what were the problems occurred during the application. The researcher had a passive role in the class and did not have any interaction with the class. He did not use any observation forms, but took field notes about the content and problems experienced. Observation continued from the beginning of the semester to the end.

### **3.7 Data Analysis**

In general, data analysis could be defined as making sense out of raw data (Creswell, 2009). Although there is no universally accepted step-by-step qualitative data analysis routine, the analytical phases of qualitative data analysis could be listed as (1) compiling data, (2) disassembling data, (3) reassembling data, (4) interpreting data, and (5) concluding data (Yin, 2011). These phases could be thought as the general steps and they could be elaborated. In this study, six steps of qualitative data analysis and interpretation by Creswell (2012) were employed. The steps were listed as follow; (1) prepare and organize data for analysis, (2) explore and code data, (3) coding to build description and themes, (4) represent and report qualitative findings, (5) interpret the findings, and (6) validate the accuracy of findings.

Qualitative data analysis is an on-going process through out the study comprising contextual reflection about the study, asking analytic questions and writing memos about the study (Creswell, 2009). The researcher transcribed the recordings of interviews as soon as possible just after the interviews. All transcriptions were

transferred to MS Word program and organized. Then, the researcher started coding the interviews. Coding is analyzing a raw, text data by dividing into small but meaningful chunks without losing the relationships between them; and helps researchers to differentiate and combine the data they collected (Miles & Huberman, 1994). In case studies researchers mostly focus on a few key issues or themes to understand the complexity of the case, instead of generalization (Creswell, 2007). One of the common analysis strategy for case studies is to determine issues within each case, and compare and contrast common themes between cases (Miles & Huberman, 1994; Yin, 2009). According to Creswell (2007), coding is the heart of the qualitative data analysis and there are different coding strategies. While, researchers may create their own coding table based on the current study, they may use a pre-determined coding table from the literature, or they may use a create a coding table by combining the pre-determined one and new codes (Creswell, 2007, 2009; Miles & Huberman, 1994). In this study, the researcher created own coding table based on the data of the study, and then designated the themes and sub-themes (Appendix E, F).

### **3.8 Trustworthiness**

A researcher need to make sure that findings and interpretations are accurate from the beginning to the end of study; and answering the questions “*Is the account valid, and by whose standards?*” and “*How do we evaluate the quality of qualitative research?*” (Creswell, 2012, p. 243 ) will help researchers to address the validation issues. While the terms validity and reliability are being used for the accuracy of a quantitative study, variety of different terms such as “authenticity” and “trustworthiness” are being used for qualitative study (Lincoln & Guba, 1985). Lincoln and Guba (1985) described the “Trustworthiness” as “*How can an inquirer persuade his or her audience (including self) that the findings of an inquiry are worth paying attention to?*” (p. 290) and defined four criteria listed as “Credibility”, “Transferability”, “Dependability”, and “Confirmability”.

Besides the number of criteria, there are several strategies to be considered to support trustworthiness such as triangulation, peer review, debriefing, negative case

analysis, clarifying researcher bias, member checking, rich description, external audits and intercoder agreement (Creswell, 2012).The researcher employed triangulation, peer debriefing, rich description, and inter-coder agreement to ensure the trustworthiness of the study.

### **3.8.1 Triangulation**

Triangulation is one of the strategy to empower trustworthiness of the study by employing multiple and different data sources or methods collaboratively to support more powerful evidences for themes and results of the study (Creswell, 2009, 2012, 2013; Lincoln & Guba, 1985; Miles & Huberman, 1994; Yin, 2011). In this study, the researcher collected the data from three separate cases via interviews and observations. Even if the researcher did not use an observation form, he attended all classes to observe the natural context instead of just seeing from the interviewees' eyes. Furthermore, the system logs were used in order to obtain accurate data about the system use.

### **3.8.2 Peer Debriefing**

Peer debriefing or peer review is another strategy to empower trustworthiness of the study. In peer debriefing an external researcher control the research process and ask critical questions to actual researcher in order to make her/him to criticize the process, and to be honest (Creswell, 2012, 2013; Lincoln & Guba, 1985; Miles & Huberman, 1994). In this study, the researcher processed under the administration of his dissertation advisor and dissertation committee. The researcher present all the findings and results to his Ph.D. advisor through out the process and to his dissertation committee every six months. Furthermore, the researcher shared information about the process with two of his colleagues and got feedback about the process in order to get feedback about the process and to understand how they will act in a similar situation.

### **3.8.3 Rich Description**

In rich description, researchers provide as much as possible information about the process of research in order to help readers easily understand the steps and the results of the study, and to sustain transferability of the study to other studies with similar properties (Creswell, 2013; Lincoln & Guba, 1985; Miles & Huberman, 1994). In this study, the researcher explained the each step to obtain rich description that readers and other researcher could easily understand the process, and findings.

### **3.8.4 Intercoder Agreement**

One of the biggest challenges in qualitative study is defining the codes. In qualitative study, reliability mostly refers to consistency of codes between different coders (Creswell, 2013). In order to obtain intercoder agreement not only definition of the codes, but also the given code to a chunk should be same (Creswell, 2009, 2013; Miles & Huberman, 1994). It is mostly suggested that two coders code a limited amount of data separately, and then they should check each other's codes. Even though there might be similarities and differences due to background and personality differences of coders, it is suggested to have a 80% similarity between different coders. Miles and Huberman (1994) suggested a formula to calculate this similarity ratio or agreement between coders by dividing number of similar codes to total number of codes given by the coders.

In this study, the researcher checked the intercoder agreement with two coders. The second coder was a research assistant in the Department of Computer Education and Instructional Technology at Middle East Technical University. She was a Ph.D. candidate and got her B.S. and M.S. degree from the same department. She got several courses on instructional technology, educational research and statistics. Furthermore, she was conducting a qualitative dissertation and experienced about qualitative study. Third coder was also a research assistant in the Department of Computer Education and Instructional Technology at Middle East Technical University. She was a Ph.D. student and got her B.S. degree from the same

department. She got several courses on instructional technology, educational research and statistics.

Before starting the coding process three coders got together and discuss the study such as rationale, methodology, and data collection process. Then, the process started with coding one faculty member's interview transcription by each coder. After all coders finished coding the first document, they got together to conduct a crosscheck. The researcher and other two coders compared the codes given in terms of similarity and differences. They compared not only the codes given, but also the chunks coded. While there were similar and different codes, there were also similar and different chunks coded. The researcher and two other coders discussed each code and chunk coded in order to obtain a common sense and to create a common coding table. After discussing all codes and chunks coded, they negotiated on a common coding table. Then, all coders coded a different document based on the coding table. In this new coded document, the coders mostly agreed on all coded chunks. While the researcher coded twenty-six chunks with sixteen codes, the second coder coded twenty-four chunks with fifteen codes, and the third coder coded twenty-five chunks with seventeen codes. According to Miles and Huberman's (1994) formula there was .92 intercoder reliability score, which was quite sufficient. After getting sufficient intercoder reliability score, the researcher started coding the rest of the interview transcriptions lonely. During this coding process, the researcher used the coding table created with two other coders. If the researcher needed to add a new code, which was not listed, he consulted to two other coders and shaped the coding table (Appendix E). The researcher sent all coded documents to two other coders to be checked. Second and third coder controlled all coded documents, and they negotiated and agreed with the researcher for the codes or chunks coded that might be coded differently.

After finishing the coding process of faculty member interviews, the researcher and two other coders coded the student interviews based on the faculty members' coding table. The researcher and two other coders met and compare the coded document. While the researcher coded nineteen chunks with sixteen codes, the

second coder coded seventeen chunks with fourteen codes, and the third coder coded seventeen chunks with sixteen codes. There were thirteen codes and sixteen chunks coded common. According to Miles and Huberman's (1994) formula there was .84 intercoder reliability score, which was quite sufficient. The researcher kept coding the rest of documents. He consulted to two other coders in case he needed to add new codes and created a new coding table (Appendix F). After the researcher finished coding all documents, he sent them to two other coders to be checked. Two other coders controlled all documents and negotiated and agreed with the researcher for the codes and chunks coded.

### **3.9 Limitations**

There are always limitations as the nature of research studies, and this study had some limitations. At first, sampling was one limitation that should be declared. Purposive sampling method was employed for sampling strategy to determine the target group. Therefore the findings of this study were valid just for this study.

The second limitation was related with the researcher. All data were collected, transcribed and analyzed by the researcher. He had a key role as the instrument and data-analyzing tool of the study. Although different validity and reliability methods were employed, the findings of the study were mainly based on the researcher's interpretations. In addition, the honesty of the participants was another limitation. It was supposed that each participant answered the questions honestly and profoundly.

The third limitation was about the language. All interviews were conducted in Turkish, which was the mother tongue of all participants. After the coding and analysis part, results were presented in English, due to official instructional language of METU was English, and dissertation supposed to be in English. There might be some semantic shift during the translations of quotations from Turkish to English.

### 3.10 Timetable of the Study

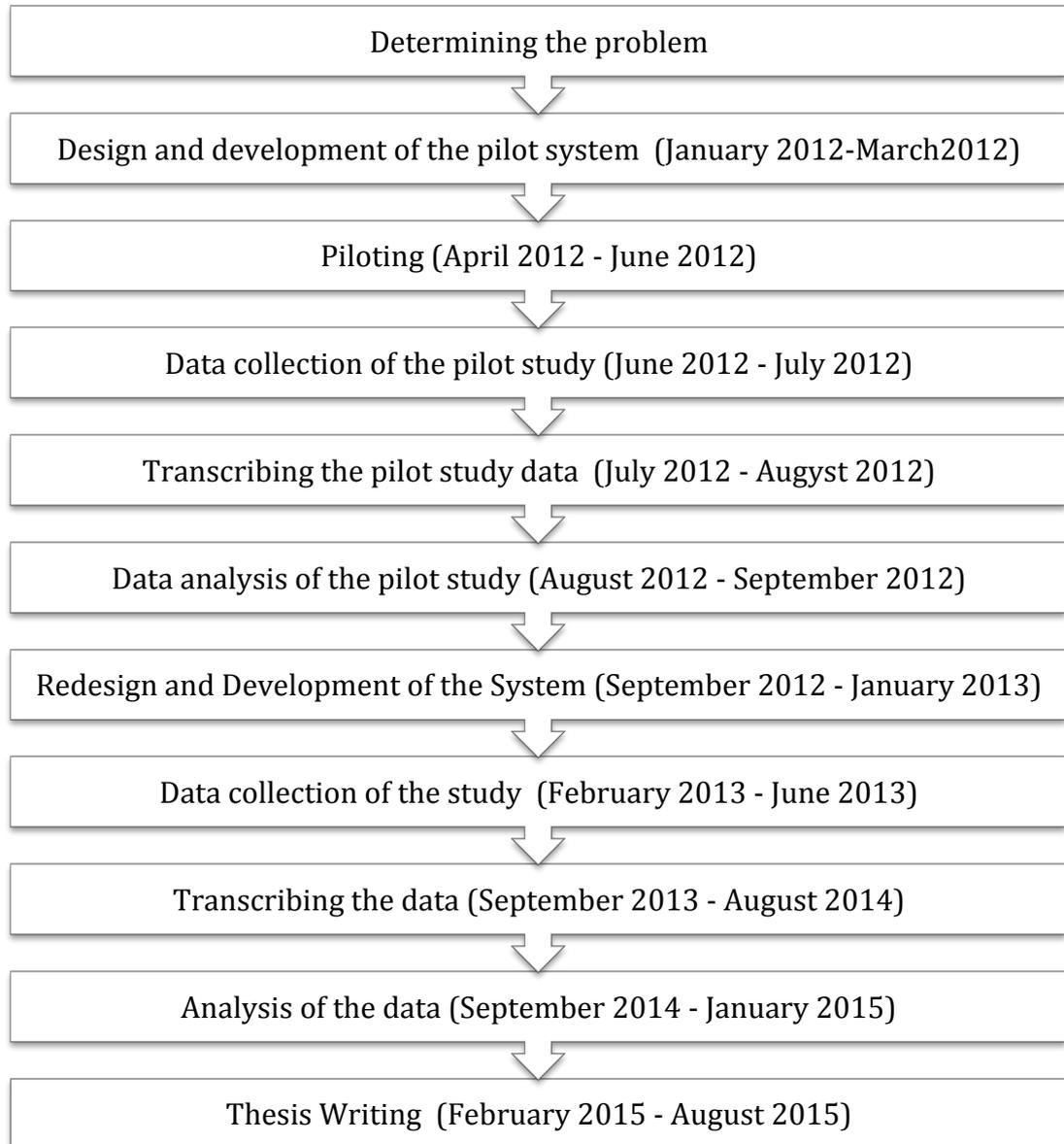


Figure 3.6 *Timetable of the Study*



## **CHAPTER 4**

### **RESULTS**

In this chapter findings of the study will be presented in two main parts: findings of the faculty members and findings of the students. While the cases are discussed as between cases in faculty members' part, the cases are discussed both within and between in students' part.

#### **4.1 Faculty Members**

##### **4.1.1 Usage**

One of the main purposes of this study was to determine why and how the faculty members used the system. In order to understand the usage habits of faculty members the system logs were analyzed in addition to system usage questions asked during the interviews.

According to system log analysis C1\_F used the system for six out of twelve weeks during the semester, and she asked from two to four questions each week. The questions were mostly about the topic of the week, but some of them were about the former weeks or the prior knowledge they were supposed to have about the current topic. Furthermore, some questions, which were asked in teacher selection exam, were asked in order to gain attention to topic, and make them ready. As a part of the course, guidance, C1\_F asked both knowledge, analysis and synthesis level

questions in order to make students think, to link current and former topics, to analyze the situation, and to find most accurate solution to problem.

In the second case, according to system logs, C2\_F used the system for four out of six weeks during the semester, due to being introduced later than other cases. C2\_F asked three questions each week, total of twelve, during the semester. While all the questions were multiple-choice questions, two of them were “fill in the blank” type questions. All the questions were about the topic of the week and related with the articles they were supposed to read. While six questions were knowledge level questions that the answers could be found directly in text, six of them were analysis and synthesis level questions that they needed to compare and contrast the new information and their prior knowledge in order to interpret the information and to come an end.

In the third case, according to system logs, C3\_F used the system for six weeks during the semester. While he asked one question in some classes, he mostly asked two to four questions. The questions were knowledge level questions and about the topic of that week, or the prior knowledge students supposed to have from the former weeks or related courses. However, just one question asked the first week was unrelated with the topic, and it was just to gain attention of the students.

#### **4.1.1.1 Purpose**

When the faculty members asked to understand what were their purposes to use this system, several different purposes were revealed based on their demand and course structure; and, it was seen that there were some common and diverse usage purposes.

#### *Discussion*

One of the purposes of using the system was creating and obtaining a discussion within the classroom. Within the three faculty members, just C1\_F mentioned that she used the system in order to obtain a discussion and lead them to think.

*It was about starting a discussion at the beginning. We want them to make a discussion according to questions about the content of the lesson, and answer the questions. After that there was a discussion directed to answers at the beginning of lesson, and at the end of lesson. Basically, it had two functions (C1\_F).*

*Bir kısmında önden tartışma başlatmayla ilgiliydi. Hani dersteki konuya ilişkin sorulara yönelik bir tartışma yürütüp, ona cevap vermelerini istedik. Sonrasında da o verdikleri cevaplara yönelik bir tartışma oldu yani ders başlangıcında, ders sonunda. Temelde iki işlevi vardı (C1\_F).*

*Actually, the main aim was to encourage them to discuss and think (C1\_F).*

*Temel kullanım amacı aslında bir onları tartışmaya, düşünmeye teşvik etmek (C1\_F).*

### *Feedback*

Both C1\_F and C2\_F used the system for feedback. But, the feedback mentioned here was not just giving feedback to students, but also getting feedback about the class. Faculty members used this system in order to understand whether their courses reached to dedicated goals, and to immediately understand how much the students understood the topic.

*Second one is to understand in which level they learned the concept or topic. Actually, receiving feedback. I can say I used it to take quick feedback about whether they reach the goals of lesson or not, or whether they reach that week's topics' goals (C1\_F).*

*İkincisi ne derece öğrendiklerini herhangi bir kavramı, konuyu, onu anlayabilmek. Geribildirim almak aslında. Onların dersin amaçlarına ulaşip ulaşmadığım konusunda ya da o haftanın konusundaki amaçlara ulaşip ulaşmadığım hakkında çabuk geribildirim vermesi anlamında kullandım diyebilirim (C1\_F).*

## *Evaluation*

While C1\_F and C3\_F mentioned that they used to system in order to evaluate the students, C2\_F did not say anything about evaluating the students via this system. C1\_F and C3\_F used the system in a similar manner to understand how much did the students remember the former classes' topics.

*In the previous ones, actually, it is used to control what students learned in previous lesson, in which level they learned, in which level they remember (C1\_F).*

*Daha öncekilerde de aslında öğrencilerin bir önceki derste öğrendiğini, ne derece öğrendiğini, ne derece hatırladığını, bir anlamda onu kontrol etmek (C1\_F).*

*We used it at the end of lesson. To see in which level they remember that we taught before (C3\_F).*

*Ders sonunda kullandık. Daha önceden anlattığımız konuları “ne derece hatırlıyorlar”ı görmek amacıyla (C3\_F).*

## *Motivation*

C3\_F stated that most of the students were uninterested in the courses and he wanted to use the system in order to increase attention, attendance and participation. In addition, C2\_F mentioned that she used to system in order to motivate the system, too. On the other hand, C1\_F mentioned nothing about motivation.

*Could using this method be more motivational? I want to track their participation percentage with a new method (C2\_F).*

*Biraz daha motive edici bir unsur olabilir mi bu yöntemi kullanmak. Biraz da motivasyon yaratmak. Yeni bir yöntemle onların katılım yüzdesini izleyebiliyor olmak istedim (C2\_F).*

*Our goal, my goal, is to increase students' interests to lesson, because they are uninterested. I used it in order to attract their interest (C3\_F).*

*Amacımız, öğrencilerin derse ilgisini arttırmaktı, benim amacım. Öğrenciler, çünkü ilgisiz. Onların ilgisini çekebilmek amacıyla kullandım (C3\_F).*

### *Engagement*

In this study, there was no limitation about the system usage, faculty members were free to use the system how and as much as they want, all faculty members mentioned that they used the system in order to engage the students. All, three, faculty members wanted to obtain and sustain active participation of students and used the system for this purposes. In addition to that, C3\_F mentioned that his primary purpose of using this system was increasing interest of students into the course.

*I want to encourage students to participate, because participation is an important part of course final grade, additionally creating motivation. I want to track the participation of students with a new method. It was very good from this point (C2\_F).*

*Ben bir parça öğrenci katılımını teşvik etmek, çünkü bu derste katılım son notun önemli bir kısmını oluşturuyor. Biraz da motivasyon yaratmak. Yeni bir yöntemle onların katılım yüzdesini izleyebiliyor olmak istedim. O açıdan çok iyi oldu (C2\_F).*

*But essentially, the purpose was to provide students' active participation to lesson (C1\_F).*

*Ama özde öğrencilerin daha fazla derse etkin katılımını sağlamaktı (C1\_F).*

*Our goal, my goal is to increase students' interests, and attendance to course (C3\_F).*

*Amacımız, öğrencilerin derse ilgisini arttırmaktı, benim amacım. Öğrencilerin derse devamını arttırma amacıyla (C3\_F).*

### *Review*

Only C1\_F stated that she used the system in order to repeat both the former weeks' topics and to repeat key points told in same class.

*Actually We used it to review the former topic, the key points of the topic, and to remember by this way (C1\_F).*

*Ashnda bir daha önceki anlatılan konunun tekrarı, anlatılan konudaki önemli noktaların tekrarı. O amaçla tekrar yapmaları, hatırlamaları amacıyla kullandık (C1\_F).*

### *Preparation*

While C1\_F stated anything about using the system for preparation, C2\_F and C3\_F told that they used the system to make students ready for the class. Nevertheless, a specific use of the system by C2\_F should be told. C2\_F assigned two or three articles to students every week. Students were supposed to read the articles before the class and they should discuss them in the class. C2\_F used the system to ask some questions about the articles at the beginning of the class, by this way she made an introduction to that day's topic and made them read the articles to get ready for the class.

*They were expected to come to the class by reading articles every week; also they came to class by knowing that three questions would be asked from each two or three articles. It was actually a certain way to make them read (C2\_F).*

*Zaten her hafta okuyup gelmeleri bekleniyordu ama özellikle o haftanın makaleleri, bazen iki bazen üç makaleden üç soru sorulacağını bilerek geldiler. Biz de okumalarını aslında bir anlamda garanti altına almanın bir diğer yolu bu (C2\_F).*

### *Implementation*

Only C1\_F mentioned that she used the system in order to ensure that the students had a chance apply what they learned in class. The system helped them not only to remember, but also to apply and to synthesis what they had learned.

*Actually, it was not just remembering the information. It, some of the questions, was about applying and synthesizing that information (C1\_F).*

*Aslında hani sadece bilgiyi hatırlama anlamında da değil, anladıkları bilgiyi, ne bileyim soruların bir kısmı öyleydi işte uygulayabilme, sentez edebilmeyi de içeriyordu (C1\_F).*

#### **4.1.1.2 Suggestions**

##### *Frequency and/or Number of questions*

Although all faculty members agreed not to annoy students by bombarding with questions, they did not specify a certain number of questions. C2\_F mentioned that the number of questions asked via the system per class might be between three and five. Furthermore she stated that number of questions could be changed and could be decided based on several variables such as the topic, state of students and faculty member. Although there was no disagreement between faculty members in terms of the number of questions, there was about the frequency of system usage. While C2\_F mentioned that the system could be used every week without any problem, C1\_F and C3\_F stated that the system could be used in every two or three weeks range.

*There should not be more than five, if questions are multiple-choice. It depends on material; also the level of students, but three to five questions seems to be ideal. How many questions could be asked from a class? Actually, it depends on several factors such as topic, instructor, and level of students; but there should not be a question bombardment (C2\_F).*

*Çoktan seçmeli olacaksa beşi kesinlikle geçmemesi gerekli. Bu malzemeye de bağlı. Öğrenci düzeyine de bağlı ama yani 3-5 arası ideal gibi geliyor. Zaten hani bir dersten ne kadar soru çıkabilir? O hani bir mid-term de düşünürseniz. Ama tabi bu şeye bağlı. Hani, konusuna, hocaya, öğrencinin kaçınıcı sınıfta olduğuna gibi bir çok faktöre bağlı ama çok da fazla bombardıman yapmamak lazım (C2\_F).*

*Occasional using instead of constant using would be more enticing for students. I think occasional using would be beneficial for students. It would be better not to use each week (C1\_F).*

*Sürekli kullanmak değil ama belli aralıklarla kullanmak öğrenciye daha cazip gelebilir. Aralıklarla kullanılmasının faydalı olabileceğini düşünüyorum. Her hafta, her hafta bence kullanmamakta fayda var (C1\_F).*

*Using frequency should be not each week. I want to use without increasing frequency. Using in every two or three week might be better (C3\_F).*

*Sıklığının her hafta olmamasının lazım. Ama dediğim gibi sıklığını çok arttırmadan kullanmak isterim. Belki de iki haftada bir ya da üç haftada bir kullanmak daha şey olabilir (C3\_F).*

### *Method*

When faculty members were asked how the system could be used or what were the usage suggestions, they stated many different ways of system use. C1\_F stated that the system should not be used exact the same way each week that students might get bored. The system usage should be varied to catch students' attention and system should be used to ask key points instead of asking so many questions. Furthermore she stated that the system worked very well in class, but it might be used to sustain between class engagement to remember past week's topics and to make students ready for the upcoming week. Moreover, she suggested that system could be used to ask open-ended questions in order to make them discuss. C2\_F suggested using system at the beginning of the course to make students study before the class and to guaranty being ready. C3\_F stated that asking questions both at the beginning and at the end of the class might be helpful in order to make students discuss; but he would prefer using it at the end off class in order to evaluate himself, if he needed to choose one. Furthermore, he stated that having an teaching assistant in the class to write and ask questions what he just told would be more beneficial for students.

*Preferably, using at the end of the class might be good thing to increase interest and participation of the students. Using at the beginning of the class might be beneficial, because students come to class ready, and you can keep going on focused. If it is used at the end of the class, someone, who did not read the articles, might answer the questions based on what s/he heard that day. The faculty member needs to decide this, but I would choose using at the beginning of the class (C2\_F)*

*Ama tercihen ders sonunda olması, öğrencinin derse ilgi ve katılımını artırma açısından iyi bir şey olabilir. Ders başında olmasında şöyle bir yarar var. Öğrenci derse hazır geliyor. Yani bir kıvamda geliyor ve o kıvam, yani böyle bir daha amaca odaklı gidebilirsiniz. Ders sonunda ise okumadan da gelen birisi, yani orada duyduklarıyla da yapabilir. Yani buna hocanın karar vermesi gerekiyor. Ama ben galiba tercihim dersin başından yana kullanırdım (C2\_F).*

*I think this system might be so effective both at the beginning and at the end of the class, or in the middle if necessary. There should be flexibility, and faculty members would be able to use the system flexibly by informing student at the beginning (C2\_F).*

*Yani ben hem dersin başında hem de ortasında gerekiyorsa da sonunda bunların, bu yöntemin çok etkili olabileceğini düşünüyorum. Yani esneklik olması lazım ve hoca, önceden tabi söyleyerek öğrencilere, bu sistemi esnek bir şekilde kullanabiliyor olmalı (C2\_F).*

*I might ask a question to support between class engagement, and students can reply it from where they are. It supports in class participation, but I think it might be used to participate or to take care of course materials and new topics (C1\_F).*

*Ben öğrencilere bu between class engagement sağlayabilmek için mesela bir soru yöneltebilirim. Öğrenciler, buldukları ortamdan cevabı verebilirler. ... Şimdi sınıf içinde katılımı sağlıyor ama iki ders arasında, bu haftadan önümüzdeki haftaya kadarki süre içerisinde katılımı ya da ders materyaliyle, ne denir, bir biçimde ilgilenmeyi sağlayacak şekilde kullanılabilir diye düşündüm (C1\_F).*

*I didn't do in this year, but each group does it in other applications. The whole class evaluates the group with this presenter evaluation form. They do it now in a paper-based format. However, the advantages and disadvantages of group evaluation are open to discussion. They gave a little form to me. The feedback can be given at the end because there can be a discussion like that they gave very good or bad feedback. So, there may be a feedback about how they evaluate each group; for example, what was given feedback to the first group, to the second group, etc. May be it can be, since students evaluates their presentation with those forms. We can do that in this way (C1\_F).*

*Bu yıl yapmadım ama diğer uygulamalarda mesela yapıyor her bir grup. Grubu, bütün sınıf bu presenter evaluation formla değerlendiriyor. Şimdi o değerlendirmeyi kağıt üzerinden yapıyorlar. Ama grup değerlendirmelerinin tabii onun da tartışılır avantajları, dezavantajları. Sonrasında belki de hepsi bittikten sonra, çünkü arada bana az verdiler, çok verdiler tartışması oluyor. Belki de sonrasında gruplara verdikleri geribildirimlerin bir şeyi çıksa. Birinci gruba ne verilmiş, ikinci gruba ne verilmiş. Mesela o da olur. Sunularını değerlendiriyor çünkü öğrenciler ellerindeki bu ... formlarla. Onu o şekilde yapabiliriz (C1\_F).*

*When I think, from my point of view, it can be used to start a discussion and then to evaluate (students) by asking questions at the beginning before the class. Furthermore, the third could be used, too (C3\_F).*

*Ama kendi açımdan düşündüğümde doğru dürüst uygulanabilse, bu ilk başta sorup ondan sonra dersi anlattığımızda tartışma ortamı yaratmak ve sonradan ölçmek kullanılabilir. Şey de kullanılabilir. Üçüncüsü de kullanılabilir (C3\_F).*

*If I need to choose one of them, I would choose the third one for me in order to evaluate myself (C3\_F).*

*İkisinden bir tanesini seçecek olursam kendi açımdan herhalde üçü seçerdim. Kendi değerlendirmemi, kendimin yapabilmesi için üçü seçerdim (C3\_F).*

*Suitable lessons*

While C1\_F and C2\_F mentioned that the system could be used in any course without any limitation, C3\_F mentioned that the system was mostly suitable for verbal courses.

*Every course can be (C2\_F)*

*Her ders olabilir (C2\_F).*

*Our engineering curriculum is computational. It may not be used in computational courses, but can be used in courses similar to our course with verbal content (C3\_F)*

*Bizim mühendislik eğitiminde sayısaldır. O sayısal derslerde çok kullanılamayabilir ama bizimki gibi biraz sözel içerik olan derslerde kullanılabilir (C3\_F).*

#### **4.1.2 Advantages**

##### **4.1.2.1 Advantages for Faculty Members**

*Feedback*

Even though this system had several advantages, the most important and valuable advantage was supplying feedback for both faculty members and students. All faculty members were agreed that the system helped them to understand whether students had done what they were supposed to do, whether they were ready for the class, whether they had prerequisite knowledge, whether they fully understood the topic, where and why the misconceptions were occurred. By this way faculty members could have information about themselves and students, and in the light of these information, faculty member could arrange current or future course content and pattern.

*Participation has a portion in grading. I could not get individual info, but I was objectively informed about the participation of whole class. That was a satisfactory aspect of the system (C2\_F).*

*Katılıma bir ağırlık veriyorum notlandırmada. Ama bu yolla bütün sınıfın genel katılımı konusunda bireyler hakkında ayrı ayrı olmamakla birlikte daha objektif bir fikir sahibi oldum diye düşünüyorum. O açıdan çok memnun edici bir yönü bu sistemin (C2\_F).*

*It helped me to learn concretely about how they learn via their responses (C1\_F).*

*Aslında benim açımdan, ne kadar öğrenmişler, verdikleri cevaplar aslında somut olarak görmemi sağladı(C1\_F).*

*It provides the comparison of the groups. Showing the evaluation at the end is the advantage of this system. It gives immediate feedback (C1\_F).*

*Hani grupların karşılaştırmasını sağlar. Aynı zamanda da sonuçtaki değerlendirmeyi görmek zaten bu sistemin avantajı o. Anında feedback veriyor (C1\_F).*

*From my point of view, a general evaluation could be done via multiple-choice questions, especially via true-false questions. But we didn't try. I saw that students chose the correct answer (C1\_F).*

*Bir de benim açımdan baktığımda, genel bir değerlendirme, öğrencilerin mesela yaptığımız özellikle bu çoktan seçmeli olanlarda, true-false ile de yapılabilir. Onu denemedik ama. Öğrencilerin mesela çoğunun doğru cevaba gitmesini ben somut olarak görebildim. (C1\_F).*

*It can be used for ourselves. We teach something during the class. I think it could be used afterwards in order to evaluate us how much did students learn (C3\_F).*

*O kendimiz için kullanılabilir. Derse girip bir şeyler anlatıyoruz. Ondan sonra bu öğrenciler o derste bunun ne kadarlık bir kısmını yakalamışlar anlayabilmek için kendi kendimizi değerlendirmek amacıyla o kullanılabilir diye düşünüyorum (C3\_F).*

*If we could do the final application earlier, then it would be helpful for me. Since, I teach something in the course, but to what degree do*

*the students understand of that? I measure myself in this way. For this reason, it was good for me (C3\_F).*

*İşte, özellikle son yaptığımız uygulamayı daha önceden yapsaydık onun bana faydası olacaktı. Çünkü ben derste bir şeyler anlatıyorum ama karşımdaki grup bunun ne kadarını algılıyor? Ben böylece kendi kendimi ölçmüş olacaktım. Bunu çok fazla uygulamadık. O benim açımdan iyiydi (C3\_F).*

### *Timesaving*

While C3\_F mentioned anything about the timesaving advantage of the system, C1\_F and C2\_F mentioned that the system helped them to use time more effective. In addition to using time more effective, C1\_F mentioned that she used to do similar applications with paper and pencil, and this system helped to do same application in way far shorter duration. Furthermore, she mentioned that if she could do the evaluation, which was made with paper and pencil, there would be less workload and would be finished in a shorter time.

*You can use the time more efficiently in this system (C2\_F).*

*Daha, zamanı da daha etkili kullanıyorsunuz bunda (C2\_F).*

*Distributing and collecting the papers back require more time than paper-based activities. It is quicker in this system (C1\_F).*

*Bizim kağıt kalemle yaptığımız etkinliklerde süre anlamında, dağıt, onların cevapları üzerinden git, biraz daha zaman alabiliyor. Bunda daha çabuk (C1\_F).*

### *Engagement*

C3\_F mentioned that the system helped him to engage. Actually the system did not directly engage the faculty member; they might be engaged when the students engaged. Furthermore, according to C3\_F, faculty member would be engages as long as students engaged, attended and participated to the course.

*In an indirect way, my interest will increase if students continue to the courses. I can say this (C3\_F).*

*Bana da dolaylı olarak, öğrenci ne kadar derse devam ederse benim de ilgim o kadar artar. Onu söyleyebilirim (C3\_F).*

### *Interaction*

C3\_F mentioned that another advantage of the system was to constitute and maintain interaction between students themselves and the faculty member.

*The first thing in my mind is that our students come to the class and then sleep at backside, unfortunately. They never listen what we teach. This is an attractive presentation for them; and I think it can be used for an interaction (C3\_F).*

*İşte aklıma gelen ilk şey, bizim öğrenciler maalesef derse geliyorlar ve arkaya geçip uyuyorlar. Dinlemiyorlar hiç karşı taraf ne anlatıyor diye. Bu böyle birden dikkatlerini çekici sunum, bir interaction amacıyla kullanılabileceğini düşünüyorum (C3\_F).*

### *Motivation*

According to C1\_F one of the advantages of the system was motivating faculty members. Faculty members could be motivated when they saw the students learned what they had taught.

*When I think the objectives of the course, the objectives of that week, such as basic concepts, my objectives are learning that concept or ability, identifying and applying it in a case and recognizing the majority of them do that motivate the instructor (C1\_F).*

*Hani dersin amaçlarını, o haftaki amaçları düşündüğüm zaman benim amaçlarım içerisinde işte diyelim ki temel kavramlarla ilgili, onu öğrenmeleri, işte o beceriyi öğrenmeleri, işte bir case de bunu tanıyabilmeleri, uygulayabilmeleriye, çoğunluğunun onu yaptığını görmek öğretene açısından motive edici (C1\_F).*

#### 4.1.2.2 Advantages for Students

##### *Feedback*

All faculty members agreed that the system derived feedback for both faculty members and students. However, just C1\_F especially mentioned that the system provide feedback to students. By the help of this feedback, students were able to see their position in the class, and level of their understanding perceptibly. Furthermore students had a chance to see where they made mistakes, to think why they chose that answer, and to rethink about the question.

*... seeing the results or level of their learning evidently, receiving immediate feedback (C1\_F).*

*... somut olarak kendi öğrenmeleri ile ilgili sonucu ya da düzeylerini net olarak görebilmeleri, anında geribildirim alabilmeleri (C1\_F).*

##### *Motivation*

When the advantages of system were examined it was seen that all faculty members agreed that the system had a motivation effect on students. Based on faculty members' opinions the system increased motivation level of students. In such case, the system increased attendance and woke up the students, who sat at the back of the class, to participate actively.

*I think it increases the motivation in terms of participation (C1\_F).*

*Katılım anlamında motivasyonunu artırıyor diye düşünüyorum (C1\_F).*

*I think it can be used for sustaining students' interest and attendance if it is used in this way (C3\_F).*

*Böyle kullanırsa öğrencilerin ilgilerinin, derse devamlarının sağlanması açısından kullanılabileceğini düşünüyorum (C3\_F).*

## *Engagement*

Another advantage of the system, which all faculty members were agreed on, was engagement. While C2\_F mentioned that she saw the system as a way of implementing technology into classroom in order to engage students, C1\_F mentioned that students were willing to participate more than usual when she used to system. She thought that this might be due to system being eye catching and students were asked to answer the questions with a way they were so familiar. C3\_F mentioned that most of the students preferred to sit at the back of the class, and did not pay attention. However, according to his observations, when he was getting ready to ask a question, students woke up, picked their phones up, paid attention to question, and tried to answer it. In addition to that, even though there was a little number of students, system created a discussion environment and students discussed their ideas with each other.

*Students are more willing to participate (C1\_F).*

*Katılmaya daha istekli öğrenciler (C1\_F).*

*For example, you taught a topic, intensely. It was like a lecture mostly. Also, you want them to think a little bit. At that point, asking a question might cause mode change. There can be a mode change (C2\_F)*

*Yani, bir konuyu anlattınız. Yoğun. Daha çok lecture gitti. Bir taraftan da biraz düşünmelerini istiyorsunuz. Orda öyle bir soru ve herkes hem bir parça da şey bir değişikliği olabilir. Bir mod değişikliği olabilir (C2\_F).*

*When you get ready to ask a question, they wake up and get consciousness. They pick up their phones and try to understand the question (C3\_F).*

*Bunu sormaya hemen hazırlık yaptığımız anda zaten bir uyanıyorlar. Kendilerine geliyorlar. Cep telefonlarını çıkartıyorlar, sorunun ne olduğunu anlamaya çalışıyorlar (C3\_F).*

*I observed that the students were awoken and interest to the course were aroused especially when we have a lot of students, and tried to do this even if we did not succeed (C3\_F).*

*Özellikle böyle çok öğrencimizin olduğu zamanlarda bunu yapmaya çalıştığımızda bile, başaramasak da öğrencilerin uyandığını, derse ilgilerinin o an, o noktada toparlandığını gördüm yani (C3\_F).*

### *Cost*

C1\_F and C2\_F mentioned that a free of charge system was another advantage of it. When it was compared with similar system used in Turkey or abroad, there was no cost for purchase a device, registration or sending SMSs.

*It's enticing for the students due to no cost (C1\_F).*

*Maliyetinin olmaması öğrencilere çok cazip geliyor (C1\_F).*

*No much cost for the students (C2\_F).*

*Öğrenciye de çok maliyeti olmayan (C2\_F).*

### *Ease of Use*

C1\_F stated that ease of use was an advantage of this system. Students could easily respond to questions via a well-known method they had been using and just with a single movement. So, answering questions became easier and made system more usable.

*Answering with a single action make easy for their tasks (C1\_F).*

*Tek hareketle cevap vermeleri işlerini kolaylaştırıyor (C1\_F).*

### *Interaction*

One of the common advantages of system for students was providing and supporting interactive environment in the class. While C2\_F mentioned that the system was so interactive, C1\_F mentioned that she asked students to interact with

each other during some of the classes, the system did not have any negative effect; on the contrary it supported interaction. Furthermore, C3\_F mentioned that the system woke up sleeping students in order to participate the lesson actively. So, they discussed questions and answers with each other and faculty member that an interactive classroom environment was supported.

*I saw that they did by discussing and talking with each other. I support that flexibility in some activities in the class, but not for all. For instance, students can ask a question to a student next to him/her, but cannot check the course materials because of using this (system) as a kind of quiz. They did it by discussing the choices. I think it is helpful at all the times. It never blocks their discussion (C1\_F).*

*Birbirleriyle tartışarak, konuşarak yaptıklarını gördüm. Ama hani sınıftaki diğer etkinliklerde de o serbestliği, her birinde değil ama tanıyorum ben. Mesela, hani yanındakine sadece sorabilir. Ders notuna bakmayacak ama bir şeyi eğer, çünkü bunların her biri quiz gibi bir anlamda. Onu yapıyorlar. Hani seçenek üstünden orada da tartışarak yapıyorlardı. Onun faydası olduğunu düşünüyorum her zaman için. Onu bloke etmedi yani birbirleriyle tartışmalarını (C1\_F).*

*They ask to each other like that "What about this question?" There is an interaction, of course (C3\_F).*

*Birbirlerine soruyorlar, "Ya, bu soru neymiş filan" diye. Tabi ki bir interaction oluyor (C3\_F).*

### *Enjoyment*

All faculty members agreed that system helped students to enjoy the class. They mentioned that the system was fun to use, students liked to use and had fun when they used it.

*The students like it very much, especially at the beginning (C1\_F).*

*Öğrencilerin hoşuna, ilk başta çok özellikle hoşlarına gitti (C1\_F).*

*... in a more entertaining way... (C2\_F).*

*...daha eğlendirici bir şekilde... (C2\_F).*

*Students enjoy very much from this (C2\_F).*

*Öğrenci bundan çok keyif aldı (C2\_F).*

*In a sense, the students like these kinds of applications since they see those popular tools (on TV) (C3\_F).*

*Yani işte bir, popüler araçları seyrettikleri için bu öğrenciler, bu tür uygulamalar o anlamda hoşlarına gidiyor (C3\_F).*

### *Way of Feedback*

Only C1\_F mentioned that the system's way of giving feedback is an advantage for the students. Besides giving feedback to students, giving immediate feedback helped students to see why they made mistakes and to correct it, just at the time.

*I think it is more useful due to way of providing feedback (C1\_F).*

*Geribildirim sunulma şekli açısından daha faydalı olduğunu düşünüyorum (C1\_F).*

### *Stress Free*

C1\_F and C2\_F mentioned that the system is stress free to use in advantage of students. C2\_F stated that this system was more fun than pop-quizzes and exams, and caused less stress than them. Moreover, C1\_F mentioned that responding questions anonymously diminished the fear of students to give a wrong answer to the question and decreased the stress.

*It prevents the fear of making a mistake since the student who replied the question is not known (C1\_F).*

*Öğrencinin yani cevabı kimin verdiğinin belli olmaması bu hata yapacağım korkusunu engelliyor (C1\_F).*

*The stress however is due to being novelty effect as compared to stress caused by the exams and pop-quiz; I think it seems less stressed and entertaining a bit (C2\_F).*

*Ama o stres, sınavların ya da pop-quizlerin yarattığı strese nazaran, belki yenilik etkisi olduğu içindir, daha az stresli, bir parça eğlenceli algıladığını düşündüm (C2\_F).*

#### **4.1.2.3 General Advantages**

In addition to all other advantages, C1\_F stated that the system had a positive side that protects student that might have a positive contribution to learning process of students and increase the general quality of the course.

*Thinking of that, it favor the students, on the other hand, it can increase the quality of the lessons I think (C1\_F).*

*Onu düşünerek, öğrenciyi kollayıcı, bir taraftan da hani derslerin kalitesini artırıcı bir şey olabileceğin düşünüyorum (C1\_F).*

#### **4.1.3 Problems**

##### **4.1.3.1 Problems related to the system**

###### *Design*

C1\_F had some complaints about the design of the system. She stated that questions were written so small that could not be seen at the back seats of the class. Based on this problem statement mentioned in the first interview design of the interface was changed, questions and choices were written with bigger font size.

*The design problems caused problems. When they looked at the slides, they could read the question but hardly. For example the choices were shown bigger, and the texts were shown smaller. It caused problems (C1\_F).*

*Tasarımdaki sıkıntılar. O sıkıntı yarattı. Yani, baktığı zaman yansıya, onu çok net, soruyu okuyabiliyor ama zorlanıyor. Mesela seçenekler daha büyük çıkıyor, yazı daha küçük çıkıyor. O biraz sıkıntı yarattı (C1\_F).*

### *Anonymity*

According to C1\_F answering the questions anonymously might be a problem. She thought that if there was no record about the identity, faculty member could not know who did not answer the question if there were missing data. In classic way, using paper-pencil, each student wrote their names, so faculty member were able to know who answered the question and who did not. In this manner, anonymity could be thought as a system related problem for C1\_F.

*Now, I do not know who did not answer the questions on the system. If 28 out of 40 students answered the questions, there was a big gap. I do not know why there was a gap, and who they are. On the other hand, I could check the names when I used paper and pencil (C1\_F).*

*Tabi şu anki sistemde kimin cevap vermediğini bilmiyorum. Ama ben 40 öğrenciden 28 öğrenci katılıyorsa, arada baya bir kaybım var. O kayıp nereden geliyor, kim olduğunu görmüyorum. Ama kağıt kalem uygulaması yaptığımda, isimler üzerinden takip etme şansım oluyor (C1\_F).*

### *Technical Problems*

One of the system related problems mentioned by C3\_F was technical problems that might result in malfunction of the system. C3\_F stated that he experienced some problems during the process and could not use the system. There should be no technical problem related with the system that caused to crash the system. So, the system was updated based on the problems C3\_F experienced and was ensured to be working bug free.

*The technical difficulties drew my attention. It caused problem to me (C3\_F).*

*Teknik aksaklıklar sadece benim dikkatimi çekti yani. Bana problem açan o yani (C3\_F).*

The researcher observed that the system had functional problems three times during the semester. While C1\_F experienced a problem at the very beginning of the semester, C3\_F experienced such problems twice during the semester. The problem experienced by C1\_F was related with the system that SMSs were not delivered due to the system was in sleep mode. This problem was solved just after it was occurred. The problems experienced by C3\_F were due to system update, once, and server connection problems, which were solved just after they were occurred.

#### **4.1.3.2 Problems related to other reasons**

Although users experienced some problems related to system, they experienced some problems related to system such as user problems, Internet connection and GSM problems

##### *User-Originated problems*

According to C1\_F, the most common problems aside from problems related to system were user-originated problems. However those were not specific to this study that they might occur any similar studies. The problems stated were forgetting mobile phone at home, phones being out of charge or not working, or students not to answer the questions.

*There might be problems caused by students. Their phones might be broken, or there might be problems. Also, there might be students who do not answer sometimes (C1\_F).*

*Öğrencilerden kaynaklanan sıkıntı da olabiliyor. İşte telefonu çalışmıyor, herhangi bir aksilik olabiliyor. Bir de cevap vermeyen öğrenciler oluyor arada (C1\_F).*

According to the researcher's observations, there was not such problem occurred during the semester. Although faculty member was worried about the device problems, all students had their phones and used them without a problem. He was

mostly curious about the students who did not respond to question, but such lost could be experienced even if students were asked to raise their hands.

### *Internet Connection*

One of the problems based on the researcher observation notes, as stated by C2\_F, was the Internet connection problem that she experienced in the middle of application. System logged her out when she lost the connection. So, responses of some students were lost. Actually the problem was not a system problem, but an infrastructure problem of the classroom.

*When the Internet connection was broken, some answers were not recorded. When the same question was asked, one student could not send message. The system seems to have a small problem. As far as I understand, the question needs to be redefined or cancelled (C2\_F)*

*İnternet bağlantısının kesildiği an, öğrenci cevapları yarım kaydedilmişti. Tekrar aynı soruya döndüğümüzde bir kişi ikinci mesajı yollayamadı. Yani sistemin öyle bir sanki minik bir defosu varmış gibi. Ya soruyu yeniden tanımlamak gerekiyor, anladığım kadarıyla ya da o sorunun iptal edilmesi gerekiyor (C2\_F).*

### *GSM Problems*

Another problem could not be controlled or originated from the system was stated by C2\_F that some responses were not delivered or took some time to be delivered that caused by GSM operators.

*... the message was not delivered. And also, this is a problem. I mean that the message delivered from Turkcell (a GSM company), but not delivered from the other one. It might not happen (C2\_F).*

*... işte cep telefonu mesaj gitmedi. Hani bir de o problem var. Yani her zaman, mesela her telefondan ya da her şeyden işte Turkcell'den gidiyor da başka bir şeyden gitmiyor gibi. Olmayabiliyor (C2\_F).*

According to the researcher's observation notes, some of the delivery confirmation SMSs were delayed delivered. However, this situation was not specific to just one GSM company. Delays were occurred in each GSM company.

#### 4.1.4 Technical Suggestions

Faculty members were asked to give some suggestions based on the problems they experienced or just based on their needs. The suggestions given by faculty members are given below.

##### *Showing Identity*

One of the properties offered adding to the system was showing identity of students and reporting the results based on identities. Although C1\_F stated that being anonymous had a stress reliever effect on students; she mentioned that when faculty members see the identities that might encourage the students to participate, too. Besides, C2\_F stated that she wanted to use this system to track active participation of students. This system would help her to track each student during the whole semester individually to make objective evaluation. Furthermore, she supported that each student should be able to answer and defend her/his idea as a requirement of his or her department.

*If the system shows it to me, and the students know that I can track them, I think it encourages the participation (C1\_F).*

*Onu, sonrasında sistem bana gösterdiğinde, benim takip edebildiğimi öğrenci gördüğü zaman katılımını teşvik edecektir diye düşünüyorum (C1\_F).*

*If a grade is given to the participation and contribution to the discussions, there should be an indicator to help instructor. There should be something numerical. For example total of a hundred questions were asked during the semester. She/He was in the class during the 80 out of these 100 questions; and answered 70% of these*

80 questions. I mean this prevents the subjectivity in that participation grade (C2\_F).

*Yani bir katılım ve katkı notu verilecekse tartışmalara hocanın elinde bir indeks olması, yani bir gösterge olması lazım. Bir sayısal bir şey olması lazım. Toplam dönem içerisinde yüz soru sorulmuş diyelim. Bu yüz sorunun sekseninde sııftaymış. Sekseninde sınıfta olduđu soruların da yüzde yetmişine cevap vermiş. Yani bu aslında bir sübjektiviteyi o katılım notunda engeller (C2\_F).*

### *Attendance*

C2\_F suggested that the system might be used to take attendance. Thus, the system would prevent time loss and distraction due to circulating sign sheet within the class. Furthermore, system would stop students to sign instead of absent friends.

*Besides, it has a potential to use in order to track the attendance of students. It would be great. Because it is a waste of time to circulate the attendance sheet and you cannot be sure all the time actually. What would you do when you see the signature of a person who is not there? I mean that is problematic. You might not check all the time meticulously, but this automatically allow to keep track of students' attendance, hence it is appropriate (C2\_F).*

*Ayrıca, öğrencinin derse devamının takip edilmesinde de kullanılabilme potansiyeli var. O çok harika olur. Çünkü hem bir zaman kaybı, bu bir kağıdın dolaştırılması hem de her zaman aslında emin de olamayabiliyorsunuz. Olmayan birisinin imzası olduğunu gördüğünüzde ne yapmanız gerekiyor? Yani, problemlı. Her seferinde kontrol etmeniz aynı titizlikle mümkün olmayabiliyor ama bu otomatik olarak, devamı da takip etmeye izin veren bir sistem olması nedeniyle, çok isabetli (C2\_F).*

### *METU ONLINE Integration*

METU-Online is the learning management system used in METU. C2\_F suggested that connecting the system and METU Online LMS system would help to meet her former suggestions such as taking attendance, track students performance, grading mini quizzes and evaluating students objectively.

*Actually, the property that should be added to the system is that if I want to keep the Log of the students for a long time. Both if he attend the lecture and I do not know their attendance to the pop quizzes. If the performance were saved, that would be great. I mean, if it is integrated to our METU Online kind of system that would be great. But in this way, perhaps, it just motivates the students. But the other can be used for serious aims, for keeping track of the students (C2\_F).*

*Aslında eklenmesi gereken özellik, ben hani uzun süreli bir öğrencinin katılım "Log"unu tutmak istiyorsam. Hem sınıfta bulunup bulunmadığını, hem de işte ne bileyim minik pop quizlere katılımını. Performansının otomatik bir kaydı olabile çok harika olur. Yani entegre edilebilse bizim METU Online gibi bir sisteme. Harika olur. Ama bu haliyle bir parça, sadece öğrenciyi teşvik edebilir. Ama öbürü daha da ciddi amaçlar için, öğrenciyi takip için kullanılabilir (C2\_F).*

### *Design*

C1\_F suggested that design of the system should be improved. She suggested for two different improvements. The first one was to redesign the user interface that the system might better catch attention and students could see the questions easily. The second one was adding more graphic illustration options for results.

*One more thing besides that the graphics might be more visual in order to catch students' attention, they have never seen before. They both participate and surprised. For example, at the beginning they liked this application because of that reason, but by few methods, perhaps software, related with design, the development of visuals that attract the students (C1\_F).*

*Onun dışında bir de belki daha, bu çıkan grafikler mesela, daha görsel olsa. Çocukların ilgisini çeken, daha önce görmedikleri, sürpriz. Hem katılacaklar, hem de şaşıracaklar. Mesela ilk başta bu uygulama o nedenle çok hoşlarına gidiyor, ama bir kaç şekilde yazılım belki de onu, tasarımıyla ilgili, daha onlara cazip gelecek şekilde görselliğin gelişmesi (C1\_F).*

#### 4.1.5 Concerns

Even though faculty members had positive attitudes to the system, they also had some concerns. These concerns are given below.

##### *Reinforcing Impatience*

C1\_F is the faculty member with more concerns than others. Although she mentioned that the way of giving feedback, immediate, was an advantage for the students, she had some concerns about the same issue, which might reinforce the impatience of the students. According to her, students were motivated to answer the questions, but they wanted to answer all questions as quickly as possible, and wanted to discuss later. She was concerned whether this motivation would become so much to make them impatience not just for this system but also for all in class applications.

*When they initiate the procedure, there is a motivation to finish it as soon as possible in children. The next should come; we should finish the other later. Like, it seems difficult to carry out synchronously. We should give the answers immediately, see the things, discuss later. I mean do we reinforce this eagerness? Like let it be quick, see immediately, take immediately. I have concerns at that point (C1\_F).*

*Bu sürece başlayınca bir an önce tamamlama motivasyonu oluyor çocuklarda. Sonraki de gelsin, ötekini sonra tamamlayalım. Sanki o ikisini senkronize yürütmek zor gibi geliyor. Hani bir an önce şu cevapları verelim. Şeyleri bir görelim. Sonra tartışalım. Hani onu pekiştiriyor muyuz bu sabırsızlığı? Çabuk olsun, hemen göreyim, hemen alayım gibi orda biraz endişem var (C1\_F).*

##### *Mobile Phone Using Habit*

Another concern of C1\_F was mobile phone using habits of students. She thought that students were addicted to their mobile phones that they always need to touch and control it whether they had any new notification. She told that the system partially satisfied their “touching the phone” needs. But, she concerned about

students being phone addicts, being distracted by phone; and, she stated that she did not allow students to use their mobile phones in class except application.

*Touching the screen of the phone is becoming a habit; you feel to look the phone in the lesson. This is entirely a limited observation. It seems to answer the necessity to me. I mean, they take and look at their phones anyway (C1\_F).*

*Cep telefonuna dokunma artık o kadar bir alışkanlık haline gelmiş ki derste de bir dönüp bakma ihtiyacı var. Bu tamamıyla çok sınırlı bir gözlem. İhtiyaca da cevap veriyor gibi geldi bana. Hani bir alıp, cep telefonunu yokluyorlar zaten (C1\_F).*

#### *Time Consuming and Extra Work for Faculty*

C3\_F concerned that the system could be time consuming and needs extra work for faculty members. According to him, faculty member should design and plan the class very careful that they would use the system. Faculty member should decide where, when and which questions would be asked, should prepare questions and then input those questions into system.

*The instructor should make preparation seriously. He should plan the questions before, should write before (C3\_F).*

*Öğretim üyesinin ciddi anlamda bir hazırlık yapması gerekiyor. Soruları önceden planlaması gerekiyor. Önceden yazması gerekiyor (C3\_F).*

#### **4.1.6 Opinions**

Besides technical issues, faculty members were asked to their opinions about the system. They had some positive and negative opinions given below.

##### *Positive*

Faculty members were asked what they thought about the system and whether they wanted to use this system in other courses. All faculty members thought that the system was useful and they wanted to use the system in other courses in future.

While C3\_F stated that the system address the needs of current students, C2\_F mentioned that the system helped students to breath during the class and could be used in any moment of the class. Furthermore, C2\_F told that students were really serious about the system usage that they readily came to class by reading related articles. Lastly, C1\_F mentioned that the most effective aspect of the system was being a new but accustomed way to interact with students that helped them to see their learning levels and misconceptions at the same time by giving immediate feedback. So, students were very happy and liked to use the system.

*The most effective side, as I said, it is new, takes the attention, requires to answer in a way that students are used to, students can see the results and the degree of their learning, they can get the immediate feedback, and in the situation where there is not any technical problem, this is very fast (C1\_F).*

*En etkili yönü, dediğim gibi yeni olması, dikkat çekmesi, çok alışkın oldukları yolla cevaplandırılmasının istenmesi, somut olarak kendi öğrenmeleri ile ilgili sonucu ya da düzeylerini net olarak görebilmeleri, anında geribildirim alabilmeleri ve bunun teknik aksaklıklar olmadığı durumda diyorum ben, çok çabuk olması (C1\_F).*

*Yes, yes in my different lessons, in different periods. Because, when the methods are varied, the tools are varied, the motivation of the students is increased (C1\_F).*

*Tabi tabi farklı derslerimde, farklı aralıklarla. Çünkü yöntem çeşitlendikçe, araçlar çeşitlendikçe öğrencilerin ilgisi artıyor (C1\_F).*

*If it is used in this way, it can be used for the motivation of students and their attendance to the courses, I think (C3\_F).*

*Böyle kullanırsa öğrencilerin ilgilerinin, derse devamlarının sağlanması açısından kullanılabileceğini düşünüyorum (C3\_F).*

*I think this is a system that meets the need of today's students (C3\_F).*

*Bence günümüz öğrencilerine hitap eden bir sistem olduğunu düşünüyorum (C3\_F).*

## *Negative*

The main complain about the system was technical problems occurred during the semester. C1\_F and C3\_F stated that they experienced some technical problems at the beginning of the semester.

## **4.2 Students**

### **4.2.1 Usage**

#### **4.2.1.1 Purpose**

When students were asked by which purposes the system was used by faculty members, some common purposes such as discussion, feedback, evaluation, motivation, engagement, preparation and a different purpose such as to check whether they read the articles or not were revealed that the students were thought to be system used. These purposes could be listed as discussion, feedback, evaluation, motivation, engagement, preparation, and to check whether they read the articles or not. While discussion, feedback, evaluation, motivation, engagement, repetition, and preparation were common, students thought that faculty members used the system additional purpose such as to check whether they read the articles or not. On the other hand implementation was a purpose mentioned by faculty members, but none of the students mentioned that.

## *Discussion*

Four out of six students from the first case stated that the faculty member used the system in order to start and carry a discussion during the class. According to them, the system was used to ask a question with no exact answer, which could be interpreted differently based on individual differences, in order to help students to explain their thoughts and to discuss on it.

*I think the aim of the instructor was different. At first weeks it was on correct answer. In this time, it was on holding discussion in a bit*

*advanced level. Taking people's viewpoints and ideas, and according to them. I think the intent of instructor was different a bit (C1\_S2).*

*Hocanın niyeti farklydı bence. İlk haftalarda direk doğru cevap, yanlış cevap üstüneydi. Bundaysa biraz daha ileri seviyede, tartışmaya yönelik. İnsanların fikirlerini alıp, ona göre. Biraz hocanın niyeti de farklydı bana göre (C1\_S2).*

*The aim of the teacher in reflective questions was that students express and reflect their ideas with discussing the topic in a way (C1\_S2).*

*Tartışma sorularında o zaman, hocanın niyeti sınıftaki öğrencilerin hani bir şekilde konu üzerinde tartışıp, düşüncelerini belirtmesiydi (C1\_S2).*

*She/he asked some questions that are discussible, not with a clear answer and reflective in latter weeks (C1\_S5).*

*Daha sonraki haftalarda biraz daha böyle tartışılabilir yani tam böyle net cevabı olmayan, belki herkese göre değişen sorular sordu (C1\_S5).*

Five out of six students from the second case stated that the faculty member used the system in order to make them discuss in the class. According to them, the faculty member asked a question at the beginning of the class to make the students discuss on a topic. Later on, faculty member asked the same or a similar question in order to see the difference.

*There was an application change that whether there is a change in one's mind or not with/after discussion (C2\_S3).*

*Orda hani insanlarda bir fikir değişikliği olacak mı tartışma üzerinden gibi bir uygulama değişikliği vardı (C2\_S3).*

*She/he asked it in the beginning of the course and then at the end to make us discuss (C2\_S3).*

*Üçüncüsünde dersin başında gene sorup, daha sonra dersin sonunda tekrar sorup tartıştırmıştı (C2\_S3).*

### *Feedback*

While one of the students from Case 2 stated that the faculty member used the system in order to give feedback to them, none of the students from Case 1 and Case 3 mentioned about it.

### *Evaluation*

Two students from Case 1 stated that the faculty member used the system in order to evaluate the students. While one of the students stated that the system was used at the end of the class in order to evaluate what they learned that week, one of the students mentioned that the system was used at the beginning of the class in order to evaluate what they learned in previous weeks.

*The part like an evaluation at the end... (C1\_S5).*

*Sonunda değerlendirme gibi oluş kısmını... (C1\_S5).*

*She made an evaluation for the last week at first (C1\_S6).*

*İlk başta, geçen haftaninkinin değerlendirmesini yaptı (C1\_S6).*

Two students from Case 2 stated that the faculty member used the system in order to evaluate the students. Both of these students told that the system was used at the end of the class in order to evaluate what they learned that week.

*Yes, with the article, related with the day's article... (C2\_S3).*

*Evet, makaleyle, o günkü makaleyle alakalı... (C2\_S3).*

*She also measured our knowledge... (C2\_S4).*

*Hem bilgimizi ölçtü... (C2\_S4).*

Five students from Case 3 stated that the faculty member used the system in order to evaluate the students. All five students stated that the system was used at the end

of the class in order to evaluate whether they listened the lecture carefully, and how much the topic was understood.

*He asked related with what he taught, in general at the end (C3\_S4).*

*Dersin sonunda da genelde anlattıklarından sordu (C3\_S4).*

*He test himself about that we learn or not and we listen carefully or not (C3\_S5).*

*Biz hani öğrendik mi öğrenmedik mi? Acaba dinliyor muyuz gerçekten etkili bir şekilde yoksa dinlemiyor muyuz diye kendini bir test etmiş oluyor (C3\_S5).*

*It changes based on flow of the lesson, however she/he used it to ask questions about the day's topic at the end of course in general (C3\_S6).*

*Soruların gidişatına göre değişti ama genel olarak dersin sonuna doğru yani işlediği konuya değinen bir soruyu dersin sonunda ne kadar anladığımızı test edebilmek için sordu (C3\_S6).*

*He asked questions using the system about the topics covered in the course and also to evaluate whether we understood and learnt better (C3\_S7).*

*Bunu, dersin içeriğinden bazı soruları sordu bize ve iyi anlaşılıp anlaşılmadığını, iyi sindirilip sindirilmediğini değerlendirmek için (C3\_S7).*

Student from all three cases stated that the faculty members used the system in order to evaluate students. While just one student from Case 1 mentioned that the system was used at the beginning of the class in order to evaluate their knowledge about the previous weeks, other students stated that the system was used at the end of the class in order to evaluate their understanding and level of learning about the topic told or discussed at the same day.

### *Motivation*

While just one student from the Case 1 mentioned that the system was used to motivate them, two students from Case 2 stated that the system was used as a motivational element for the course.

*Mrs. ... used it to take our attention, actually to motivate us at the beginning of the course (C1\_S3).*

*... Hoca bunu daha çok dersin başında ilgi çekmek, yani motivasyonu sağlamak amacıyla kullandı (C1\_S3).*

*She asked about which choices were correct to increase our motivation (C2\_S3).*

*İşte motivasyonumuzu arttırmak için seçeneklerden hangilerinin doğru olduğu sorular sordu (C2\_S3).*

### *Engagement*

Just one student from Case 2 stated that the system was used to maintain engagement for the students.

### *Review*

Four of the students from Case 1 stated that the faculty member used the system for review that she asked questions related with former weeks at the beginning of the class to repeat former topics and to help them remember.

*In a sense, there were questions to repeat the earlier topics (C1\_S4).*

*İşte, böyle, ilk başlarda bir işlediğimiz konuları tekrar amaçlı sorular oldu (C1\_S4).*

*She asked 4-5 multiple-choice questions to us to repeat the earlier topics (C1\_S5).*

*Önceki konuları tekrar etmek için bize 4-5 tane çoktan seçmeli soru vermişti (C1\_S5).*

Three students from Case 3 stated that the faculty member used the system for review. According to students, faculty member asked questions at the beginning of the class related with former weeks to review them, and at the end of to class to review what he taught that week.

*At first reminding the information about the course and then a short summary at then end (C3\_S4).*

*Dersle ilgili bilgilerimizi öncelikle hatırlamak sonunda da dersin ufak bir tekrarı (C3\_S4).*

*It was used as a summary of the previous course, in order to reinforce the topic of the course (C3\_S3).*

*Bir önceki dersin de bir özeti şeklinde kullanıldı. Derste işlediğini pekiştirme amaçlı (C3\_S3).*

### *Preparation*

Four out of six students from Case 1 stated that the faculty member used the system for preparation. One of those students mentioned that the faculty member used the system in order to check their prior knowledge and to catch their attention at the same time, two of them mentioned that the faculty member used the system just to help them remember prior knowledge, and one of them mentioned that the faculty member used the system just to catch their attention.

*She firstly wanted from us to know about the topic (C1\_S1).*

*Öncelikle konuyla ilgili bilgimizin olmasını istedi (C1\_S1).*

*Questions about the topics of that day were asked to us. We replied them (C1\_S5).*

*O gün işleyeceğimiz konu ile alakalı sorular sorulmuştu bize. Onları cevaplamıştık (C1\_S5).*

Three students from Case 2 stated that the faculty member used the system for preparation by asking questions to check their prior knowledge related to topic.

Five students from Case 3 stated that the faculty member used the system for preparation. They agreed that the faculty member used the system in order to check and to help them remember their prior knowledge. Furthermore, one of those students stated that the faculty member additionally used the system to catch their attention.

*It provided us to think about the course and practicing before the course (C3\_S1).*

*Bizi ders ile ilgili düşünmeye, ders başlamadan önce bizim biraz pratik, egzersiz yapmış olmamızı sağlıyordu (C3\_S1).*

*There were also questions about the former topics. He tried to understand how much we remember, and discuss. He tried to figure out this (C3\_S2).*

*Önceki haftalarla ilgili sorular da sordu. Aklımızda ne kadar kalmış, ne kadar kalmamış, ne kadar yorum yapabiliyoruz? Bunu denedi bizde (C3\_S2).*

When all three cases were compared with each other, it can be seen that students from all cases agreed that the faculty member used the system for preparation in order to make the students ready for the class and to start the lecture. When how the faculty members used the system was examined, the common opinion was asking questions to test or to remember prior knowledge of students. Furthermore, two students, one each from Case 1 and Case 3, stated that the system was used to catch their attention and to direct it to lecture.

*To Check Whether They Read the Articles or Not*

All students from Case 2 stated that the faculty member used the system in order to check whether they read the assigned articles, or not. In Case 2, few articles were assigned that they were supposed to read before the class, and discussed in the

class. Faculty member used the system as a way of controlling whether they read, or not, and whether they understood, or not.

*She used the system to measure the interest to the course materials. In other in words it was used to measure how we read the articles (C2\_S4).*

*Sistemi, ders materyaline olan ilgiyi ölçmek için kullandı. Yani hani, okuduğumuz makaleleri ne kadar okuduk, ne kadar dikkatli okumuşuz, onun için (C2\_S4).*

*...(it was used) to measure our knowledge and whether we read the course materials (C2\_S2).*

*Ders hakkında yeterince, yani dersteki materyaller hakkında yeterince bilgimiz olup olmadığını, okumuş olup olmadığını ölçmek için (C2\_S2).*

## **4.2.2 Advantages**

### **4.2.2.1 Advantages for Faculty Members**

#### *Feedback*

Two students from Case 2 mentioned that one of the advantages of the system for faculty members was providing feedback to them. According to both students the system helped faculty members to see what were the tendencies and misconceptions in the class and to correct them at the mean time before being too late.

*One can see the number and ratio of wrong answers. When the instructor sees it, s/he focuses on that topic more. S/he makes us to search on deal with the topic. S/he deals with the wrong answers. The system has such an advantage.*

*Yapılan yanlış sayısı ve oranı göreceksin. Hoca onu gördükten sonra da ona göre o konunun daha fazla üzerinde duracaktır. O konuyla ilgili çalışma aratacak. Yanlış olan neyse, onun üzerinde duracak. Öyle bir avantajı var bunun (C1\_S1).*

*One can understand the tendency toward the question in the class via the graph. So, the instructor focuses on that option when she/he sees the wrong answer (C1\_S1).*

*Sınıf içindeki soruya karşı olan eğilimi de anlıyorsunuz. O grafikten. Dolayısıyla hoca, yanlış şıkkı gördüğü zaman, hani o şıkkın üzerinde daha fazla duruyor (C1\_S1).*

*It provides to find out mis/understandings in the entire class if we think the instructor uses (C1\_S2).*

*Öğretmenin kullandığını düşünürsek, anlık, bütün sınıftaki, konu ile ilgili yanlış bilinenleri ya da doğru bilinenleri anlama imkanı sunuyor (C1\_S2).*

Five students from Case 2 stated that the system was useful for faculty members in terms of providing feedback. According to them faculty members were able to see the readiness status of students, what amount of students participated to class, and to evaluate themselves by the help of this system.

*There are some questions about the courses that I am enrolled. The instructor tries to learn what the students think compulsorily. However if this system was used, it would provide to learn about what students think in detail, especially in the crowded class that includes 70-80 students, and easy to learn about what the others think, what can be done in this issue, how can be eliminated, what is the wrong if it is wrong, what students are prone to which mistakes (C2\_S1).*

*Aldığım dersler için sınıf içinde sorular soruluyor. Hoca zorla böyle kimlerin ne düşündüğünü öğrenmeye çalışıyordu. Ama bunun yerine bu sistem kullanılsaydı çok daha net bir şekilde sınıfın neler düşündüğü, çünkü kalabalık 70-80 kişilik sınıflarda çoğunluğun ne düşündüğünü, o yönde geri kalan yarının ne düşündüğü, bu konuda neler yapılabileceği, nasıl bertaraf edileceği, yanlışsa yanlışın nerede olduğunu, hangi yanlışsa daha çok kayıldığı öğrenilebilir (C2\_S1).*

*Everybody do not speak during the class, but we can see that they are knowladgable. It was kind of different. For instance, the faculty member might think that a small group of student is knowladgable*

*about the topic because of a small group is talking. Now, at least she knows that most of them are knowladgable (C2\_S2).*

*Herkes konuşmuyor sınıfta ama en azından bildiklerini görmüş oluyoruz. Hani, o şekilde bir değişiklik oldu. Şu anda mesela, belki de hoca şöyle düşünüyordu, çok az kişi konuştuğu için çok az kişi bilgi sahibi olduğunu düşünüyor olabilirdi. Ama şu anda en azından çoğu kişinin okuduğunu biliyor (C2\_S2).*

All students from Case 3 stated that the system had an advantage of providing feedback to faculty member that the faculty member would be able to understand the level of students' understanding, their way of learning, where they made mistakes, and general situation of the class. Thus, faculty member could review and revise his teaching strategies.

*The faculty member could better see that which is not understood. It actually shows the effeciency of the course. The faculty member or I can change the teaching or learning strategies based on the feedback received. She can keep going if it is successfull, else she can question the reasons of failure. So, more recent teaching strategies could be utilized (C3\_S7)*

*Neyin iyi anlaşılmadığını hoca daha iyi anlayabilir mesela. Yani ne kadar verimli olduğunu gösteriyor dersin. Hoca da ya da ben de ona göre çalışma tekniklerini ya da uygulama tekniklerini değiştirebilirler aldıkları geribildirime göre. Başarılıysa öyle devam eder. Başarısızsa sorar yani neden olmuyor, neden bitmiyor diye. Bir iletişime geçip daha yeni bir teknikle bir ders işleme metodu kullanılabilir yani (C3\_S7).*

When all 3 cases were examined it was seen that students from all three cases thought that the system was beneficial for faculty members in terms of providing feedback. Students from all cases agreed that the faculty members would acquire data about the general status of students, detect the common misconceptions of students and make the necessary arrangements. In addition, one student from Case 3 stated that faculty members could notice the passive students and might evaluate themselves and the teaching methods employed.

### *Timesaving*

One student from Case 1 and one student from Case 3 stated that the system was timesaving which was an advantage for faculty members who were trying to teach a massive amount of knowledge in a limited time. According to both students a big amount of time was being lost during the question answer session in the class. Furthermore, the student from case 3 stated that it was so difficult, sometimes impossible to count the number of responses by rising hand in crowded classrooms or auditoriums. This system might help faculty members to shorten the duration allocated and count the responses.

### *Interaction*

One student from Case 1 and one student from Case 3 stated that the system increased the level of interaction between the faculty member and students and it was beneficial for both sides.

#### **4.2.2.2 Advantages for Students**

### *Feedback*

Four out of six students mentioned that the system was beneficial for student in terms of providing feedback. The students agreed that the system helped them to see their own mistakes and the common mistakes made by other students, thus students had chance to correct them. Furthermore those common mistakes were seen by the faculty member and supportive or corrective feedback was supplied. In addition, one of the students stated that he tried to solve similar multiple-choice question tests at home, but he was not able to answer all the questions alone and get feedback about them. However, they had a chance to solve questions all together, to see their mistakes and to get feedback and correct them by the help of this system.

*This number of students chose this choice. If it was wrong, where was the most common mistake. For instance, faculty member said that you*

*hesitated so much between these two choices, and be careful about this. She gives some key points there (C1\_S5).*

*Şu kadar kişi bunu demiş. Yani yanlışsa da mesela en çok yanlış nerede yapılmış. Hoca da diyor ki mesela “Şu iki şık arasında çok fazla kalmışsınız. Şuna, buna dikkat edin” gibi bizi de orda, o soru ile ilgili trick noktaları verebiliyor (C1\_S5).*

*In general, I solve the multiple-choice questions alone. Solving them in class is a different thing. I solve individually and then try to learn what I do not know, but mostly I could not. For instance, you cannot find or ask to faculty member. Integrating into class, using in the class... Additionally, the question might be understood in a different way by each student, I saw that (C1\_S6).*

*Çoktan seçmeli sorularda şöyleydi hani, bireysel genelde, çözerdim. Burada sınıf içinde çözmek çok daha ayrı bir şey. Ya ben bireysel çözerdim, sonra bilmediğimi bir şekilde öğrenmeye çalışırdım ki çoğunu öğrenemezsin bile. Diyelim hocaya soramazsın, bulamazsın, edemezsin. Derse dahil edilmesi, dersin içinde olması... Ha bir de bir soru birçok kişide farklı anlaşılmaya sebep oluyor mesela, yanlış anlaşılma. Bunların hepsini görme fırsatım oldu hani (C1\_S6).*

All the students of Case 2 stated that one of the advantages of this system was providing feedback to students. They thought that the system was helpful to see their level of understanding and whether they learned, or not, getting feedback, and seeing what the class was thinking.

*I think to take feedback and learn about what the entire class think (C2\_S2)*

*Sanırım geribildirim almak. Sınıfın ne düşündüğünü öğrenmek (C2\_S2).*

*... (it shows) whether I know correctly or not, how I should read, and what I should pay attention (C2\_S3).*

*Doğru biliyor muyum, bilmiyor muyum ya da daha fazla nasıl okumam gerekiyor, neye dikkat etmem gerekiyor (C2\_S3).*

*I like the system, because I also can see the participation in the class by this and I can see the correctness of my answers immediately by this way. I see how much I understand or not (C2\_S4).*

*Sistem hoşuma gitti, çünkü ben de sınıftaki katılımı görmüş oldum böylece ve kendi cevaplarımın da doğruluğunu hemen anında öğrenmiş oldum böylece. Ben de ne kadar anlayıp, anlamadığımı öğrendim (C2\_S4).*

*Normally, we can only see these kinds of things in the exams, I mean whether we really understand or not. This was a kind of quick exam for us (C2\_S4).*

*Normalde, hani bu tarz şeyleri ancak sınavlarda görebiliyoruz. Hani gerçekten anlayıp, anlamadığımızı. Bu da hani hızlı bir sınav oluyor bizim için (C2\_S4).*

*Students also determine their own learning degree (C2\_S6).*

*Öğrencinin de kendi öğrenme düzeyini belirlemesi... (C2\_S6).*

Three students from Case 3 stated that the system was beneficial for providing feedback to them. While one of the students mentioned that the system helped them to learn together as a group and improve see the general situation of the class and support learning, another student pointed out that the system helped them to understand whether they learned as expected, or not. Another student stated that he was able to see his misconceptions, problems and inadequate part related with his learning, so he could detect the topics he had to study.

*Now, instead of one knowing how much he knows or not, he can act based on general percentile. It is more beneficial to learn the general students degree and in the development of himself than the previous one (C3\_S1).*

*Artık bir kişinin bilip bilmemesinden genel bir yüzdelerle hareket edebilecek. Sınıfın bütününün öğrenmesi ve kendisini geliştirmesi açısından daha faydalı olacağını düşünüyorum eskiye göre (C3\_S1).*

*I like the immediate feedback. I can say it has a contribution on us to see whether the lesson is learnt more effectively or not (C3\_S5).*

*Anlık geri bildirim vermesi hoşuma gitti. Dersin etkili bir şekilde öğrenilip öğrenilmediğini bizim de görmemiz açısından katkısı oldu diyebilirim (C3\_S5).*

*For example, if the answer is wrong, if 5 out of these 50 people give wrong answer, I am also one of these 5 people. It means I have knowledge gap and my classmates know these topics well. I can say I delivered feedback myself as I was behind the class. Normally, we can get feedback as kind of only in exams. And it happens if we do thing, if we go and look at our papers (C3\_S7).*

*Biz de kendimizi, içinde bulunduğumuz mesela soru yanlış çıkıyorsa bu elli kişiden beş kişi yanlış cevapladıysa; ha ben de bu beş kişiden bir tanesiyim. Demek ki benim biraz eksikim var ve sınıf arkadaşlarım bu konuları biliyorlar. Ben geride kalmışım diye kendi kendime geribildirim aldığımı söyleyeyim (C3\_S7).*

Feedback was one of the advantages of the system for students that both faculty members and students mentioned. Students from all cases agreed that the system was beneficial for them to provide feedback. According to their opinions, the system gave them a chance to see their and friend's mistakes, and to correct them. Furthermore, one student from Case 1 mentioned that answering the questions via this system in class was more beneficial for them than solving the same question alone.

### *Motivation*

Five students from Case 1 stated that the system helped them to motivate to participate the lesson. According to them, although they were not sure about their answers, they were curious about the correct answer, hurried to see the results and motivated to answer the next question. Furthermore, one student stated that asking a question, discussing on it, then asking the same or a similar question to track changes after discussion was extra motivated her to participate to the lesson.

*Because, you wonder the thing, no matter how much you assure, you wonder that which answers will be appeared or whether my answer is true. Or that can be happened, for example sometimes you send an option that you are not sure. In that situation, you also wonder the result (C1\_S5).*

*Çünkü şeyi merak ediyorsun, ne kadar emin bile olsan acaba gelede hangi cevap çıkacak ya da cevabım doğru mu diye. Ya da şey de olabiliyor mesela bazen, emin olmadığın bir şıkkı atıyorsun, gönderiyorsun. Orda da yine merak ediyorsun sonucu (C1\_S5).*

*Something like that is happened. For example, human, at least, I wonder like whether I do right or wrong. And also this sentence "At the end of the lesson, we are going to ask this question again" sentence, willy-nilly makes people, like this time I should do right... I focus on listening the lesson for not being two people who marks wrong, I wonder what instructor do, how he explains. In order to give the correct answer at the end of the lesson. After that... It pushed me to this. Also, I corrected my mistake anyway (C1\_S6).*

*Şöyle bir şey de oldu. Mesela, insan, bir kere merak uyandı hani doğru yaptım mı, yanlış yaptım mı. Bir de şu söz, "Dersin sonunda bu soruyu bir kez daha soracağız" sözü, ister istemez insanı, hani bu sefer doğru yapayım, şey olmasın diye. Gidip orda iki kişi filan kalmayalım diye, yanlış işaretlemeylem diye dersi dinlemeye odaklandım hani, merak ettim. Hoca ne yapıyor, nasıl açıklıyor. Bir de dersin sonunda doğru yapalım şıkkı diye. Ondan sonra... Beni buna itti. İşte sonra da düzeltiltim zaten hatamı (C1\_S6).*

All students from Case 2 mentioned that the system motivated them to listen the faculty member carefully and to participate the lesson. One student indicated that he had felt obligated to study more before the class in order to give correct answers to the questions. Also, one student mentioned when the results were shown as a graphic and saw her answer was correct, they smiled unintentionally. Another student from Case 2 indicated that the system motivated her to answer the questions and to find the correct one due to evaluating herself.

*Once, it encourages people (C2\_S1).*

*Bir kere teşvik ediyor insanları (C2\_S1).*

*People can be sure more for the correctness of their answers, because of receiving feedback, they can be motivated to speak more, I mean to participate the lessons more (C2\_S2).*

*İnsanlar verdiği cevabın doğruluğundan daha emin olup, çünkü geri bildirim aldıkları için daha fazla konuşmaya yani daha fazla derse katılmaya motive olabilirler (C2\_S2).*

*First of all, since only a person knows his answers to the questions, I mean he assesses himself, and it motivates to learn more. I mean, since he has like he has a thing that he should know the right answer, I mean he controls himself according to me, it motivates to learn more (C2\_S3).*

*Öncelikle, sadece kişinin kendisi bildiği için verdiği cevapları, hani kendisi kendini değerlendirdiği için öğrenmeye daha çok teşvik eder. Hani, kendisinin böyle, doğru bilmeliyim diye bir şey olduğu için, hani kendisi kendisini kontrol ettiği için bence öğrenmeye daha çok teşvik eder (C2\_S3).*

Two of the students from Case 3 remarked that the system was beneficial to motivate them. One of them especially pointed out that the system supported them to state their opinions whether it was correct, or not.

*In order to motivate the students to the courses, it can be used in all courses (C3\_S2).*

*Öğrencilerin derse motivasyonunu sağlaması adına bütün derslerde kullanılabilir (C3\_S2).*

Motivation was another advantage of the system mentioned by both faculty members and students from all cases. Most of the students were agreed that the system motivated them to answer the questions, to participate the class and to state

their opinions. Furthermore, the researcher observed that students were willing to answer the questions.

### *Engagement*

Four out of six students from Case 1 remarked that the system was engaging and helped them to engage to the lesson. Students stated that they got distracted after a while and severed from the lesson. The system was beneficial to eliminate distraction, daydreams and helped to catch attention and redirect to lesson by asking questions.

*In lesson, you sometimes get bored from the thing. It becomes monotony sometimes. The lectures can be contentiously but sometimes there is monotony. You get used to that after a time. When it is happened, I mean when we used, out of nowhere you send a message from your phone etc. One way it makes us in the lesson, it helps us to let us go and motivates us I can say. It helps in that manner perhaps. At least for me, I can say it eliminates the boredom (C1\_S2).*

*Derste bazen sıkılıyorsun işte şeyden. Monoton gittiği için bazen. Ders yine tartışmalı geçiyor ama bazen bir monotonluk oluyor yani. Ona da alışılıyorsun zamanla. Öyle olduğunda hani bunu kullandığımızda işte bir anda telefonda mesaj atılıyorsun filan. Bir şekilde bizi derse işte şey, kafa dağıtıp motivasyonu arttırdı diyebilirim hani. O açıdan faydası oldu herhalde. En azından benim için dersteki o sıkınlığı geçirdi diyebilirim (C1\_S2).*

*I get bored a lot when only the instructor speaks. People feel the necessity to do something. I wiggle my legs or I play with something somehow. But, when I start to speak, naturally I spend my energy on something and I feel happy. I start to enjoy the lecture. I think it increases these kinds of things. When I speak, the others are listening to me. When the others speak, I am listening to them. By this, the knowledge level is increased and the interaction is increased According to me (C1\_S4).*

*Ben çok sıkılıyorum derslerde, sadece hoca konuştuğunda. Böyle bir şeyler yapma gereği hissediyor insan. Ayağımı sallarım ya da bir şeylerle oynarım bir şekilde. Ama ben de konuşmaya başladım mı doğal olarak enerjimi bir şeye sarf ediyorum ve mutlu hissediyorum kendimi. Zevk almaya başlıyorum dersten. Hani bu tarz şeylerde daha fazla arttırdığımı düşünüyorum ben. Ben konuşurken başkaları da beni dinliyor. Başkaları konuşurken ben dinliyorum. Hani böylece bilgi düzeyi biraz daha artıyor ve etkileşim daha da artıyor bence (C1\_S4).*

All students from Case 2 stated that the system helped them to engage to the lesson. According to their opinions, the system had two different aspect of engagement. One was warming-up students by asking questions related with the new topic before to be told. So students were asked to think about the new topic and their attention was caught and directed. The second one was that the system was helpful to catch the attention of distracted students or students who sat at the back of the class and did not actually participate to the class, and let them participate.

*This helped me to participate the lesson. It has great effect on this. Because willy-nilly, first of all, generally people sitting in a corner, how it is, I mean in related to characteristics, people who are shy, are not comfortable much to tell what they think. By this way, since there is anonymity, they can participate easily (C2\_S2).*

*Derse katılımımı sağladı bu benim işte. Buna etkisi çok fazla. Çünkü ister istemez bir kere, genelde köşeye oturanların nasıl oluyor, yani kişilik özellikleri bakımından çekingen, düşüncelerini söylemekte çok rahat olmayan insanlar. Bu şekilde zaten anonim olduğu için rahatça katılabiliyor (C2\_S2).*

*First, it affects the interaction between the students of course. There is nobody left who is sitting in the corner, sleeping. It takes everybody's attention. It may be, because of the newness of the system, it might be decreased in time if it is used for a time. But, the newness of the system takes the attention. The involvement of the technology is a different thing. Because, now everybody spent time with smart phones and also when they see such kind of technology since it is different, they are doing more (C2\_S1).*

*Ya en basitinden, en başta öğrencilerin kendi aralarındaki etkileşimi etkiliyor zaten. Köşede oturun, uyuyan kimse kalmıyor. Herkes, bir dikkatini çekiyor. Belki de sistemin yeni olmasından kaynaklı, belki sistem sürekli kullanılsa bu da zamanla düşebilir. Ama sistemin yeni olması ilgiyi çekiyor. Teknolojinin işin içine girmesi zaten ayrı bir şey. Çünkü herkes artık akıllı telefonlarla vakit geçirdiği için bir de böyle bir teknolojiyi görünce farklı diye daha bir şey yapıyorlar (C2\_S1).*

All students from Case 3 indicated that the system supported them to engage to the lesson. According to their opinions, system was more beneficial when used at the beginning of the class to adapt them to the class and to get used to the new topic. Moreover, the system helped them to focus back to topic and to participate when they were distracted. They told that a lesson of 50 minutes was a long time to keep attention; they would be distracted in a while, and refocusing was difficult to them. However, the system provided small pauses during those long 50 minutes classes that made them think and engaged to the class, instead of alienation. Furthermore, two students stated that they were not good at listening to a course and they went to class just to become familiar with the topics, but the system helped them to focus on and they learned via the system.

*In fact, we cannot incorporate the students who do not interested to participate to the lessons no matter what we do. But, in the name of winning students who are intermittent, this system can be beneficial method (C3\_S1).*

*Şimdi, gerçekten ilgisi olmayan öğrenciyi hiç bir şekilde, ne yaparsak yapalım derse dahil edemeyiz. Ama arada gidip gelen öğrencileri kazanmak adına bu faydalı bir yöntem olabilir (C3\_S1).*

*Due to the characteristics of our lesson, since it is a verbal course, I mean it's a kind of one who makes you sleep. But, the application adapts us to the lesson, increases the attendance (C3\_S1).*

*Dersimizin de özelliğinden, sözel bir ders olduğu için hani uyku getiren cinsten bir ders. Ama bu uygulama bizi derse adapte ediyor. katılımı arttırıyor (C3\_S1).*

*And also, I for example do not listen to the lesson after 20 minutes. By this, people can engage more. You support your attendance to the course (C3\_S4).*

*Bir de ben mesela dersleri 20 dakikadan sonra pek dinlemem. Böyle olunca insan daha bir bağlanıyor yani. Kendi katılımını sağlıyorsun derse (C3\_S4).*

*It increases the attendance to the lesson. At that moment, may be you do not attend, you do not listen. There are some friends who come to the lesson but are not be careful. Since it attracts their interest, since it is an interesting thing, and we are as youngers curious about technology. By this way, sending as a message. In act, we do not put away the telephone from our hands, I mean sending as a message, attending to the course I think was very effective in there (C3\_S7).*

*Derse katılımı artırıyor şimdi. O an belki dikkat ediliyor olmayacak, dinlemeyecek. Derse gelip de çok dikkatli olmayan arkadaşlar var. Onların bile ilgisini çektiği için, ilginç bir şey olduğu için ve teknolojiye meraklıyız biz, gençler olarak. Bu şekilde hani mesaj olarak atmak. Zaten telefonu elimizden düşürmüyoruz, hani mesaj olarak atmak, derse katılmak bence baya etkili oldu orda (C3\_S7).*

Engagement was the most commented topic by the students that almost all students agreed that the system helped them to engage to the course. The most common opinion between all cases was duration of a class was so long and students got distracted in a while, and started to daydream and had difficulties to focus back to topic. Students pointed out that the system was a good alternative to prevent distractions and getting bored. Moreover, students from Case 2 and Case 3 who could not involve to the class, and could not focus on the topic stated that they got involved by the system, participated to the class, and helped them to learn.

#### *Free / Costless*

Although two faculty members thought that requiring no cost to use a big advantage for the students, only two students, one from Case 1 and one from Case 3 stated that being free is an advantage of system.

*Anyway, it is free. I mean it does not have any budget thing (C1\_S2).*

*Zaten ücretsiz, hani herhangi bir bütçe şeyi de yok (C1\_S2).*

*All people have mobile phones nowadays; people who do not use phones are rare. All students have. Like this thing, without giving people burden financially, the thing that gives extra things in this way should be supported (C3\_S7).*

*Böyle herkesin telefonu var artık günümüzde, çok nadirdir telefon kullanmayan insan. Öğrencilerin hepsinde var. Hani böyle bir şey maddi olarak da kimseye bir zorluk getirmeden, bu şekilde ekstra şeyler getiren bir şeyin bence desteklenmesi lazım (C3\_S7).*

### *Ease of Use*

Four students from Case 1 indicated that the system was very easy to use and that was an advantage of the system. One of the students stated that the system did not require any specific device, and worked any kind of mobile phone capable of sending and receiving feedback that was very important for them. Also, another students stated that they used the technology via this system while they were learning that using technology was an advantage for them due to loving to use technology and touching it all the time.

*It is practical use in fact, also it is important not to require extra tool.*

*It is an application that can be done in every cell phones (C1\_S3).*

*Pratik bir kullanım aslında bir de hani özel bir cihaz gerektirmemesi önemliydi.*

*Hemen her türlü telefonla yapılabilen bir uygulamaydı (C1\_S3).*

*We use technology. Using technology is always an advantage for the new upcoming generation, and us because we love to use. The mobile phone is a thing that is always in our hands (C1\_S5).*

*Hem teknolojiyi kullanıyoruz. Teknolojiyi kullanmak her zaman için; yani hem bizim için hem de yeni gelen nesil için avantajlı bir durum. Çünkü seviyoruz kullanmayı. Telefon zaten sürekli elimizde olan bir şey (C1\_S5).*

Two of the students from Case 2 stated that the system was easy to use and that was an advantage of the system. Furthermore, both students mentioned that the system was so practical, easy and usable, and they liked that the system used SMS for responses.

*The thing I like, these can be done by one message is nice to me  
(C2\_S3).*

*Hoşuma giden taraf şey, bir mesajla bunların şey yapılması güzeldi bence yani.  
(C2\_S3).*

*The usage is easy, both you can adapt its usage where you want  
(C2\_S5).*

*Hani kullanımı çok kolay, hem de nereye isterseniz çekebilirsiniz kullanımını  
(C2\_S5).*

Two students from Case 3 indicated that the system was easy to use and that was an advantage of the system. One of the students mentioned that the system would not cause any problem or bore students due to being so easy and practical. Additionally, the other students stated that the mobile phone was an important element of their life that as the youngsters they did not drop it during the day, sent countless number of messages. So, using this system was so easy and habitual for them.

### *Interaction*

Four students from Case 1 stated that the system increased the level of interaction on the positive way within the class. Students mentioned that although the faculty member taught the class so interactive and tried to participate whole class, there were always some students that they did not participate. While discussions were carried by a few students before the system was initialized, all students started to participate more or less via the system by responding to questions. What's more, those students tried to participate in class discussion after the system was being initialized. Besides, one student pointed out that they did not know and chat with other students because the course was offered to all College of Education and

students were from different departments; they started to chat with each other by the help of system that broke the ices between them.

*Constantly, the instructor asks questions, the answers are given. He does not insist on the ones who do not give answers, but lately the ones who do not answer start to talk in the class. It is good as an environment, about interaction (C1\_S1).*

*Sürekli hoca sorular sorar, cevaplar da gelir. Çok cevap vermeyenlere üstelemez ama son zamanlarda o cevap vermeyenler de konuşmaya başladılar sınıfta. İyi yani ortam olarak, etkileşim konusunda (C1\_S1).*

*Because, as I said before, how much the instructor try to make few people to be active while he is explaining something in there or we solved a test, in there while we went over the questions, generally certain students answered. You do not attend much, you might solve in your hand but when something is happened, as I said everybody is curious about something much, which one will be appeared much. More attention is given (C1\_S5).*

*İllaki kopuyor yani mutlaka birileri. Çünkü dediğim gibi, ne kadar bir kaç kişiyi olayın içine katmaya çalışsa da hoca orda bir şey anlatırken ya da test çözdük biz, orda soruların üzerinden giderken genelde belli öğrenciler cevap veriyorlar. Çok katılmıyorsun, belki elinde çözüyorsun ama şey olduğunda, dediğim gibi herkes şeyi çok merak ediyor. Hangisi en çok çıkacak acaba filan diye böyle biraz daha dikkat kesilme oluyor (C1\_S5).*

*With people that you do not speak, now he defends an opinion, actually the relationship is increased. For example, with a person you do not know, but constantly an opinion, you have an opinion or a counter view. You can say we met again at the end of the lesson. The communication with people in the classroom is increased (C1\_S6).*

*Hiç muhabbetimiz olmayan kişilerle, şimdi o farklı bir görüşü savunuyor, aslında gerçekten ilişkileri de arttırıyor. Mesela hiç tanımadığınız bir kişi, ama sürekli böyle bir fikir, ya ortak bir fikrin oluyor ya zıt bir fikrin oluyor. Dersin sonunda da*

*görüürüz filan diyebiliyorsun. Hani, insanlarla o sınıf içindeki iletişim gerçekten artıyor (C1\_S6).*

Three students from Case 2 stated that the system made them more interactive in the class. While one of those students denoted that they liked using the technology in the class and it was so good to support participation of all students via such systems; the other one stated that more students started to participate to class, discuss their opinions, so the interaction within the class was increased, which was so rewarding.

*Yes, generally 3-5 people speaks more, from that sense, from the participation of everyone, it is more beneficial... Since it is not like a lecture, eventually it is perceived as enjoyable thing at the same time (C2\_S3).*

*Evet, genellikle 3-5 kişi daha fazla konuşuyor, o açıdan, herkesin katılımı açısından daha iyi oldu. Bir de hocayla katılık açısından hani bu şey, tam böyle, tam ders gibi geçmediği için hani hoca, sonuçta keyifli bir şey olarak da algılanıyor aynı zamanda, orda daha böyle bir dersten daha şey oluyor (C2\_S3).*

*For once, of course using technology, in any parts of the lecture being active while answering the questions and participation of everybody was nice (C2\_S6).*

*Bir kere tabi ki teknoloji kullanmak, dersin herhangi bir yönünde kendimizin aktif olması bir şekilde sorulara cevap verirken ve herkesin katılmış olması güzeldi (C2\_S6).*

All students from Case 3 stated that the system was so beneficial to support interaction within the class. They mentioned that the system increased the level of student-student interaction and faculty member-student interaction. They stated that the system let them answer the questions, wonder about the results and discuss on them, instead of just sitting and listening the faculty member passively. One of the students thought that nothing could be done to the students who did not want to be part of class, but this system might appeal the faltered students to be intercorparated. Moreover, students indicated that although there were dozens of

students, just a limited number of students were answering the questions, the faculty member was just interacting with them, and pacing of the course was determined based on them. After the system was initialized, the participation rate was increased, all the students answered the questions and interacted with the faculty member, so the faculty member saw the general state of the class and the pace was adjusted based on the whole class.

*The most important advantage, the question was asked to only one person. Now, the whole class was asked (C3\_S4).*

*En önemli getirisi soruyu sadece bir kişiye soruyordu. Şimdi bütün sınıfa sormuş olacak (C3\_S4).*

*Normally when the instructor asks a question, 2-3 people answers it, in here lots of people were participated. 40-45 people out of 50 were participated to it (C3\_S7).*

*Normalde hoca bir soru sorduğu zaman elli kişilik bir sınıftan 2-3 kişi ses çikartırken burada birçok kişi katıldı yani. 50 kişinin 40-45 kişi buna dahil oldu (C3\_S7).*

When all three cases and the researcher's observation notes were examined, it was seen that students thought that the system increased the level of interaction within the class and saw that as an advantage. Before the system was initialized the pace of the course was adjusted by a small group of students who participated constantly. All discussions, question- answer sessions were occurred between them and the faculty member. But, by the help of this system all students were incorporated actively, so passive students started to participate discussions and express their opinions. And, pace was adjusted based on all students. Furthermore, the interaction was the key factor to engage the students.

### *Enjoyment*

Three students from Case 1 stated that the system was fun to use. Sending and receiving SMSs were part of their daily routine, but integrating it into the class,

sending just a choice as a SMS was interesting and fun. Furthermore, one student stated that he observed the class during the applications and he saw that all students participated and they liked the application even if they did not like technology.

*Sending message is normally is not a big deal. It integrated to our life but sending in the lectures is very different that makes people enjoy the class. It prevents the lessons to be bored (C1\_S2).*

*Mesaj atmak normalde çok şey bir şey değil yani. Hayatımıza entegre oldu ama derste atmak çok farklı bir şey olduğu için, bir şekilde insanı eğlendiriyor hani. O da dersin sıkıntısını, sıkın bir hale gelmesini engelliyor. Sıkıcı bir ders olmasını engelliyor (C1\_S2).*

*At that moment, I also observed the classroom, lots of my friends were actively participated and most of them were from different department, they do not like the technology for example to use in the class. Despite that, they found this enjoyable (C1\_S5).*

*Ben o arada sınıfı da gözlemledim, birçok arkadaşım aktif bir şekilde katıldı ve ki diğerlerinin çoğu başka bölümlerden, teknolojiyi çok sevmiyorlar mesela sınıfta kullanmayı. Ona rağmen bunu böyle eğlenceli buldular (C1\_S5).*

Five students from Case 2 thought that the system was fun to use that the system brought fun to class and they liked it. Furthermore, they stated that when they saw they answered the question correctly, they got a little bit excited and enjoyed.

*The thing I like most is being fun (C2\_S3).*

*En çok hoşuma giden taraftı, öncelikle keyifli bir şey olması (C2\_S3).*

*But, still people eventually wants to show some level of performance, it can be an enjoyable assesment technique (C2\_S5).*

*Ama yine de insanlar sonuçta belli bir toplu performans göstermek isteyeceği için keyifli bir ölçüm olacaktır (C2\_S5).*

Four students from Case 3 stated that the system was fun to use and they really enjoyed using the system. According to them, system was so helpful when they got bored and feel sleepy that the system embellished the class.

*I think the system is enjoyable (C3\_S1).*

*Sistemin eğlenceli olduğunu düşünüyorum (C3\_S1).*

*This system for once, color up the lessons (C3\_S1).*

*Bu sistem derse bir kere bir renk katıyor (C3\_S2).*

*It is entertaining for us. Anyway, you get bored after a while in the lessons. It is better (C3\_S4).*

*Eğlenceli oluyor bize. Zaten derste bir süre sonra sıkılıyorsunuz. Daha iyi oluyor yani (C3\_S4).*

When mobile phones became a part of our life, messaging with each other became a daily routine. Students mentioned that they sent and received number of messages each day. Students from all cases agreed that the system used this routine but in an entertaining manner. They stated that they enjoyed using the system, and felt happy and amusing when they answered the questions correctly. Furthermore, the system embellished the class when they got bored. They would prefer to use such system instead of just staring at the board. Furthermore, according to the researcher's observation notes, students had fun about using the system. During the system use, students made jokes to each other about the question and the results.

### *Timing of Feedback*

Three students from Case 2 stated that the timing of feedback was very important and the system gave immediate feedback. They mentioned that they did not have a chance to receive feedback except exams, such applications could be thought as an exam, and it was so beneficial to see the current status of the class immediately.

*The part that I like, these can be done by one message is nice. I mean the class, in another word, the population, seeing how much the population has the knowledge and seeing that immediately was nice (C2\_S2).*

*Hoşuma giden taraf, şey, bir mesajla bunların şey yapılması güzeldi bence yani. Hani sınıfın, yani popülasyonun, popülasyonun ne kadar bilgi sahibi olduğunu görmek ve bunu hemen görebilmek güzeldi (C2\_S2).*

*Normally, we can only see these kinds of things in the exams, I mean whether we really learn or not. This is a kind of quick exam for us.*

*Normalde, hani bu tarz şeyleri ancak sınavlarda görebiliyoruz. Hani gerçekten anlayıp, anlamadığımızı. Bu da hani hızlı bir sınav oluyor bizim için (C2\_S4).*

Three students from Case 3 mentioned the immediate feedback providing by the system was an advantage for them. One of the students indicated that they could receive feedback after exams and they were not so careful, just skim over the paper if they got high grades; they did not get any feedback whether and how much did they learn, just commented as an easy or a difficult exam. Another student pointed out that he was able to recognize what were his misunderstandings or the missing parts about the topic that he had to study. Therefore, he could solve the problems easily by studying for a short amount of time; instead of recognizing the mistakes at the exam and it was too late to fix the problems.

*I like it provides immediate feedback (C3\_S5).*

*Anlık geri bildirim vermesi hoşuma gitti (C3\_S5).*

*Normally, we can get feedback as kind of only in exams. And it happens if we do thing, if we go and look at our papers (C3\_S7).*

*Normalde geribildirim sadece sınavda alabiliyoruz gibi bir şey. O da şey yaparsak, gidip sınav kağıdımıza bakarsak (C3\_S7).*

While three students from each Case 2 and Case 3 stated that the advantage of providing feedback at the time, immediately, any of the students mentioned it from

Case 1. Students from Case 2 and Case 3 were agreed that they were happy to get immediate feedback; because, they did not have a chance to get adequate feedback in class, they barely get feedback after the exams, and it might be too late to correct their mistakes. As one student from Case 3 stated providing immediate feedback during or just after the class helped students to recognize their problems and to solve them easily.

### *Stress Free / Anonymity*

Five out of six students from Case 1 stated that responding to questions anonymously was so advantageous for them that they could answer without any concern or pressure. All five students were agreed that they felt pressure on them to answer question correctly when the faculty member asked a question in the class. Furthermore, they were anxious about feeling humiliated if they gave the wrong answer or could not answer the question. But, by the help of this system they feel free to answer the questions without any pressure, concern or stress. They told that the system encouraged them to answer the questions and everybody responded to questions.

*The thing I like most, everybody can give answer anonymously, without being bored. If the students do not do things, if they do not trust whether they give right answer or not, they do cannot ask questions. This broke that somehow according to me. Who gives what answer is not shown. Only, the performance of whole class is shown. Since it is in that way, according to me, this is one of the most important features (C1\_S2).*

*En çok hoşuma giden, işte bu anonim bir şekilde herkes cevap verebiliyor ya, hiç sıkılmadan. Doğru mu yanlış mı sıkıntısı var hani. Düşündüğümüzde belki de derse katılmamanın nedenlerinden biri, eğitim derslerinde hep konuşuyoruz, Öğrenci şey yapamıyorsa, doğru cevabı verip vermeyeceğine güvenemiyorsa elini kaldıramıyor, soru soramıyor. Bunu kırdı bir şekilde. Herkes anonim bir şekilde cevap atıyor. Kimin ne cevap verdiği görünmüyor. Sadece, sınıfın toplam olarak performansı*

*görüliyor. Böyle olduđu için bence hani bu en önemli özelliklerinden birisi hani (C1\_S2).*

*In the system the property I like, the system, I mean, not indicating who gives which answer is done something. It encourages the students to use the system. Everybody absolutely give answers..... Since it does not reveal you, that is comfort (C1\_S3).*

*Bu sistemde hoşuma giden özellik, sistemin, hani verilen cevapların kim tarafından verildiğinin belli olmaması bir şey yapıyor. Kişiyi sistemi kullanmak için cesaretlendiriyor öğrencileri. Herkes mutlaka bir cevap veriyor. Çünkü orada teşhir, ne denir ona. Şey olmayacağı için, kendini açık etmeyeceği için bu bir rahatlık (C1\_S3).*

*Comparing to raising the hands, I think the system is more effective. As I said, now if I raise my hand, I mean, since the given answers, who gives which answer is known, the students might be afraid of giving answer. I mean they might be shy. They cannot raise their hands. Compared to that, it is more effective. And also, since it is a new thing, it is interesting. This application has a feature that is encouraged, motivated (C1\_S3).*

*El kaldırmaya göre bence daha etkiliydi bu sistem. Dediğim gibi şimdi el kaldırmada da hani, verilen cevaplar, kimin hangi cevabı verdiği belli olduğu için öğrenci yanlış cevap vermekten çekinebilir belki. Yani çekingen durabiliyor. Kaldıramayabiliyor elini. Ona göre çok daha etkiliydi. Hem de yeni bir şey olduğu için ilgi çekiciydi. Teşvik edici, motivasyonu artırıcı bir özelliği var bu uygulamanın (C1\_S3).*

*It was the best fort he people who do not want to reveal identity (C1\_S4).*

*Hani ifşa etmekten çekinen insanlar için birebir diyebilirim (C1\_S4).*

Five of the students from Case 2 stated that being anonymous while responding was one of the advantages of the system. They told that answering the questions without any social pressure, overwhelming of their peers, or the grading concerns helped

them to express their ideas and opinions freely. By this way, the system helped them to evaluate themselves and release the real thoughts of the students.

*Once while answering the question, you feel free yourself. No social pressure. We can express the answer we thought without under the influence of anyone in anonymous way. This is good way of it. Well how I can tell. If the names are shown, everyone hesitates, looks right and left. They thought, the real things cannot be explained. There, being without name, that he or she did not show (C2\_S1).*

*Bir kere cevap verirken özgür hissediyorsunuz kendinizi. Sosyal baskı yok. Kimsenin etkisi altında kalmadan kendi düşündüğümüz cevabı isimsiz bir şekilde orda aktarabiliyoruz. Güzel olan yanı bu. Yani nasıl anlatayım. Orda insanın bir şey, isim çıkıyor olsa herkes bir tereddüt eder, herkes bir sağa sola bakar. Düşündüğü, gerçek şeyleri açıklayamaz. Orası, isimsiz olması, kendisini göstermemiş olması (C2\_S1).*

*In that way, although grade is not mentioned, the person's own assessment (C2\_S3).*

*O açıdan not söz konusu olmamasına rağmen kişinin kendisini değerlendirmesi (C2\_S3).*

*Now it might look like, namely the great advantage of this system is that the names are not appeared. Both in terms of participation and students' convenience (C2\_S5).*

*Şimdi şöyle olabilir yani bu sistemden ismin görünmemesi çok büyük avantaj. Hem katılım açısından, hem öğrencinin rahatlığı açısından (C2\_S5).*

Three students from Case 3 indicated that anonymity of the system was so helpful that shy students anxious about public speech and could not participate to the lesson, and student afraid of giving wrong answer due to peer pressure had a chance to participate and engaged to the lesson. Furthermore, they stated that they were able to answer any questions even if they were not sure about the answer that they

had a chance to see what they know and to evaluate them without any stress that promoted their learning by the help of the system.

*Because not everyone likes to talk in the community or he/she cannot show his/her own confidence. There are some friends like who has more asocial lifestyle. In this sense, everyone gives an answer at that point and you keep everyone's pulse (C3\_S1).*

*Çünkü herkes toplum içerisinde konuşmaktan hoşlanmıyor veya kendince o özgüveni gösteremiyor. Daha asosyal yaşam tarzına sahip olan arkadaşlarımız vs. var. Bu anlamda herkes bir cevap veriyor o noktada ve herkesin nabzını tutabiliyorsunuz (C3\_S1).*

*I can answer there that I could not. After that nobody knows. But I have learned it. It was wrong (C3\_S5).*

*Cevap veremeyeceğim bir şeye orda verebiliyorum. Sonrasında kimse bilmiyor. Ama ben onu öğrenmiş oluyorum. Yanlışmış (C3\_S5).*

*If teacher asks normal question, there might be some friends who can be reluctant to answer. But with this way everybody reflected their ideas without indicating who it is, and they see whether it is true or not (C3\_S7).*

*Hoca normal bir soru sorsa belki çekinebilecek arkadaşlarımız var. Ama bu şekilde hani herkes fikrini hiç bir şekilde kendini, kim olduğunu bile belli etmeden bu şekilde yansıttı ve doğru olup olmadığını gördü (C3\_S7).*

Students from all three cases acknowledged that responding questions anonymously via such system was so helpful for them. Although they were adults, some of them still had public speaking problems, felt stressed to express their opinions, or concerned to be humiliated if they gave wrong answer. On the other hand, the researcher did not observe any hesitation within the classes of any case during the data collection process. Anonymity of the system helped those students to beat their concerns to answer the questions and engaged them. Furthermore, students pointed out that they chose the choice of majority, instead of their own if they were asked to

answer the questions by raising their hands, so they could not learn why was their choice was wrong. This system prevented that and helped them to express their opinions and support self-evaluation.

*Test herself/ himself*

Two students from Case 1 stated that the system helped them to test their knowledge without any concern. One of the student especially mentioned that responding anonymously helped them, too.

*Of course, myself there, in there I can try myself, sincerely and without thinking anybody. I prove myself completely without under any psychological pressure. This is what happens to me.*

*Tabi, kendimi orada şey artık, orda kendimi deneyebiliyorum. İçten bir şekilde, kimseyi düşünmeden. Herhangi bir psikolojik baskı altında olmadan tamamen kendimi deniyorum. O oluyor bende (C1\_S1).*

Four students from Case 2 stated that answering the questions via this system was helpful to test them. They told that they did not have a chance to check their knowledge in class, they could just test their knowledge in exams and it was too late.

*Because in there people only evaluate themselves. Actually, not feeling pressure, and just for learning, actually for confirm himself/herself (C2\_S3).*

*Çünkü orda sadece kişi kendisini değerlendiriyor. hani, bir baskı hissetmiyor ve sadece öğrenmek için, hani kendisini doğrulayabilmek için (C2\_S3).*

*The most important feature, actually my own knowledge, I have evaluated my own level (C2\_S4).*

*En önemli özelliği, yani kendi bilgimi, kendi seviyemi ölçmüş oldum (C2\_S4).*

Three students from Case 3 indicated that they were kind of tested with this system and they could see the results. One student stated that he mostly did not participate the class, but answered the questions via this system to test his knowledge. Other students mentioned that they saw the system as a chance to test them.

When all the cases were compared two students from Case 1, four students from Case 2 and three students from Case 3 mentioned that the system was beneficial for them to test own knowledge. They stated that anonymity of the system had a big role to test their knowledge without any concerns.

*Useful, it is helpful. Actually, for example, normally I do not answer so much but in there I give answer that I thought I knew. Ultimately I could test myself whether I knew or not (C3\_S5).*

*Faydalı, faydalı oluyor. Hani, normalde ben çok cevap vermem mesela ama orda bildiğimi sandığım cevabı veriyordum. Sonuçta bilip bilmediğimi kendim tartabiliyordum (C3\_S5).*

#### *Awareness*

Three students from Case 1 stated that the system raised their awareness. Two of the students mentioned that discussions held in class by asking same or similar questions repetitively helped them to see there were other views and to accept them. Furthermore, one student stated that the system raised his awareness about the course, in general.

*I can say that it was effective in terms of seeing different ideas (C1\_S2).*

*Farklı düşünceleri görmek açısından etkili oldu diyebilirim (C1\_S2).*

Three students from Case 2 stated that the system raised their awareness. According to them they got aware of to study before the class in order to answer the questions asked at the beginning of the class, and to listen carefully in order to answer the

questions asked at the end of the class when they knew the system would be used in class.

*Actually, thus we come to class by reading more carefully (C2\_S5).*

*Hem de hakikaten biz bu sayede belki de biraz daha dikkatli okuyarak gerçekten geliyoruz (C2\_S5).*

*Of course, I saw that I needed to come class by reading more carefully (C2\_S6).*

*Tabi ki gerçekten okuyarak, bilerek gelmem gerektiğini gördüm (C2\_S6).*

Three students from Case 3 stated that the system raised their awareness. They thought that asking same or similar questions at the beginning and at the end of the class was so helpful and directive for them that they were more aware of the course and started to pay more attention to the course.

*Like I said, when asked at the beginning and at the end, about attention, it made me more careful about listening the course (C3\_S7).*

*Dediğim gibi ilk başta ve sonda sorduğu zaman dikkat konusunda dersi daha dikkatli dinlememe neden oldu (C3\_S7).*

Almost half of the students from all cases stated that the system made them aware. According to students from Case 1, the system helped them to understand there were other views around, they are supposed to respect those views, and those views might be acceptable for them. Furthermore, students from Case 2 acknowledged that they needed to get prepared for the class and to participate actively. Lastly, students from Case 3 stated that they understood their mistakes by the help of the system and its feedbacks that they prevented them at the beginning.

### *Repetition*

Three students from Case 1 stated that the system helped them to repeat the former weeks' topics that most of the time they could not find or allocate time to repeat them, so they could not answer the questions of the faculty member. But, when the system was used to ask questions about the former topic at the beginning of the class or the new topic, it was beneficial to remember former one and easier to learn the new one.

*It was very useful to recall the last week's topics (C1\_S2).*

*Geçen haftaki konuyu hatırlama açısından çok faydalı oldu (C1\_S2).*

*It was really helpful for me to repeat the topic of last week. I actually understood the repetition of last week (C1\_S6).*

*Ciddi manada hem geçen haftanın konu tekrarı açısından faydalı oldu benim için.*

*Geçen haftanın tekrarını net bir şekilde orda anladım (C1\_S6).*

Two students from Case 2 stated that the system was beneficial to repeat former topics in order to make them rethink and repeat.

Two students from Case 3 mentioned that the system was useful to repeat former topics. While one of the students offered using the system at the beginning and at the end of the class, the other student offered using the system at the end of the class in order to repeat the topic would be beneficial.

When all three cases were compared with each other three students from Case 1, two students from Case 2 and two students from Case 3 mentioned that the system was helpful in terms of repetition. While students of Case 1 mentioned using the system at the beginning of the class in order to ask questions about former weeks helped them to remember the topics and got them ready for the new topic even if they did not have a chance for repetition before the class; students from Case 3 mentioned using the system at the end of the class in order to repeat the topic taught that day would help them. Furthermore, students from Case 2 did not suggest any

usage style, but stated that using the system helped them to repeat and remember the former topics.

*Summarization / Point out important points*

Three students from Case 1 stated that the faculty member summarized and pointed out the important points of the topic by this system. They pointed out that faculty member ensured that by two ways. One of which was by asking questions at the end of the class to cover what was told yesterday. The second way was that after all the students answered the questions, the faculty member check the results and she summarized or pointed out where they made mistakes if there were loading on more than one questions.

*It was helpful to summarize the class, and help us to learn (C1\_S2).*

*Orada da dersi özetlediği için faydalı. Bir şekilde faydalı oluyor öğrenmemize (C1\_S2).*

*For example, where the most mistakes were. For instance, faculty member told us that you remained between these two options, and be careful about this. She told us the tricks about the topic (C1\_S5).*

*Mesela en çok yanlış nerede yapılmış. Hoca da diyor ki mesela “Şu iki şık arasında çok fazla kalmışsınız. Şuna, buna dikkat edin” gibi bizi de orda, o soru ile ilgili trick noktaları verebiliyor (C1\_S5).*

In Case 2 just one student mentioned that the faculty member used to system to summarize or to point out the key points. He stated that the faculty member prepare questions from the most important, key points of the topic that they learned via this system.

*We would be aware of the topic due to questions asked at the beginning of the class related with the topic. For instance, there was a question related to leadership types, and now I am knowledgeable about that leadership type (C2\_S2).*

*Derse başlamadan önce, aslında biz birkaç genel, özellikle genel şeylerden yani hoca noktalardan soruları hazırladığı için o konular hakkında bilgi sahibi olmuş oluyoruz. Mesela, geçen derste bir liderlik çeşidinden, bir örnek soru sordu. Mesela o liderlik çeşidi ile ilgili bir şey öğrenmiş olduk. O açıdan (C2\_S2).*

Four students of Case 3 stated that the system helped them to summarize and to point out the key points. All students thought that sometimes they could not understand the topic even if they listened it carefully, but the faculty member asked the important points of the topic via this system and they were able to remember those questions asked via the system. Furthermore, the faculty member could determine the points they student had problems, and could prepare an effective teaching.

*Faculty member ask a question, a key question, for sure, about a point that he thinks it is important (C3\_S2).*

*Hoca muhakkak derse dair önemli gördüğü bir soruyu soruyor, kilit bir soruyu soruyor (C3\_S2).*

*Even though we learn a lot in the class, we could keep just a little part of it. At least, we know which parts should be remembered after the class (C3\_S5).*

*Sonuçta derste ne kadar şey öğrenek de bir kısmı aklımızda kalıyor. Akılda kalması gereken kısımları en azından biliyor oluruz, dersten sonra (C3\_S5).*

*The critical questions asked by the faculty member. He asked that critical questions in the exam. I recognized that, and liked it (C3\_S6).*

*Hocanın sorduğu kritik sorular. Sınavda da o kritik sorulara değindi. Yani onu fark ettim. O yüzden hoşuma gitti yani (C3\_S6).*

*(Faculty member) Could ask a key question to determine the misconceptions or missing parts, and then he would re-teach that parts to make all clear (C3\_S7).*

*Çok kilit sorular sorup, iyi anlaşılmayan bir yeri belki daha çok anlatıp, belki üzerinden bir daha geçip daha şey netleştirebilir o noktaları (C3\_S7).*

There were three students from Case 1, one student from Case 2, and four students from Case 3 who stated that the system was beneficial in terms of summarizing the topic and pointing out the key points. All students thought that the faculty members asked questions about the key points of the topic that all students needed to learn. Furthermore, students from Case 1 and Case 3 agreed that the faculty member used the system in order to reveal whether they learned those key points, and repeated them if needed. Moreover, students from Case 1 indicated that the faculty member summarized the topic by asking questions at the end of class; and students from Case 3 indicated that they could not remember everything told in class even if they studied very hard, but they were able to remember everything longer asked via this system.

### *Retention*

In Case 1, three students stated that the system supported retention and helped them remember longer. According to students from Case 1, as they mentioned before, by summarizing and pointing out the key points, the system helped them to learn better and to increase retention of the knowledge. Furthermore, two of the students indicated that by asking the same or the similar questions at the beginning and at the end of the class to make students discuss and to track changes in their opinion helped them to scrutinize the topic and learned better.

*You reinforce what you have learned. Sometimes it might be up in the air. I think it (the system) helps me to reinforce what I have learned in the class (C1\_S5).*

*Öğrendiklerini pekiştirmiş oluyorsun. Bazen havada kalıyor çünkü. O anlamda dersi pekiştirmek için bana katkısı olduğunu düşünüyorum (C1\_S5).*

*Retention might have increased when it was scrutinized; I learnt something by this way (C1\_S6).*

*İrdeleyince kalıcılığı arttı belki de, ben öyle öğrendim yani bazı şeyleri (C1\_S6).*

In Case 2, three students stated that the system was beneficial to increase retention. They all agreed that by the help of discussions taken place in class started via this system the retention levels were raised. Furthermore, one student indicated that asking questions and discussing on them just after the faculty member taught the topic was so beneficial for them.

*It might be helpful to better remember the information of the article (C2\_S3).*

*Makaledeki bilgilerin aklımızda daha iyi kalması açısından da katkısı olabilir (C2\_S3).*

*Because, it was better to reinforce after the class... (C2\_S5).*

*Çünkü hani ders boyunca bir konuyu yaptıktan sonra hem pekişmesi açısından... (C2\_S5).*

All students from Case 3 agreed that the system helped them to increase the level of retention. All students mentioned that they could remember almost all the questions with answers asked via this system and they could solve answer similar questions if asked. Moreover four of the students stated that they gathered extra knowledge from the discussion taken place after the question-answer part, and that knowledge were more memorable than learned in traditional question-answer sessions in class. In addition, two students stated that the questions asked via such system, seeing result graphically, discussing them helped them to correlate with application and remember longer.

*I remember some of the questions asked. I learnt them. I will not forget them easily (C3\_S4).*

*O sorduğu soruların birkaçını hatırlıyorum ben. Onları net öğrenmiş oldum. Onları kolay kolay, bundan sonra unutmam (C3\_S4).*

*I think I will never forget that information. It is more permanent after an activity (C3\_S5).*

*Çünkü o bilgiyi ben bir daha unutmam diye düşünüyorum. Yapılan bir aktivite sonrası daha kalıcı olur (C3\_S5).*

*Maybe it is an easy to remember activity by this way. I still remember that question (C3\_S7).*

*Belki de daha akılda kalıcı bir uygulama oldu böylece. O soruyu ben hala hatırlıyorum mesela (C3\_S7).*

Three students from each Case 1 and Case 2, and all students from Case 3 admitted that the system helped them to improve their retention rate and duration. Students from all three cases approved that discussion parts taken place after the question-answer sessions were so effective in learning and retention. Besides, seeing the questions and the results graphically seen as an extra ordinary situation out of the daily routine of the class by the students that they associated with the topic, so remembered longer.

### **4.2.3 Problems**

As a developing project, the system had some problems as usual. One of the main aims of this study was to determine the problems based on users' opinions and fix them. The problems mentioned by the users were grouped under two main titles; problems related to the system, and problems related to other reasons.

#### **4.2.3.1 Problems Related to the System**

The first group of problems was the system related ones. Students mentioned three main system related problems, design, technical problems, and multiple-choice questions.

## *Design*

One of the problematic issues mentioned by the students was the design of the system. Five students from Case 1 indicated that the questions and the choices were written too small to be seen at the back of the class, and the general design of the system could be more attention catcher.

*In some mediums it might be difficult to read. It might be a problem in large classes. Maybe, an amendment could be done in this way, in order to let it be seen from the back of the class (C1\_S3).*

*Bazı ortamlarda zor olabiliyor, okunabilirlik. Geniş sınıflarda da çok sıkıntı olabiliyor. Belki o yönde bir iyileştirme yapılabilir. Hani en arkadan da çok rahatlıkla soruların ve cevapların görünebilmesi için (C1\_S3).*

*Actually it was bad in terms of visual design. It needs to be improved. Readability, font size, colors; the visual design could be improved (C1\_S6).*

*Görsel açıdan kötüydü açıkçası. O geliştirilmesi lazım. Okunabilirliği. Hani, fontların büyüklüğü, yani renkler, görsellik geliştirilebilir (C1\_S6).*

## *Technical Problems*

One other issue was the technical problems occurred while the system was being used. Three students from Case 1 and one student from Case 3 stated that they experienced some problems at the beginning of the semester. According the students, the system could not be activated or their responses did not received even if the system was activated.

*As we experienced today, the system did not work. I think it needs to be improved a little bit more (C1\_S4).*

*İşte bu sabah yaşadığımız gibi, sistem çalışmadı. Bence geliştirilmesi gerekiyor biraz daha (C1\_S4).*

*There were system errors sometimes. It might be due to being in testing process (C3\_S4).*

*Bazen sistem hataları verdi. Herhalde deneme sürecinde olduğu içindi ama (C3\_S4).*

### *Multiple-Choice Questions*

Asking just multiple-choice questions was mentioned not a problem, but a limitation of the problem by one student from Case 1 and two students from Case 3. The student from Case 1 stated that she was opposed to asking just multiple-choice questions. Furthermore, the students from Case 3 were concerned about the suitability of the system to the detailed questions that it could be used for just multiple-choice or short-answer questions. Yet, that idea of the students was gathered at the first interview and they did not mention about this topic in latter interviews.

*It seems that the only problem of the system is not being able to adapt to detailed questions. It is suitable to ask information, questions with short-answers, or multiple-choice questions. It seems that it is not suitable for mechanical or other courses with more details (C3\_S1).*

*Sistemin tek sorun olarak detaylı sorulara çok adapte edilemeyecek gibi duruyor. Sadece bilgi veya kısa cevaplar için uygun. Şıklı sorular için. Mekanik ya da daha detaylı, böyle şey dersleri ölçebilecek bir sistem gibi durmuyor (C3\_S1).*

### **4.2.3.2 Problems related to other reasons**

The second group of problems was the ones related to other reasons. In this group students just mentioned the GSM problems they experienced.

#### *GSM Problems*

The GSM problems were the only problem that students mentioned as a problem except system related problems. One student from Case 1 and two students from Case 3 stated that they experienced problems related with GSM operators. The

student from Case 1 indicated that he received the delivery notification later than his friends that might be boring and problematic for him. Students from Case 3 stated that they did not receive or received a delayed notification that they sent a second SMS to the system.

*There might be problems with (GSM) operators. It might not be completed due to these problems. It might be solved (C3\_S3)*

*Bazen hatlarda problem yaşanabiliyor. Hatlarda yaşanan problemler, bir sonuç alınamayabiliyor. Bu giderilebilir (C3\_S3).*

#### **4.2.4 Technical Suggestions**

Likewise the faculty members, students stated their suggestions in order to improve the system based on their needs and problems experienced.

##### *Showing Identity*

Three students from Case 2 suggested that the identity of participants could be shown on the system. While one of the students stated that the identity of each participant should be shown on the screen, one other student stated that the identity of the participants could be shown if the faculty member would use the system in order to test the students. The other student suggested to give an option to faculty member to choose whether the identities be shown, or not based on the question and purpose, or to show identities to just faculty member not on the screen, but in a separate part for the faculty member.

*I want to tell which option did I choose. I want to tell what I thought, or I want to learn what others thought while choosing an option (C2\_S3).*

*Hangi, neye cevap verdiğimi de söylemek isterim. Oradaki mantığımı da söylemek isterim. Ya da başkalarının başka cevaplara verdikleri mantığı da öğrenmek isterim (C2\_S3).*

Four students from Case 3 offered to show identity of the students as a suggestion. Three out of four students suggested to record all students' phone number on the system and to show identities along with the results. So, the system could be used as an exam or quiz application. Furthermore, one student indicated that the system could be used for tutorials that phone numbers could be recorded and students could be graded.

*If an option could be added to show which student, or which phone sent which option in some ways, it might be used as a tutorial and the results of the tutorial could be tested (C3\_S6).*

*Bir şekilde belki sisteme şey eklenebilirse, cevabı hangi öğrencinin ya da hangi telefonun yolladığı eklenebilirse, bunu bir şekilde tutorial gibi yapıp daha sonra tutorialın sonuçlarını test edebilir (C3\_S6).*

When all cases were examined 3 students from Case 2 and four students from Case 3 suggested showing identities of the students instead of being anonymous, so the system could be using for testing and grading. Furthermore, one student from each, Case 2 and Case 3, suggested to add option to choose whether the question was asked anonymous, or not, decided by the faculty member based on the topic and aim of the questions. In addition one student suggested that a module could be added to the system for faculty members to see identities of the students instead of showing on the screen to whole class.

### *Design*

Five students from Case 1 suggested improving the design of the system. These students were the ones who mentioned that design of the system was problematic and needed to be improved. While four students indicated that questions were written too small to read, so needed to be enlarged, three students indicated that the system generally needed to be graphically improved. Furthermore, one student stated that graphically illustrated results were just showing the option, not the choice, so choices should be given with the results.

*Maybe, the interface, it might be more pleasurable to use in class (C1\_S2).*

*Ama arayüzde hani, derste kullanırken daha hoş gidebilecek bir şey olabilir belki (C1\_S2).*

*I am a girl, maybe because of that. The web page is a bit dim for me. It might be more colorful (C1\_S4).*

*Ben kızım belki de ondan da şey böyle. Web sayfası biraz donuk geliyor bana. Hani biraz daha böyle cıvıtlı şeyler olabilir (C1\_S4).*

While just one student from Case 2 stated that the system worked very well without any problem, but its design might be improved, nobody from Case 3 stated about the improvement of the design.

#### *Receiving Questions via SMS*

Receiving questions via SMS instead of seeing them on the screen was one of the improvement suggestions offered by the students. One student from Case 2 and one student from Case 3 suggested sending questions to students' mobile phones instead of projecting them on the screen. Furthermore student from Case 3 suggested changing the choices or order of choices that it could be useful, if the system would be used for grading that each student would see and answer the question privately.

*If it will be used as a quiz, questions will be asked in a way that students can see on the screen of their phone. It is more logical for me to see the questions one by one rather than projecting on the screen (C2\_S5).*

*Quiz gibi yapılırsa, mesela ayrıca öğrencinin görmesi için, yani sadece öğrencilerin telefonlarında görebileceği şekilde sorulabilir belki. Tahtaya yansımından ziyade hani soruları tek tek görebilmesi filan daha mantıklı olur gibi geliyor bana, elde (C2\_S5).*

*It might be useful if (questions) it can be sent to each student by changing the order of choices (C3\_S1).*

*Herkes farklı grup şeklinde, şıkların yerleri değiştirilerek bir mesaj gitmesi olanağı varsa faydalı olabilir (C3\_S1).*

### *Open Ended Questions*

Although just one student from Case 1 stated that asking just multiple-choice question was a limitation of the system, four students suggested that the system could be used to ask open-ended questions with short answers. Students mentioned that multiple-choice questions were not enough to test the students' knowledge that the system could be adapted to ask just one-word answered questions such as a name, a date or a number.

*There are some questions that multiple-choice questions will not work. They might be answered shortly. For example, when was Istanbul conquered? Faculty member wants to evaluate the knowledge instead of letting students choose (C1\_S2).*

*Çoktan seçmelilerin çalışmayacağı şeyler için mesela bazı sorular vardır. Böyle kısa cevap verilecek mesela, nedir o. Mesela İstanbul'un fethi ne zamandır? Seçmek yerine hoca böyle bir şey ölçmek istiyor, direk bilgiyi ölçmek istiyor (C1\_S2).*

*We only used multiple-choice questions. I do not know whether the infrastructure is suitable, but there might be different question types. There might be different activities that lead the class to discuss more (C1\_S5).*

*Şimdi biz böyle sadece çoktan seçmeli sorular üzerinden gittik. Bilmiyorum altyapı uygun olabilir mi, ama belki daha farklı soru çeşitlerinden olabilir. Daha fazla sınıfın discussion yapabileceği, tartışabileceği aktiviteler sisteme konulabilir (C1\_S5).*

Even though any of the students from Case 2 complained about asking multiple-choice questions, four students offered to adapt the system to ask open-ended questions which could be done in two different ways. While the first one was sending just a word to fill in the blanks or similar; the second one was sending long

answers consisted of several sentences which could be kept and be evaluated latter by the faculty member.

*Open-ended questions might be asked. Answering them, writing long answers might be problematic but answers with short sentences could be found (C2\_S1).*

*Ucu açık sorular sorulabilir. Onun cevaplamaı, belki çok uzun mesajlar yazmak sıkıntı olabilir de birkaç cümle ile anlatılabilecek cevaplar bulunabilir (C2\_S1).*

*Open-ended questions could be asked that we can write and send our answer as a classical exam. But the answer should not exceed a sentence or few words (C2\_S4).*

*Açık uçlu bir soru sorup, direk biz onu, hani klasik yazılıdaymış gibi o cevabı yazıp yollayabiliriz. Ama hani böyle bir cümleyi ya da birkaç kelimeyi geçmeyecek (C2\_S4).*

Although two students from Case 3 mentioned that asking just multiple-choice questions was a limitation of the system, two different students suggested asking open-ended questions via this system. They offered two different ways to use the system. The first one was sending just one-word, short, numerical answers that could be evaluated by the system. This application would be used by sending more than one word with a single SMS to fill in the blanks. The second one was sending long answers to questions that could be evaluated by the faculty member after the class. By this way, faculty member could see the students' actual situation and evaluate them better. Furthermore, this application will eliminate probability of giving correct answer by chance.

*I think one of the steps to be done is asking open-ended questions such as fill in the blanks, or text, for classical questions in order to improve the system (C3\_S2).*

*Bence yapılabilecek adımlardan bir tanesi hani sadece şıklı değil, farklı, boşluk doldurmalı veya metin, klasik sorulara da yönelik bir sistem olabilmesi bence sistemin geliştirilebileceği bir nokta (C3\_S2).*

*There would be sending text instead of sending the choice. Maybe, there would be sending the result (of a mathematical operation), a numerical data (C3\_S7).*

*Sadece şık olarak değil de metin gönderme gibi bir şeyler olabilir. Ya da şıksız sadece sonuç, mesela sayısal bir şey gönderme gibi bir şey olabilir (C3\_S7).*

Students from all cases, four from Case 1, four from Case 2, and two from Case 3 suggested using the system to ask open-ended questions in addition or instead of multiple-choice questions. Students stated that the system could be used for different question types such as fill in the blanks, complete the sentences, or to send exact number or date. By this was probability of answering the question by chance would be eliminated, the level of students could be determined better. Moreover, students from Case 2 and Case 3 suggested that open-ended questions with long answers could be asked to the students that faculty members could evaluate after the class. By the way, they could express their opinions and ideas more comfortable.

### *Mobile Application*

Two students from Case 1 suggested developing a mobile application that questions would be seen on the screen and students could answer by just clicking instead of sending SMS.

*Maybe, a mobile application will be developed in future (C1\_S2).*

*Belki ileriki aşamalarda bunun mobil uygulaması geliştirilebilir (C1\_S2).*

*Choices would be appeared (On the screen), when connected to application (C1\_S3).*

*Uygulamayla, hani bağlantı yapıldığında cihazlarda şıklar çıkar (C1\_S3).*

One student from Case 2 stated that a mobile application could be developed instead of current system that all the questions would be asked sequentially. So, it might shorten the duration, otherwise waiting everybody to answer took a bit longer.

*It would be better if there would be a phone application that we can see all the questions there immediately. Because we send our answer and wait (the others), and it takes some time (C2\_S4).*

*Bir telefon uygulaması olsa ve biz anında o soruyu ya da beş soruyu, hani soru sayısı kaçsa, hani onu görüp kendimiz o anda gönderebilsek daha iyi olur. Çünkü hani biz yolluyoruz, bekliyoruz, hani yavaş yavaş daha zaman alıyor gibi (C2\_S4).*

One student from Case 3 mentioned that almost all students had smartphones and this system might work on a mobile app or a web site.

*Now, everybody has a mobile phone. Maybe, we can log in to a web site and click the answer rather than sending a text message (C3\_S4).*

*Artık herkeste akıllı telefonlar var. Belki SMS atmak yerine, hani bir siteye girilip oradan "click" de yapılabilir (C3\_S4).*

A mobile application was one of the system improvement suggested by students from all cases. They thought that more questions would be asked in shorter time by the help of a mobile application instead of SMSs.

#### *Changing Answer*

One student from Case 2 and one student from Case 3 asked to change the answer they sent, before the time was over. In the current system students could not change the answer after they sent. If they sent a second SMS to the system, system would reject and send a notification that they answered that question before. These two students stated that the system might be updated to accept the last SMS sent, in case they might change their idea or send a wrong answer accidentally.

#### **4.2.5 Concerns**

##### *Time Consuming*

One student from Case 1 and one student from Case 3 thought that the system could be time consuming to use in class. Both students thought that answering a question

by raising hands might be shorter than taking out the phone, responding to question and waiting for the results. The student from Case 1 indicated that faculty members should carefully plan the class and implement the system in it.

#### *Small Group Usability*

Two students from Case 3 concerned about using the system in small groups. They thought that the system was so usable and effective for crowded classrooms. But, they thought that there was no need such system in a small classroom that responses could be taken easily and directly from students.

*The part I did not like was that I think it is useless and waste of time to use in small groups. The system would not be used with 8-10 people (C3\_S2).*

*Hoşuma gitmeyen taraf, ben dediğim gibi küçük gruplarda uygulanması gereksiz bir vakit kaybı diye düşünüyorum. Yani 8-10 kişiye uygulanması bu sistemi çok şey yapmaz (C3\_S2).*

### **4.2.6 Opinions**

Students were asked to express their feelings and opinions about to system during the interviews, and answers were categorized under six topics: positive, the best application, change in opinions, novelty effect, willing to use the system, usability of the system in other courses.

#### **4.2.6.1 Positive**

Five students from Case 1, five students from Case 2 and all students of Case 3 mentioned that they really liked the system and they thought that the system would be beneficial for them. Moreover, one student from Case 3 stated that students were interested in the course when the system was used, and it was important to keep the interest.

*The system is generally useful. We liked it as a community. I liked it very much due to specifications such as repetition, breaking monotony during the class, summarizing what we have learnt. I think it is useful for learning (C1\_S2).*

*Sistem hocam, genel olarak hani faydalı hani. Bizim hoşumuza da gitti komün olarak hani. Kendi adıma da söyleyeyim hani. Tabi bu şeylerden, baştaki o tekrar etme olsun, ders arasında o monotonluğu kırması açısından, o en sonda da hani bu bütün olarak düşündüğümüzde özetleme şeyi benim çok hoşuma gitti hani. Öğrenme açısından da bir şekilde faydalı olduğunu düşünüyorum hani (C1\_S2).*

*When I looked based on the questions, this affected me more. I think this is more secular (C1\_S4).*

*Sorular bazında baktığımda bu daha çok etkiledi beni açıkçası. Hani daha çok, uzun süreli olduğunu düşünüyorum (C1\_S4).*

*I liked the system, because I saw the participation in the class, and learned the correctness of my answers, and the level of my own learning immediately (C2\_S4).*

*Sistem hoşuma gitti, çünkü ben de sınıftaki katılımı görmüş oldum böylece ve kendi cevaplarımın da doğruluğunu hemen anında öğrenmiş oldum böylece. Ben de ne kadar anlayıp, anlamadığımı öğrendim (C2\_S4).*

*Positive. Because, I think technology should be adapted into education somehow, and it needs to be reached us. So, it was positive, definitely positive (C2\_S5).*

*Olumlu, çünkü bence yani teknoloji kullanımı bir şekilde adapte edilmesi gerekiyor eğitim sistemine de, bize de kesinlikle gelmesi gerekiyor. O yüzden olumlu. Kesinlikle olumlu (C2\_S5).*

*The feature I liked most was that the system works with a device, mobile phone, which everybody already has it in his or her pockets, via SMS. All mobile phones, even the simplest one, have this feature. This system is different because of this. It can be made with*

*smartphones, but everybody does not own a smartphone, so being worked via SMS is the biggest advantage of the system (C3\_S2).*

*Ya sistemin en çok hoşum giden tarafı herkesin cebinde olan cihaz cep telefonu ve sistemin SMS üzerinden çalışması en büyük avantajı. En basit telefonda dahi olan bir uygulama mı diyeyim, özellik mi diyeyim artık. Temel bir fonksiyonu aslında telefonun. İşte bu sistem farklı, bugünkü akıllı telefonlar ile de yapılabilirdi ama tabi herkes sahip değil böyle telefonlara. Onun için sistemin SMS ile çalışıyor olması en büyük avantajıydı bence (C3\_S2).*

*The thing I liked most was the interest. There was a huge interest when the question was asked. It is important to keep the interest (C3\_S3).*

*En çok hoşuma giden derste bir ilginin olması, derste sorulduğu zaman bir ilgi yoğunluğu oldu. Bu ilginin kaybolmaması için önemliydi (C3\_S3).*

#### **4.2.6.2 The Best application**

When students were asked which application was the best based on their opinion, and why. One student from Case 1 told that using the system at the end of the course was the best for him, because the questions were asked just after the topic was told, and he was knowledgeable about it. Therefore, he would answer the questions confidently. Another student mentioned that using the system by asking same or similar questions at the beginning and at the end was the best for her. She told all the applications were beneficial but she liked discussion, so asking questions to discuss and then retaking the answers to see the difference was so beneficial.

There was diversity between the students of Case 2. When their idea about the best application was asked, one student said that using at the beginning of the class, three students said that using at the end of the class, and two students said that using both at the beginning and at the end was the most beneficial. The student who wanted to use the system at the beginning of the class stated that they were most aware at the beginning of the class; they might be tired and distracted at the end of the class, and they would like to go as quick as possible. So, using the system at the

beginning of the class was the best for her. The students who wanted to use the system at the end of the class stated they mostly came from another class, so they could not focus so quickly, but at the end of the class, they were canalized to that topic, and the application would help them to reinforce. Lastly, the students who wanted to use both at the beginning and at the end of the class told that the topic was discussed and understood better by this way, otherwise the system was used just a kind of a test.

In Case 3 while one student preferred using at the end of the class, five students preferred to use the system both at the beginning and at the end of the class. The student who preferred to use at the end of the class told that asking questions about the topic of the class helped them to perceptibly understand whether they learned, or not. The other group of students told that using the system at the beginning helped them to remember their prior knowledge to get ready to class, and asking same or similar questions at the end helped them to learn by asking someone that they already knew.

When all cases were examined it could be seen that one student preferred to use system at the beginning of the class that students were more aware at the beginning of the class. Six students from all cases preferred to use the system at the end of the class that the topic was just told, they were knowledgeable to answer the questions confidently, and they would have a chance to learn whether they learned, or not. Lastly, eight students preferred to use the system both at the beginning and at the end of the class by asking the same or similar question to discuss. They thought asking a question at the beginning would catch their attention and redirect it to new topic, would help to remember prior knowledge; discussing on the topic made it more consistent; and asking the same or similar topic helped them to see the difference and the level of their learning, too.

#### **4.2.6.3 Frequency and/or Number of questions**

Students from all three cases stated the system could be used every week by asking between three to five questions based on different variables such as the needs of

course and students, topic, purpose. Students from Case 1 especially mentioned that the system would be used for formative assessment. Furthermore, students from Case 3 stated that the system might be used in every two or three weeks, but the number questions should be increase then.

#### **4.2.6.4 Change in Opinions**

In each interview students were asked to tell their opinions about the system. In second and third interviews students were asked to tell how their opinions about the system were changed since the previous interview. Students told that their opinions changed from negative to positive, from neutral to positive, positive and no change, from positive to more positive.

##### *From Negative to Positive*

Four students from the Case 1 stated that their opinions were changed from negative to positive. When the reasons of the change were asked to students, they told that the technical problems of the system were fixed. Furthermore, at the beginning they thought that the system was unnecessary or waste of time to use instead of something that just could do by raising their hands, and they thought that the students would not willing to use the system. Nevertheless, in time, after using the system their opinions changed and they started to think that the system motivated them, and less stressful than answering the questions by raising a hand.

*Yes, at the beginning I thought as “Why do we need this” and thought as unnecessary bother. While I was thinking that we could raise our hand and answer the question, I recognized that was not valid. There were no true or false for these questions. It was not a problem if your identity is visible for the former questions, but here it might be a problem, because there is no true or false, and people might be judged due to their ideas. So, I thought this system was better. Maybe, I could not raise my hand and express my idea. But, I thought I express my idea freely by this way (C1\_S4).*

*Evet, ilk başta “Ya buna ne gerek var ya filan” diye, hamallık olarak gördüm. Elimizi kaldırıp da söyleyebiliriz çok da rahatlıkla diye düşünüyorken, sonradan böyle olmadığını fark ettim. Şimdi bu sorularda mesela doğru-yanlış diye bir şey yok, hani öbürkülerinde hadi o kadar ifşa edilsen de sorun değil. Ama bunlar, doğru-yanlış diye bir şey yok, insanlar düşüncelerinden dolayı yargılayabilir mi diye bir içimde şüphe uyandı. Hani dedim o zaman mesaj daha iyi. Hiç kimsenin önünde elimi kaldırıp, ben bunu düşünüyorum diyemeyebilirim mesela. Ama hani düşüncemi de rahatlıkla ifade ettiğimi düşünüyorum (C1\_S4).*

*As I told, I was not so positive at the beginning. I thought others would be murmured, would see it as a burden, and would not want it. But, there was an unbelievable positive effect in the class. I started to like it later on. You can see what others did. So, mine changed from negative to positive (C1\_S5).*

*Yani ben, dediğim gibi ilk başta çok da olumlu değildim. Hani böyle şey olacak gibi geliyordu bana, hani böyle sıñftakiler de homurdanacak, istemeyecekler, bunu yük gibi görecekler diye düşünüyordum ama sınıfta inanılmaz pozitif bir etki vardı. Ben de aslında hoşuma gitmeye başladı orda, diğerlerinin ne yaptığını filan da görüyorsunuz zaten. O yüzden benimkisi olumsuzdan olumluya doğru arttı (C1\_S5).*

In Case 2, just one student mentioned that her opinion changed from negative to positive. When the reasons were asked, she told that, at the beginning, she thought the system would be using for grading; but in time, she understood it would not and her opinion was changed.

Two students from Case 3 told that their opinions were changed from negative to positive in time. They told the reasons were thinking the system unnecessary, at the beginning. According to them, they learned via the system, could remember the questions asked via the system, and the system would be so beneficial for students.

*Actually, I thought it was useless when I first saw it. Asking before the class, teaching the topic and re-asking the question, I learnt something unconsciously. So, I liked it (C3\_S6).*

*Ne yalan söyleyeyim, ilk gördüğümde gereksiz geldi bana. Bir dersten önce sorup, o günkü konuyu anlatıp dersten sonra tekrar sorması, ister istemez hakikaten öğrenmişim bir şeyler .O yüzden hoşuma gitti yani. (C3\_S6).*

### *From Neutral to Positive*

Two students from Case 2 stated that their opinions were changed from neutral to positive during the term. While one student mentioned that she did not have an idea about the system to have an opinion, the other student told that she thought the system would be more beneficial for faculty members, not students, so she was neutral about it. But, their opinions were changed to positive in time due to seeing its benefits for the students.

*I was neutral before the first use. Because, I did not know it. I thought it was something just useful for faculty member. After using it, my opinion changed to positive (C2\_S2).*

*İlk kullanmadan önce nötrdü. Çünkü bilmiyordum yani nasıl bir şey olacağını. Sadece hocaya faydası olan bir şey olduğunu zannettiğim için nötrdü. Ama kullanınca, uygulayınca daha pozitif bir yaklaşım gösterdim (C2\_S2).*

Two students form Case 3 stated that their opinion changed from neutral to positive in time. Students stated that they did not have much idea at the beginning about the system, and they thought the system was not necessary. But, while they used to system they recognized the benefits and their thoughts changed.

*I was neutral at the beginning. I thought it was unnecessary, and it would be without it. But, I saw the benefits at the end. A more controlled student would be more successful (C3\_S6).*

*Başta nötrdüm yani, bence çok gerek yok. Olmasa da olur diye düşündüm ama sonunda hakikaten yararını gördüm yani . Ki derse daha iyi hakim olabilen öğrenci için çok çok daha yararlı olur diye düşünüyorum (C3\_S6).*

### *Positive*

One student from Case 1, three students from Case 2 and three students from Case 3 stated that they were thinking the system was beneficial at the beginning and their thought did not change.

### *From Positive to More Positive*

Two students from Case 1, two students from Case 2, and one student from Case 3 stated that they were thinking positive about the system, and it went to more positive during the semester. When the reasons behind those changes were asked the student from Case 2 stated that they had chance to use different purposes and applications, and they saw the individual benefits of the system. Moreover, the student from Case 3 stated that he saw the advantages of the system not only individual, but also for the group and on all the students.

*It was positive at the beginning and it became more positive. I liked the idea at first. After seeing the usability and efficacy, my opinion became more positive (C3\_S7).*

*İlk başta olumluydu, daha da olumluya gitti. Hani fikrin güzelliği hani hoşuma gitmişti. Sonra kullanılabilirliğini ve işe yararlılığını gördükten sonra daha da hani olumluya gitti fikrim (C3\_S7).*

When all cases were examined it was seen that there were students from all cases whose opinions were changed from positive to more positive. The common reasons for all cases was seeing the different applications of the systems and recognizing its benefits.

#### **4.2.6.5 Novelty Effect**

While students' opinions were collecting about the system, it was tried to determine whether there was a novelty effect or not. Students were asked to answer whether they liked the system at the beginning, but refused to use it later, or felt weariness and saying "not again!".

Five of the students from Case 1 stated that they did not feel any weariness about the system; on the contrary, they liked to use it. While one of the students stated that at the beginning of the semester he thought the same thing whether his friends would feel weariness and would not use the system, but he did not observe any boredom during the semester. Besides, his classmates were happy to use the system. Another student stated that they were the “Y Generation” that they liked the technology, and they would never get bored if there were technology. Furthermore, one student mentioned that he never got bored; on the contrary, he was curious about the results and excited when he was not sure about his choice. Moreover, two students mentioned that they never got bored, but they might, if the system would be used in the same way as with same frequency and same number of questions. So, the system usage should be diversified.

*I thought that at the first time, it seemed everybody liked it, but what would happen in a few weeks. I had a chance to observe the class. Everybody liked it during the semester (C1\_S2).*

*Benim aklıma gelmişti, ilk geldiğinde yani. Herkesin hoşuna gitti filan da diyordum böyle iki hafta, üç hafta sonra ne olacak diye. Sınıfta benim de gözlemleme şansım oldu. Herkesin hoşuna gidiyor yani, dönem boyunca (C1\_S2).*

*I think student would like everything, which technology embedded in. Because, there is a “Y Generation”, a new generation. It could be liked if there is a technology in it. I think they like it (C1\_S4).*

*Bence teknolojinin içine katıldığı her şeyi öğrenciler sever. Çünkü biliyorsunuz “Y Generation”, yani yeni bir generation var. Hani, teknoloji içinde oldukça bence sevilebilir. Bence zevk de alabilirler yani bu durumdan (C1\_S4).*

All students of Case 2 stated that they used the system without any boredom. Nevertheless, although they used the system without any boredom, it would be just one of the any other technology in the class, if it used as the same way all the time and became a routine of the class without any variation. In order to prevent this situation, applications should be varied to make students curious.

*There is nothing to moped, because this is not an entertaining based thing. So, I do not think there would be a problem if it were used permanently. Actually, using once in a week in a weekly course would not be a problem (C2\_S4).*

*Bu hani böyle eğlence bazlı bir şey olmadığı için sıkacak bir durum da yok yani. O yüzden sürekli kullanılsa bu kadar sorun olacağını sanmıyorum. Zaten haftada bir olan bir ders haftada bir kere de kullanılması bence sıkıntı yaratmaz (C2\_S4).*

In Case 3, none of the student mentioned to be bored during the study. They all mentioned that they were pleased with the system, and they thought they would not get bored.

*The system is very easy and simple in terms of usability that it would not have a problem. I think the content of the questions and faculty members' way of system use would be more efficient in a while rather than the system (C3\_S1).*

*Sistem kullanılabilirlik açısından çok kolay ve çok basit bir sistem olduğu için hiç bir zaman o şeye düşmez. Bir süre sonra zaten sistemin kendisinden çok soruların içeriği ve hocanın onu kullanım yöntemi daha etkin olacaktır diye düşünüyorum (C3\_S1).*

*We never told something like that. It was fun to use for us. Actually, you get bored in a while and this is better (C3\_S4).*

*Yok canım öyle bir şey demedik. Çünkü eğlenceli oluyor bize. Zaten derste bir süre sonra sıkılıyorsunuz. Daha iyi oluyor yani (C3\_S4).*

#### **4.2.6.6 Willing to Use the System**

During the data collection process, students were asked whether they want to keep using this system, or not. Five students from Case 1, two students from Case 2, and two students from Case 3 stated that they want to keep using this system.

#### 4.2.6.7 Usability of the System in other courses

After asking whether they want to keep using the system, students were asked whether this system be used in other courses, and the types of courses this system might be used. Five students from Case 1, five students from Case 2, and three students from Case 3 stated that this system could be used in various courses, and both verbal and computational courses would be suitable to be used. But, students from Case 3 stated that the system could not evaluate in detail, such as mathematical equations, else it could be used in any course.

*I think it would be for both. It might be used to solve a problem and collect the answer in computational courses. In verbal courses, it might be used in same way. It might be suitable for both, if it is designed well (C1\_S5).*

*Bence ikisi için de olabilir. Sayısal derslerde belki problem çözüp onun cevabını almak gibi olabilir. Sözel derslerde de yine aynı şekilde çok fazla soru cevap yaptığımız için ikisi için de uygun olabilir, tasarımı güzel yapılırsa (C1\_S5).*

*I think it would be used in all courses, and I would take the advantages (C2\_S2).*

*Bence bütün derslerde kullanılabilir. Hepsinde faydasını görürüm gibi geliyor (C2\_S2).*

*There is no course that I would say, "it is impossible to use". It can be used in any course (C3\_S1).*

*"Bu derste kesinlikle kullanılmaz" diyebileceğim herhangi bir ders yok. Her derse adapte edilebilir sonuçta (C3\_S1).*

#### 4.2.7 In Class Technologies

During the interviews, students were asked what kinds of technologies were used in class except this system. Students of Case 1 stated that the faculty member just used the projector for slide shows, and there were no other technology used in class. Students of Case 2 stated that, similar with Case 1, the faculty member just used

projector for slide shows, and sometimes for playing videos, and there were no other technology in the class. Lastly, students of Case 3 stated that the faculty member just used projector for slideshows. Furthermore, the faculty member asked to students whether they prefer slideshows or writing on the board. According to them, students chose the latter and he kept writing on the board.

*There is no technology used in our classes. In fact, our classes keep going on classical methods. We are in school of engineering, in the department of civil engineering. We have seven departments, dozens of laboratories. But, we cannot use even one of the labs. Faculty members have no attempt for that. They may not kick us out, but there is no attempt to invite us. I thing nothing is told about engineering of the new period. Actually the old things, old methods. I think there were the same exams 30 years ago with the ones we are taking today. For some faculty members, there is nothing to improve the courses. We can tell that there are some slides, nothing else (C3\_S2).*

*Derslerimizde kullanılan herhangi bir teknoloji yok. Hatta derslerimiz çok, yani klasik yöntemlerle devam ediyor zaten. Biz hala mühendislik fakültesindeyiz. İnşaat mühendisliği okuyoruz, yedi tane bölümümüz var, onlarca labımız var. Biz bir tane labın kapısından içeri dahi girmiyoruz. Hocalarımız tarafından da yani böyle bir girişim yok. Belki gitsek bizi kapıdan kovmazlar ama bize de “gelin çocuklar, buyurun” diyen bir eğilim yok. Bence yeni dönem mühendisliğe dair okulda zaten bir şey öğretilmiyor. Hani hep klasik şeyler, klasik yöntemler. Bence 30 sene önce de bizim burada olduğumuz sınavlardan farklı sınavlar yapılmıyordu. Yani bu noktada, hele ki öyle dersleri geliştirme amaçlı filan, kimi hocalarımızın yaptığı böyle biraz farklı olarak sunabileceğimiz, söyleyebileceğimiz tek şey hazırladıkları slaytlar (C3\_S2).*

### **4.3 Summary of the Chapter**

All themes, sub-themes and codes found from the data analysis, and the sources are given below as a summary of the results.

Table 4. 1

*Themes, Sub-themes, Codes, and Sources*

Theme	Sub-theme	Code	Source
Usage	Purpose.	Discussion	Faculty (Case 1) Student (Case 1, 2)
Usage	Purpose	Feedback	Faculty (Case 1, 2) Student (Case 2)
Usage	Purpose	Evaluation	Faculty (Case 1, 3) Student (Case 1, 2, 3)
Usage	Purpose	Motivation	Faculty (Case 2, 3) Student (Case 1, 2)
Usage	Purpose	Engagement	Faculty (Case 1, 2, 3) Student (Case 2)
Usage	Purpose	Review	Faculty (Case 1) Student (Case 1, 3)
Usage	Purpose	Implementation	Faculty (Case 1)
Usage	Purpose	Preparation	Faculty (Case 2, 3) Student (Case 1, 2, 3)
Usage	Purpose	To check whether they read the article or not	Student (Case 2)
Usage	Suggestions	Frequency/ Number of questions	Faculty (Case 1, 2, 3) Student
Usage	Suggestions	Method	Faculty (Case 1, 2, 3)
Usage	Suggestions	Suitable lessons	Faculty (Case 1, 2, 3)
Advantages of the system	Advantages for Faculty M.	Feedback	Faculty (Case 1, 2, 3) Student (Case 1, 2, 3)

Table 4.1 continued

Advantages of the system	Advantages for Faculty M.	Time saving	Faculty (Case 1, 2) Student (Case 1, 3)
Advantages of the system	Advantages for Faculty M.	Interaction	Faculty (Case 3) Student (Case 1, 3)
Advantages of the system	Advantages for Faculty M.	Engagement	Faculty (Case 3)
Advantages of the system	Advantages for Faculty M.	Motivation	Faculty (Case 1)
Advantages of the system	Advantages for Students	Feedback	Faculty (Case 1, 2, 3) Student (Case 1, 2, 3)
Advantages of the system	Advantages for Students	Motivation	Faculty (Case 1, 2, 3) Student (Case 1, 2, 3)
Advantages of the system	Advantages for Students	Engagement	Faculty (Case 1, 2, 3) Student (Case 1, 2, 3)
Advantages of the system	Advantages for Students	Cost	Faculty (Case 1, 2) Student (Case 1, 3)
Advantages of the system	Advantages for Students	Ease of use	Faculty (Case 1) Student (Case 1, 2, 3)
Advantages of the system	Advantages for Students	Interaction	Faculty (Case 1, 2, 3) Student (Case 1, 2, 3)
Advantages of the system	Advantages for Students	Enjoyment	Faculty (Case 1, 2, 3) Student (Case 1, 2, 3)
Advantages of the system	Advantages for Students	Timing of feedback	Faculty (Case 1) Student (Case 2, 3)
Advantages of the system	Advantages for Students	Stress free	Faculty (Case 1, 2) Student (Case 1, 2, 3)

Table 4.1 continued

Advantages of the system	Advantages for Students	Test herself / himself	Student (Case 1, 2, 3)
Advantages of the system	Advantages for Students	Increasing Awareness	Student (Case 1, 2, 3)
Advantages of the system	Advantages for Students	Repetition	Student (Case 1, 2, 3)
Advantages of the system	Advantages for Students	Summarization / Point out important points	Student (Case 1, 2, 3)
Advantages of the system	Advantages for Students	Retention	Student (Case 1, 2, 3)
Advantages of the system		General Advantages	Faculty (Case 1)
Problems	Related to the System	Design	Faculty (Case 1) Student (Case 1)
Problems	Related to the System	Technical Problems	Faculty (Case 1) Student (Case 1, 3)
Problems	Related to the System	Anonymity	Faculty (Case 3)
Problems	Related to the System	Multiple-choice questions	Student (Case 1, 3)
Problems	Related to other reasons	User originated problems	Faculty (Case 1)
Problems	Related to other reasons	Internet connection	Faculty (Case 2)
Problems	Related to other reasons	GSM Problems	Faculty (Case 2) Student (Case 1, 3)

Table 4.1 continued

Technical suggestions	Showing identity	Faculty (Case 1, 2) Student (Case 2, 3)
Technical suggestions	Design	Faculty (Case 1) Student (Case 1, 2)
Technical suggestions	Attendance	Faculty (Case 2)
Technical suggestions	METU Online integration	Faculty (Case 2)
Technical suggestions	Receiving questions via SMS	Student (Case 2, 3)
Technical suggestions	Open-ended questions	Student (Case 1, 2, 3)
Technical suggestions	Mobile application	Student (Case 1, 2, 3)
Technical suggestions	Changing answer	Student (Case 2, 3)
Concerns	Rainforcing impatience	Faculty (Case 1)
Concerns	Mobile phone using habit	Faculty (Case 1)
Concerns	Time consuming and extra work for F.M.	Faculty (Case 3)
Concerns	Time consuming	Student (Case 1, 3)
Concerns	Small group usability	Student (Case 3)
Opinions	Positive	Faculty (Case 1, 2, 3) Student (Case 1, 2, 3)

Table 4.1 continued

Opinions		Negative	Faculty (Case 1, 3)
Opinions		The best use	Student (Case 1, 2, 3)
Opinions	Change in opinions	From negative to positive	Student (Case 1, 2, 3)
Opinions	Change in opinions	From neutral to positive	Student (Case 2, 3)
Opinions	Change in opinions	Stable at positive	Student (Case 1, 2, 3)
Opinions	Change in opinions	From positive to more positive	Student (Case 1, 2, 3)
Opinions		Novelty effect	Student (Case 1, 2, 3)
Opinions		Willing to use the system	Student (Case 1, 2, 3)
Opinions		Usability of the system in other courses	Student (Case 1, 2, 3)
In class technologies			Students (Case 1, 2, 3)

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## CHAPTER 5

### DISCUSSION AND CONCLUSION

This chapter presents the discussion on the findings of the current study. Firstly, the results arised from this study will be discussed with the result of previous studies in terms of similarities and differences. Then, implications and suggestions for future research studies will be stated.

#### 5.1 Discussions on the First Sub-Question

While answering the question “How does a SRS facilitate teaching and learning process in classroom?”, understanding how this system was utilized, what were the purposes of using such system, how faculty members and students experienced this system, and what are the opinions of students and professors about using this system are crucial. When the literature was examined, it was seen that SRS could be used with variety of purposes such as to increase interaction (Caldwell, 2007; Duncan, 2006; Kennedy & Cutts, 2005; Trees & Jackson, 2007; Zhu, 2007), to facilitate peer discussion (Crossgrove & Curran, 2008; Duncan, 2006; Kennedy & Cutts, 2005; Seviaan & Robinson, 2011; Zhu, 2007), to assess students readiness (Caldwell, 2007; Duncan, 2006; Seviaan & Robinson, 2011), to assess formatively (Caldwell, 2007; Duncan, 2006; Seviaan & Robinson, 2011; Trees & Jackson, 2007; Zhu, 2007), to make lecture fun (Caldwell, 2007), to measure attitudes (Duncan, 2006), to find common misconceptions of students (Duncan, 2006; Trees &

Jackson, 2007), to grade (Duncan, 2006), to increase attendance and participation (Duncan, 2006; Sevian & Robinson, 2011), to understand level of learning (Zhu, 2007), to prepare exams or quizzes (Fifer, 2012; Kennedy & Cutts, 2005), to give immediate feedback without waiting (Duncan, 2006; Sevian & Robinson, 2011; Trees & Jackson, 2007). In this study faculty members stated that they used the system in a similar way with other studies such as to start discussion, to receive and provide feedback, to evaluate students, to motivate students, to engage students, to review former topics, to prepare students to class and to help them to implement what they have learnt. When three cases are compared it could be seen that the system was used with similar purposes within all three cases. Although each case was from a different major, educational science and psychology majors could be thought as similar fields. While educational science and psychology are defined as verbal majors, the third one, civil engineering, is defined as computational major. Even though civil engineering is a computational major, the selected course, Case 3, could be defined as a verbal course due to no computation within the course, and its conceptual content. Thus, the use of system might be similar within all three cases. Moreover, students reported that the faculty member of Case 2 used the system with an additional purpose, to check whether they read the assigned articles, even though the faculty members did not mention this purpose. This purpose was specific to a case and might be caused due to not to inform students about the purposes.

Furthermore, attitudes toward using technology is one of the key elements of technology integration into education (Teo, 2009). In this manner, opinions of students and faculty members are so important whether they would like to keep using the system, or not. According to results of the study, all faculty members agreed that the system was very useful, meets the needs of students, and they wanted to keep using the system. They just have some minor negative opinions due to technical problems. Similarly, almost all students thought that they liked the system and the system was beneficial for them.

The students were asked to specify their favorite usage aspect of the system and the reasons. The most favorite one was using the system in order to start a discussion

by asking a question, and then asking the same or a similar question to see the change in their opinions at the end of discussion, which was one of the main purposes of the system in order to ensure and to support learning. This result got along with the former studies of Bojinova and Oigara (2011), Caldwell (2007), Crossgrove and Curran (2008), Duncan (2006), Kennedy and Cutts (2005), Lantz (2010), Lowery (2006), Smith et al. (2009), Tao et al. (2010), Wood (2004), and Zhu (2007). Starting and carrying a discussion in a class setting is always difficult even if the class size is small. There would always be some students who hesitate to talk, and most of the discussions occur between a limited numbers of students (Caldwell, 2007). The reason why students liked this system might be due to letting all students to participate and state their opinions without any concerns. Students mentioned that they had not so many discussions in class, there were some question-answer sessions and these sessions mostly occur between the faculty member and a small number of students. This system lets them state their ideas and participate the class actively; so, they could interact with faculty member and their friends, and engage to the course.

In addition to their favorite use, in the second and the third interviews students were asked how their opinions have changed during the semester. These interviews were also done to understand whether there was novelty effect or not. According to results of the study, all students' opinions proceeded to the positive side. While some of the students' opinions changed from negative to positive, some students' opinions changed from neutral to positive, but all proceeded to positive. Although there were some technical problems occurred during the semester, their opinions were positive, not negative. The reasons behind these changes might be the good experiences with the system. Students might have thought that the faculty member would use the system in order to track them, or the system was just beneficial for the faculty member. However, in time, as they experienced the system, they might recognized the benefits of the system for them. Furthermore, solving the technical problems occurred at the beginning of the semester based on their suggestion might be effective on changing their opinions.

Another issue that should be taken into the consideration was the novelty effect. A new media always changes the environment of the context and has an effect on learners. But the important issue is whether the effect of this media is temporary and just due to being new, in other terms due to novelty effect, or not. During the data collection process students were asked whether they got bored, or not, along with the change in their opinions. None of the students mentioned about boredom due to using system after a while. Although they always use messaging tools in their daily life, using such a system was new for the participants of the study. According to the results they really liked the system and the wanted to keep using it in their different courses. Furthermore, they thought that the system could be used in various different courses without any problem. As mentioned before, the main reason why students liked the system this much, wanted to keep using it in different courses might be recognizing the benefits of the system for themselves. Nevertheless, students did not mention about boredom due to the system, it is still possible for this to get bored due to always using the system as the same way. Faculty members should diversify the use of the system and keep catching the attention of the students.

## **5.2 Discussion on the Second Sub-Question**

The second sub-question was “How faculty members and students define the benefits and problems of the Student Response system in classroom?”. Both faculty members and students were asked to specify the benefits and the problems of the system, and a long list consisted of mostly advantages was arisen. When the result of this study compared to the literature, there are some similarities and differences between the literature and the results of current study. According to former studies, SRSs have several advantages and a number of disadvantages. The advantages are not separate from each other; on the other hand, they are tightly connected with each other. The advantages of SRSs could be listed as feedback (Caldwell, 2007; Fifer, 2012; Kennedy & Cutts, 2005; Kenwright, 2009; Sevan & Robinson, 2011; Tao et al., 2010; Trees & Jackson, 2007), participation/interaction (Bojinova & Oigara, 2011; Caldwell, 2007; Duncan, 2006; Kenwright, 2009; Lantz, 2010; Tao et

al., 2010; Terrion & Aceti, 2012; Trees & Jackson, 2007; Zhu, 2007), anonymity (Caldwell, 2007; Hunsinger et al., 2008; Lantz, 2010; Martyn, 2007; Patterson et al., 2010), engagement/encouragement (Bojinova & Oigara, 2011; Lantz, 2010; Terrion & Aceti, 2012; Wood, 2004), raising concentration (Kennedy & Cutts, 2005; Lin, 2015), grate student satisfaction (Lowery, 2006), improving attendance and preparation (Kenwright, 2009; Kulesza et al., 2014; Lowery, 2006), improving grades (Bojinova & Oigara, 2011; Kenwright, 2009; Kulesza et al., 2014), improving effectiveness of learning (Lowery, 2006; Oswald & Rhoten, 2014; Terrion & Aceti, 2012), saving time (Martyn, 2007), and contributing to protection of nature by removing paperwork (Martyn, 2007). And the disadvantages could be listed as cost (Bojinova & Oigara, 2011; Crossgrove & Curran, 2008; Duncan, 2006; Kenwright, 2009; Smith et al., 2009; Wood, 2004; Zhu, 2007), and technical problems (Lowery, 2006). According to the results of current study, advantages of the system were gathered under two main groups: advantages for students and advantages for faculty members.

Feedback is one of the most important and common advantages of the system for both faculty members and students. In a similar vein to literature, both students and the faculty members agreed that the system provides feedback to faculty members and students. While students would be able to get feedback after exams, which are too late to fix the problems, faculty members determine the level of students, and make decisions based on a limited number of students attending and participating the class permanently. As Brookhart (2008) stated that feedback types could be grouped based on timing, amount, mode, and audience. According to this grouping, the system provides immediate feedback based on timing, oral feedback based on mode, and group or class wide feedback based on audience. By the help of this system, both faculty members and students would be able to get feedback immediately, which is another advantage of the system. Getting immediate feedback is beneficial for both faculty members. Students could learn whether their answers are correct or wrong just after answering the question. Likewise O'Reilly et al. (1994), O'Reilly et al. (1992) and Kulhavy & Wager (1993) both students and faculty members stated the importance and the advantages of feedback, especially

the immediate feedback. By the help of immediate feedback, students would be able to fix their mistakes before being so late. Furthermore, they could recognize not only their mistakes, but also misconceptions, and they have a chance to deal with them. Moreover, faculty members have a chance to determine students' level of understandings, and misconceptions; so, they may assess students and design their further classes (Lantz, 2010; Lowery, 2006; Tao et al., 2010) based on the data from whole class instead of a few students. By this way, faculty members could see the mistakes and misconceptions of the class that they could organize the course.

Another issue is time effectiveness of the system. While two of the faculty members and some of the students mentioned that the system helps faculty members to save time, likewise Martyn (2007) was stated, one of the faculty members stated that the system was time consuming and requires extra time to get ready to course. This might be due to structure of the course and the teaching methods that faculty members used to use. According to the results of the study the faculty member used blackboard instead of projector and presentations based on students' demand. Actually the system requires preparing questions before or during the class, and a good plan to decide when to ask the questions. If the system is going to be used for the first time, it needs extra effort to integrate it into class, but this is valid for all media, not specific to this one.

Interaction is one of the advantages of the system, which is mentioned for both faculty members and students. Several studies suggest that interaction, or in other words active participation of the students, is one of the key elements of learning and SRS maintain, and support both student-student, and student-faculty member interaction (Bojinova & Oigara, 2011; Caldwell, 2007; Duncan, 2006; Kenwright, 2009; Lowery, 2006; Tao et al., 2010; Terrion & Aceti, 2012; Trees & Jackson, 2007). The results of the current study support the former studies that the system constitutes an interactive environment. Employing SRSs do not allow students to sit quietly, passively in a class without any interaction. SRSs push students to come class prepared to be able to answer questions, to answer questions, and discuss with their peers (Terrion & Aceti, 2012; Zhu, 2007). Constituting and maintaining an

interactive environment in the classroom is really a tough work, and needs support. At this point another property and the advantage of the system take the duty over: anonymity.

Anonymity is one of the properties of the system. It was consciously designed to not to show identity of the user. Although each phone number and the answer given is stored in the database of the system, they were not reported, so faculty members could not know which answer was given by whom. Being anonymous, as stated before, supports the interactive environment of the class. In traditional classrooms, most students are generally unwilling to participate or answer the questions due to public risk (Martyn, 2007); in other words making mistakes in front of other people and feel embarrassed (Caldwell, 2007). Level of unwillingness generally increases parallel to increase in number of learners (Caldwell, 2007; Martyn, 2007). At this point SRSs help students by enabling them to answer the questions without concerning about embarrassment or humiliation (Caldwell, 2007; Hunsinger et al., 2008; Lantz, 2010; Martyn, 2007; Patterson et al., 2010). By this way, the students who are shy to talk with others could get used the class, and other students and would start to talk. At this point another advantage of the system, which is a consequence of anonymity and interaction arises: engagement.

According to Lantz (2010), Mayer et al. (2009), Smith et al. (2009), Terrion and Aceti (2012), and Wood (2004) engagement is crucial for learning and there is a positive relationship between learning and engagement. In other words, students learn better as long as they feel engaged. Former studies showed that SRSs support engagement of the students (Bojinova & Oigara, 2011; Terrion & Aceti, 2012). In a similar manner, the results of current study showed that one of the faculty members and almost all students agreed that the system engaged them to the course. According to faculty the member, the system did not directly engage him, but when the students engaged, he got engaged. Furthermore, students pointed out two important benefits of the system that engage students. At first, some of the students from different cases mentioned that they came to class for attendance or just to get knowledgeable about the topic. They mostly preferred to sit at the back of the class

without interaction and went out after the class. They stated that they answered the questions asked via this system, because their identity is hidden and there was no harm to answer a question. However, after using the system they liked and kept using it. The second benefit was helping them to focus back to topic. Students mentioned that the duration of the classes were so long that they felt bored and started daydreaming after a while. The system was like a break or a refresher for them to re-focus to the topic and think about it, which was one the problems of traditional classroom setting. Engaging students and support active participation bring another consequence, actually an advantage together: motivation.

Motivation is one of the other advantages of the system, which is mentioned by both students and faculty members and valid for both. According to Kulhavy and Wager (1993) telling people how well they are performing motivates people to study harder due to seeing as an indicator of their future achievements. The results of this study indicated that the system motivated both faculty members and students as Wolter et al. (2011) stated. A faculty member stated that he used the system in order to motivate student and increase the attendance, and it is seen that he achieved it. Students mentioned that the system motivated them in different ways. At first, they felt motivated to answer the questions correctly so they needed to study before the class and listen the faculty member more carefully. They mentioned that they wanted to see their answer was correct and to be in the group of glorious. Secondly, when they started to answer the questions, they wanted to keep answering more questions without interruption, if the answer was correct. When the reasons of this motivation were thought, several different ideas came to mind. The first thing thought was the novelty effect, the excitement due to using a new technology. But the responses of students eliminate this option. Despite the students thought the opposite, novelty effect might have a part. Secondly, as a union of active participation, engagement, feeling free might have motivated students to use the system. Thirdly, the enjoyment and ease of use of the system might have motivated students.

Ease of use and enjoyment were two advantages of the system for students mentioned by both faculty members and students. Although they were mentioned as different heading in the result chapter, they are totally nested. Most of the students stated that they mostly got bored during the long lectures, and, as stated before, the system helped them to take a breath by sending an SMS. Furthermore, they stated that they send number of SMSs to friends during the day, and it became a daily routine of their daily life. They were not asked to learn a new system, but asked for just sending an SMS. Although they use their phones to send a SMS or messages via different tools, it was a bit different and fun for them. Furthermore, it might be due to not to pay anything to use the system.

Despite the fact that the cost of SRS is a disadvantage for both institutions and students, it was not valid for the current study. Normally, the installation and maintenance of such systems might cost thousands of dollars for institutions. Furthermore, students should buy devices that the amount of money vary based on the specifications of the device, and should pay a registration fee (Bojinova & Oigara, 2011; Crossgrove & Curran, 2008; Duncan, 2006; Wood, 2004; Zhu, 2007). In Turkey, companies ask enormous amount of money to set up an SRS with a limited number of response devices due to lack of competition. Moreover, students would not have own devices, but would use the ones distributed by instructor. Instructor should distribute devices at the beginning of the class and collect them back at the end, which was not practical. On the other hand, there is no extra device, extra installation, or extra charges for the current system. One of the main goals of this study was removing the charges for institutions and students. During this study neither institution, nor students paid anything for the system. All charges were covered by the developer company as a complimentary support to the university. Even if the system will be required to pay SMS charges, almost all the students have SMS packages to use. Either, institutions might buy bulk SMSs for a minimal amount per year instead of paying for installation.

While all the former advantages were stated by faculty members and students, test herself/himself, review, summarization, retention and increasing awareness were

the benefits of the system for students mentioned by just students. Actually summarization, review and retention are nested and in conjunction with each other. According to the results of the study, students thought that faculty members asked questions about the most important and must be known points of the topic. By this way, they repeated and summarized the topics, and helped students to remember the topics much longer. Students stated that they could easily remember the question asked via the system, especially the ones they discussed in class and they could answer similar ones. This might be due to other advantages of the system mentioned before such as engagement, motivation, and especially interaction. Peer discussion and instruction is one of the best ways of learning supported by SRSs (Lowery, 2006; Terrion & Aceti, 2012; Trees & Jackson, 2007). Furthermore, SRSs not only support peer interaction, but also student-instructor interaction, which is generally inadequate, missing or limited (Fifer, 2012). According to the results of the study, students were not totally passive in classrooms, but this was a new kind of interaction for them. So, it could be easier to remember the topics covered in the class for the students. Moreover, seeing the results of all students on the screen as a graph might help them to remember the questions and the results easier than usual.

As stated before any of these advantages could not be taken separate from each other. All the mentioned advantages of the system are nested and inseparable from each other. One of each property or advantage of the system is caused by and led to another advantage.

Despite the system has several advantages; some problems were also experienced by the faculty members and the students during the semester. Although reasons of the problems were based on the system, itself, and tried to be solved, there were some other reasons could not be manipulated by the researcher.

The first problem, which both faculty members and students complained, was about the design of the system. There were two different complaints about the design of the system. The first one was the questions and the choices could not be seen from the back of the classroom. Actually there were two different reasons to this problem. The first one was the size of the text, which was enlarged after the

complaints and solved. The second one was the physical properties of the classrooms. According to observations of the researcher the placement of the projector was not convenient or the lamp has expired that the vision on the screen was not qualified enough. The second complaint, not a problem, was the appearance of the system. Some of the students asked for more colorful and attention catcher interface. Although some upgrades were made based on their demands, the interface still needs to be improved.

The second problem stated by faculty members and students was the technical problems. Actually the theme called technical problems was mostly the problems caused by other reasons instead of the system itself. The system was unable to work once due to server problem accrued at the beginning of the semester. After a server problem occurred once, necessary precautions were taken and a similar problem never occurred. Actually the reported technical problems were the Internet connection problem, GSM network problems, and user problems. At one point, the Internet connection was lost, so the system logged the faculty member out, and ended the duration of the question. Actually this was a problem occurred due to physical infrastructure of the classroom, and the researcher had no chance to interfere. Merely a mobile device with mobile Internet connection instead of wired or wireless connection, or sharing the mobile Internet connection of mobile device could be the solution or a backup plan. Another technical issue was GSM problems. While students using the system, they got a confirmation SMS that the system got their response. In some cases, depending on the GSM Company, students did not get or got delayed confirmation that they felt anxious and tried to resent their choices, but they got another SMS reported that their response was already taken and they could not send another one. This problem was occurred due to GSM companies and the researcher had nothing to do. The last technical problem stated by just faculty members and it was user or users' device problems. Faculty members stated that any of the students might have forgotten her/his phone at home, or the phone might be out of charge that they might lose data. Actually, this problem was not specific to this study, and could be occurred with any mobile device.

Even though it was stated as an advantage, faculty members mentioned that anonymity was a disadvantage at the same time for them. According to the results faculty members want to track the improvement of each student, to determine the mistakes of each student, but being anonymous obstructed them.

In addition to these problems, faculty members and students had some concerns about the system. According to results of the study, one of the faculty members stated that the system reinforces the impatience of the students. While world is becoming faster and faster day by day, she was concerning about being immediate of the system. She thought that students would like to answer more questions in a shorter time, to see the results as soon as possible, and this might become a habit. Even though the faculty member concerning about reinforcing the impatience of the students, faculty members are the people who could control and organize the use of the system. If they plan the lesson carefully and could apply their plan there would not be any problem.

Usability of the system for the small groups was a concern of the students. According to the results of the study, students thought that the system was so beneficial for large groups, but they were not sure about the small groups. They thought that students could raise their hand instead of using this system. As Caldwell (2007) stated that there would be shy and introvert students anxious about talking in front of other people, even if the class size is small. So, system might be beneficial and useful even if the class size is small.

Lastly, both students and faculty members concerned about the system might be time consuming for them. According to the results of the study, students thought that using system might take more time than just raising hand and they might need to wait other students. One of the faculty member thought that he need would need more time to get ready to class and prepare questions. But, this situation was not specific to this system, a good planning might solve all these problems, and the system would be more effective after the first implementation.

### **5.3 Discussion on the Third Sub-Question**

The last sub-question was “How faculty members and students define their expectations and suggestions about the SRS?”. Both students and faculty members were asked to specify their expectations from the system and their suggestions. According to results of the study, expectations and suggestions were grouped under two headings: technical and utilization.

Although there were number of technical suggestions, two of them were suggested by both faculty members and students: design and showing identity. As mentioned before, faculty members and students complained about design of the system, they suggested changing the design of the system. The researcher contacted with the developer company and they changed the design based on the suggestions of faculty members and student. Design of the interface of a system has a great effect on the perceptions of the users. The interface is the screen where users interact with the system. Even if a system works effectively without a problem, it might be perceived as useless, or hard to use due to its design. The perceptions of the users about the design are crucial to utilization of the system. The design of the current system could be updated and designed more remarkable before the further studies.

Another suggestion for the system was showing the identity of students. Both faculty members and some students asked to show the identity of students. Faculty members wanted to see the students’ identity in order to evaluate and grade their process, students were agreed to reveal their identity if the system would be used as a quiz or test application, nothing else. Furthermore, students suggested that showing identity could be optional based on the questions and the purpose, otherwise they do not want to reveal their identity. Anonymity is one of the most important advantages of the system for students. If the anonymity of the system were taken out, the system would not be beneficial anymore. All other advantages related with anonymity would be diminished along with anonymity. Asking some questions could be used as an option in some cases to assess students, but anonymity should not be taken from students.

Furthermore, faculty members suggested connecting this system with LMS of the university to take attendance and track students, but all these suggestions are possible if the identity of students is not hidden. Actually all data of the students are kept on the system, but not shown to faculty members. System could be updated to take attendance without revealing the identity of students to faculty member, and to keep data of the questions, which were optionally selected as cognoscible.

In addition to faculty members' suggestions, there were some suggestions from students such as asking open-ended questions, receiving questions via SMS, changing answer, and a mobile application. At first, students suggested that open-ended questions could be asked via the system. At this point, this suggestion could be partially implemented. Analyzing open-ended questions is not quite possible for now, but it might be done in a near future. There would be two options to ask open-ended questions. The first one is to ask questions, and faculty members would analyze them after the class; or, questions with just one-word answer such as a name or a exact date could be asked. The system could compare the answer with answers of the students and shows the results. The second option is a bit more useful than the first one due to not requiring extra workload for the faculty members.

Students suggested receiving questions via SMS instead of projecting on the screen. Furthermore, they suggested that each SMS could be send with a different order of choices. Developer Company could utilize this suggesting by working on it, but the main goal of this system was not assessing students with exam like questions. The actual goal of the system was supporting active learning via increasing interaction, engaging students, and motivating them. So, this suggestion would be utilized, if the system would be used in order to test students with clarified identity.

Another suggestion of the students was changing their answers after sending one before. Students suggested that they might want to change their answer after realizing something they forgot, or they might have pushed the wrong button. Changing the answer after sending one was consciously banned likewise all other SRSs. Students mostly talk with their friend about their answer after sending it.

What happens next is thinking their answer was wrong. If students were allowed to change their answers, most of them would be tried to change it after talking with friends. One of the goals of this system was helping student to see their own mistakes and misconceptions to give a change to fix them. In order to support this, the system was used to ask similar or the same questions to give a chance students to discuss on it. Letting students to change their answers would be harmful, not beneficial.

Lastly, students suggested developing a mobile application instead of using SMS technology. According to results of the study students thought that almost all students have smartphones with mobile Internet connection and a mobile application would be more beneficial for them. Actually, developing a mobile application and using it instead of SMS was thought at the beginning of the study, and the developer company had a mobile application for smartphones that could be used in this study; but all students did not have smartphones that day. So, it would be an unfair, if the system was used via a mobile application. It was thought that each college student had a mobile phone, even if they did not have a smartphone. Today, almost all students have smartphones with mobile Internet connections or institutions maintain wireless network connections. But even if there were one student without a smartphone mobile application would not be used. The one way of using a mobile application would be updating the system in order to collect data from both mobile application and SMSs, or maybe clicking from a web site.

Aside from technical suggestions, there were utilization suggestions about the system, but these suggestions were not as much as technical suggestions. Almost all students and two of the faculty members agreed that the system could be used any course without a problem. Only one faculty member stated that the system was suitable for verbal courses. When the structure of the system was examined it is seen that the system is so adaptive that could be used in any course. While almost all students and one of the faculty member suggested that the system could be used every week, two of the faculty members suggested using the system in every two or three weeks. While students wanted to use the system, the suggestion of faculty

members could be due to extra work that system needs. They might not have time to prepare questions that seldom using the system might be easier for them. Lastly, all students and faculty members agreed that three to five questions per class would be adequate. But the system should not be used as the same way each week. The use of system should vary to not to bore the students.

At the end, the world is changing rapidly, new high-tech devices arise each day and we could not catch them all. Mankind always tried to implement each new technology or high-tech device into education, and they were not successful in all cases. It should always be remembered that devices could be changed; the important point is how you utilize them, and how you enhanced teaching and learning.

#### **5.4 Implications for the Practice**

In this study, how a SRS, which similar systems have almost been using in US classrooms for decades, but not common in Turkey, facilitates the teaching and learning process in college classrooms was investigated. In this manner, as a significance of this study, a new system was designed based on the needs and opinions of the actual users of these systems, instructors and students, was developed in a corporation with a private company associated with GSM companies, and utilized instead of using compact systems offered by different companies.

The system is actively being used in METU campus by several faculty members, and keeps evolving. In this manner, this system might constitute a base for the new systems that these systems might benefit from the experiences of a working example, might eliminate several problems and might save time. Moreover, although all demands of faculty members and students could not be applied to the system, the list of these demands, and suggestions are listed within this study, and they might be used to desing and develop an advanced system.

This study showed that the same system could be used with many similar or different purposes. Of course, there is no limitation about the use of the system that

it might be used with many different purposes based on the needs of the course, level of the students, etc. However, the most popular use of the system within the students was starting and carrying a discussion which is a big problem in classroom settings, especially in large ones. Related with the increasing number of students, time and care allocated to each student decrease day by day that new solutions should be found to engage students and let them participate the class actively. According to faculty members and students, the current system is capable of doing it. Therefore, this system could be used to to engage, motivate, and let tstudents participate in large classrooms. Also, students stated that the system is really effective in small classrooms, too. One of the reasons of the system being effective is being anonymous while answering the questions. There are always shy students who hesitate to talk in public, although the group is small, and this system might help these students. Moreover, one of the faculty members asked to use the system in order to support between class engagement. This system might be used before or after a few days to class in order to engage students by sending the questions via SMS, collecting answers, and discussing the answers duringthe class. Also, asking questions via SMS removes the barriers of classrooms, and necessity of being in the exact same location that might be used to support lifelong learning. Besides, asking questions via SMS between the classes might be effective based on several variables such as the age and attitudes of participants, content of the course, etc.

In addition, faculty members mentioned that current students were born in technology, and want to use it permanantly. Furthermore, one faculty member stated that students are addicted to their mobile phones and they need to check it in a while. However, students mentioned that faculty members do not use new technologies in their class. Furthermore, this generation asks for new educational strategies, and evaluation methods that the system might be a good alternative to let student to “touch” their phones, and bring the technology in the class at the same time.

Furthermore, this study explained how the system might be used in the classrooms, how many questions should be asked, and what should the frequency be in college classrooms based on the faculty members and students. Although students mentioned that the system could be used each week in each course, faculty members stated that the system might be used in every two or three weeks in order to wake the students up, to engage, to motivate, and to evaluate them. Furthermore, both faculty members and students were agreed that the optimal question number to be asked per class is three to five in order not to bore or to treaten them. On the contrary the system should be used for fun. In this manner, this system could be an alternative way to activate the sleeping, or passive students and create an interactive learning environment.

Lastly, feedback is one of the issues that should be taken into consideration during the implementation of the system. Both students and faculty members mentioned the feedback as one of the most important advantages of the system. Furthermore, faculty members used the system not only to give feedback, but also to receive feedback. Although there is no problem for faculty members while receiving feedback, they should be careful while providing feedback to the students in terms of timing, amount, and audience. Faculty members have no chance for the mode of the feedback that they should provide oral feedback while using this system. On the other hand, timing and the amount of feedback may vary. For instance, faculty member may not show the results instantly, may delay the feedback a little bit, in order to encourage students to discuss the results and express their ideas. By this way the class might be more interactive, engaging and motivative. Furthermore, amount of the feedback may vary based on topic, level of class, and some other variables. However, the important point is supporting adequate and corrective feedback to students. Although, the feedback is given to group based on the choices of students, each student could test himself or herself, and receive the feedback individually. Thus, faculty members should be carefull about the feedback provided. Even though results of each question could not be discussed, faculty member should explain why a choice is the correct one, and the others are not.

Table 5.1

*The System Utilization Purposes, and Examples*

Purpose	How (Examples)	Timing
Catching attention	By asking fun facts about the topic	At the beginning of class During the class At the end of class
Motivation	By asking questions that all students are able to answer	At the beginning of class During the class At the end of class
Engagement	By asking questions that all students are able to answer	At the beginning of class During the class At the end of class
Discussion	By asking questions that answers of which depends on several variables	At the beginning of class During the class At the end of class
Evaluation	By asking questions about the former, or current topics	At the beginning of class During the class At the end of class
Feedback	By asking question similar with exam questions	At the beginning of class During the class At the end of class
Review	By asking questions about the former, or current topics	At the beginning of class At the end of class
Pointing out important points	By asking more than one, and similar questions about that topic	During the class At the end of class
Fun	By asking funny and interesting question that do not have to be about the topic	At the beginning of class During the class At the end of class

Table 5. 2

*The System Utilization Suggestions*

What	Suggestions	Why
Frequency	The system might be used every week, or in every two week	The frequency depends on needs of your course
Number of question	Three to five questions might be asked per week	Too many questions per week might harass the students
Type of question	Do not use same question type all the time. Type of questions should be diversified	Students might get bored due to same type of questions
Purpose	Do not use the system for the same purpose all the time	Using the system with the same purpose all the time might cause weariness
Timing	Timing of system use needs to vary during the class	The system is fun for students. There should not be a routine for the system

### 5.5 Recommendations for the Future Research

This study revealed the properties that such systems should have, advantages and disadvantages, in which courses, how, and in which frequency the system could be used. However, this study was conducted as a case study that investigates three cases that used the system during the development process, and experienced this system, the results of the study are limited with the data of three cases. In future, developmental studies would be conducted to design more advanced systems, or

experimental studies may be conducted in order to investigate the effect of these systems on students' achievements and classroom climate.

At the beginning of this study, smartphones were not widespread as now that the system was designed and developed for mobile phones to use SMS. New systems that might work with on mobile phones, smart phones, and web interface for future studies based on the suggestions revealed in this study. Furthermore, mobile applications for smartphones and tablet computers could be designed and developed that has the option for showing identity, keeping logs, working collaboratively with student affairs information system in order to use for quizzes and attendance. On the other hand, today there are different applications that let instructors to poll during the class. While some of these applications are developed for polling such as polleverywhere (<http://www.polleverywhere.com>), some of them are developed for different purposes and polling is just one on their components such as Socrative App (<http://www.socrative.com>). These new applications might be examined and used in future studies, but integrating these systems with students affair system might be beneficial.

During this study both faculty members and students mentioned some of their concerns about the system and technology use in education in general. Further studies would be conducted to investigate these concerns.

Lastly, novelty effect is one of the important issues that should be taken into consideration while conducting a technology integration study. Although the novelty effect of this system was investigated by asking questions during the interviews, longitudinal studies will be conducted to investigate long-term effects.



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## APPENDIX A

### INFORMED CONSENT FORMS

#### GÖNÜLLÜ KATILIM FORMU – ÖĞRETİM ÜYESİ

Sayın Hocam;

Bu çalışma Orta Doğu Teknik Üniversitesi Eğitim Fakültesi Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü’nde yürütülmekte olan doktora “THE USE OF STUDENT RESPONSE SYSTEM IN COLLEGE CLASSROOMS: A MULTIPLE CASE STUDY” başlıklı doktora tez çalışmasının bir parçasıdır.

Size yönlendirilen görüşme soruları ile şu anda derslerinizde cep telefonlarının kısa mesaj servisi ile kullandırmakta olduğunuz “Mobil Cihazlar için Anlık Geri Bildirim Sistemi” hakkındaki deneyim, görüş ve önerilerinizin alınması hedeflenmektedir. Görüşme esnasında sizden hiçbir kişisel bilgi istenmeyecek olup, vermiş olduğunuz bilgiler gizli tutularak, sadece bu araştırma kapsamında kullanılacaktır.

Görüşmemiz yaklaşık olarak 20 sürecek olup katkılarınız için çok teşekkür ederiz.

AD SOYAD

İMZA

## GÖNÜLLÜ KATILIM FORMU - ÖĞRENCİ

Sayın Öğrencimiz;

Bu çalışma Orta Doğu Teknik Üniversitesi Eğitim Fakültesi Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü'nde yürütülmekte olan doktora "THE USE OF STUDENT RESPONSE SYSTEM IN COLLEGE CLASSROOMS: A MULTIPLE CASE STUDY" başlıklı doktora tez çalışmasının bir parçasıdır.

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Görüşmemiz yaklaşık olarak 20 sürecek olup katkılarınız için çok teşekkür ederiz.

AD SOYAD

İMZA

## APPENDIX B

### INTERVIEW QUESTIONS FOR FACULTY MEMBERS

#### İlk Görüşme Soruları

- Bu çalışma kapsamında geliştirilen cep telefonları için anlık geribildirim sistemini kaç dersinizde kullandınız?
- Bu sistemi derslerinizde hangi amaç ya da amaçlarla kullandınız?
- Bu sistemin en hoşunuza giden özelliği ya da özellikleri nelerdi?
- Bu sistemin en hoşunuza gitmeyen özelliği ya da özellikleri nelerdir?
- Bu sistemin faydalı olabileceğini düşünüyor musunuz? Neden? Nasıl?
- Sizce bu sistemi daha etkili ve verimli hale getirmek için neler yapılabilir? Sisteme ne gibi yeni özellikler eklenebilir?
- Sizce sistemden çıkarılması gereken özellikler var mıdır? Varsa, nelerdir?
- Sizin belirtmek istediğiniz, benim sormadığım herhangi bir şey var mıdır?

#### İkinci ve Üçüncü Görüşme Soruları

- Sizce, hangi uygulama türü daha etkili ve verimliydi?
- Sizce, sistem hangi amaç ya da amaçlarla kullanılmalı?
- Sizce, sistemin kullanım sıklığı ve sorulan soru sayısı nasıl olmalı?
- Sizce sistemin en etkili yönü nedir?



## APPENDIX C

### INTERVIEW QUESTIONS FOR STUDENTS

#### İlk Görüşme Soruları

- Adınız Soyadınız
- Fakülteniz
- Bölümünüz
- Sınıfınız
- Bu çalışma kapsamında geliştirilen cep telefonları için anlık geribildirim sisteminin kullanıldığı tüm derslere katıldınız mı? Hepsine katılmadıysanız, katıldığınız ders sayısı nedir?
- Katıldığınız derslerde bu sistem ne sıklıkla kullanıldı?
- Katıldığınız derslerde bu sistem hangi amaç ya da amaçlarla kullanıldı?
- Bu sistemin en hoşunuza giden özelliği ya da özellikleri nelerdir?
- Bu sistemin en hoşunuza gitmeyen özellik ya da özellikleri nelerdir?
- Bu sistemin faydalı olabileceğini düşünüyor musunuz? Eğer cevabınız evet ise nasıl?
- Sizce sistemi daha etkili ve verimli hale getirmek için ne gibi özellikler eklenebilir?
- Sizce sistemden çıkarılması gereken özellikler var mıdır? Varsa, nelerdir?
- Sizin belirtmek istediğiniz, benim sormadığım herhangi bir şey var mıdır?

## İkinci ve Üçüncü Görüşme Soruları

- Sınıfınızda bu sistem aracılığıyla farklı uygulamalar yapıldı mı?
- Yapılan bu uygulamalar arasındaki farklar nelerdir?
- Sizce, yapılan farklı uygulamaların size farklı katkıları oldu mu?
- Sizce, bu sistem aracılığıyla ne gibi farklı uygulamalar yapılabilir?
- Bu sistemi kullanmaya devam etmek ister misiniz?
- Bu sistemi farklı derslerinizde de kullanmak ister misiniz?
- Sistemi ilk kullanmaya başladığınızdaki görüş ve düşünceleriniz nelerdir?
- Sistemi kullandıkça, sistem hakkındaki görüş ve düşüncelerinizde değişiklik oldu mu? Olduysa ne yönde?
- Sizce, bu sistemin sürekli kullanımı sorunlara yol açar mı?

## APPENDIX D

### PERMISSION OF ETHICAL COMMITTEE

UYGULAMALI ETİK ARAŞTIRMA MERKEZİ  
APPLIED ETHICS RESEARCH CENTER



ORTA DOĞU TEKNİK ÜNİVERSİTESİ  
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16.11.2014

Gönderilen : Prof.Dr. Kürsat Çağıltay  
Bilgisayar ve Öğretim Teknolojileri Eğitimi

Gönderen : Prof. Dr. Canan Sümer   
IAK Başkanı Vekili

İlgi : Etik Onayı

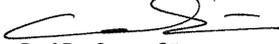
Danışmanlığını yapmış olduğunuz Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü öğrencisi Ömer Faruk İslim'in "Design and Development of an Immediate Feedback System For Mobile Platform" isimli araştırması "İnsan Araştırmaları Komitesi" tarafından uygun görülerek gerekli onay verilmiştir.

Bilgilerinize saygılarımla sunarım.

Etik Komite Onayı

Uygundur

16/11/2014

  
Prof.Dr. Canan Sümer  
Uygulamalı Etik Araştırma Merkezi  
(UEAM) Başkanı Vekili  
ODTÜ 06531 ANKARA



## APPENDIX E

### CODING TABLE FOR FACULTY MEMBERS

Table E.1  
*Coding Tables for Faculty Members*

Theme	Sub-theme	Code
Usage	Purpose.	Discussion
Usage	Purpose	Feedback
Usage	Purpose	Evaluation
Usage	Purpose	Motivation
Usage	Purpose	Engagement
Usage	Purpose	Review
Usage	Purpose	Implementation
Usage	Suggestions	Frequency/ Number of questions

Table E.1 continued

Usage	Suggestions	Suitable Lessons
Usage	Suggestions	Methods
Advantages of the system	Advantages for Faculty M.	Feedback
Advantages of the system	Advantages for Faculty M.	Time saving
Advantages of the system	Advantages for Faculty M.	Interaction
Advantages of the system	Advantages for Faculty M.	Engagement
Advantages of the system	Advantages for Faculty M.	Motivation
Advantages of the system	Advantages for Students	Feedback
Advantages of the system	Advantages for Students	Motivation
Advantages of the system	Advantages for Students	Engagement
Advantages of the system	Advantages for Students	Cost
Advantages of the system	Advantages for Students	Ease of use
Advantages of the system	Advantages for Students	Interaction
Advantages of the system	Advantages for Students	Enjoyment
Advantages of the system	Advantages for Students	Timing of feedback
Advantages of the system	Advantages for Students	Stress free
Advantages of the system		General Advantages

Table E.1 continued

Problems	Related to the System	Design
Problems	Related to the System	Technical Problems
Problems	Related to the System	Anonymity
Problems	Related to other reasons	User originated problems
Problems	Related to other reasons	Internet connection
Problems	Related to other reasons	GSM
Technical suggestions		Showing identity
Technical suggestions		Design
Technical suggestions		Attendance
Technical suggestions		METU Online integration
Technical suggestions		Receiving questions via SMS
Concerns		Reinforcing impatience
Concerns		Mobile phone using habit
Concerns		Time consuming and extra work for F.M.
Opinions		Positive
Opinions		Negative

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## APPENDIX F

### CODING TABLE FOR STUDENTS

Table F.1

*Coding Table for Students*

Theme	Sub-theme	Code
Usage	Purpose.	Discussion
Usage	Purpose	Feedback
Usage	Purpose	Evaluation
Usage	Purpose	Motivation
Usage	Purpose	Engagement
Usage	Purpose	Review
Usage	Purpose	Preparation
Usage	Purpose	To check whether they read the article or not

Table F.1 continued

Usage	Suggestions	Frequency/ Number of questions
Advantages of the system	Advantages for Faculty M.	Feedback
Advantages of the system	Advantages for Faculty M.	Time saving
Advantages of the system	Advantages for Faculty M.	Interaction
Advantages of the system	Advantages for Students	Feedback
Advantages of the system	Advantages for Students	Motivation
Advantages of the system	Advantages for Students	Engagement
Advantages of the system	Advantages for Students	Cost
Advantages of the system	Advantages for Students	Ease of use
Advantages of the system	Advantages for Students	Interaction
Advantages of the system	Advantages for Students	Enjoyment
Advantages of the system	Advantages for Students	Timing of feedback
Advantages of the system	Advantages for Students	Stress free
Advantages of the system	Advantages for Students	Test herself / himself

Table F.1 continued

Advantages of the system	Advantages for Students	Increasing Awareness
Advantages of the system	Advantages for Students	Repetition
Advantages of the system	Advantages for Students	Summarization / Point out important points
Advantages of the system	Advantages for Students	Retention
Problems	Related to the System	Design
Problems	Related to the System	Technical Problems
Problems	Related to the System	Multiple-choice questions
Problems	Related to other reasons	GSM
Technical suggestions		Showing identity
Technical suggestions		Design
Technical suggestions		Receiving questions via SMS
Technical suggestions		Open-ended questions
Technical suggestions		Mobile application

Table F.1 continued

Technical suggestions		Changing answer
Concerns		Time consuming
Concerns		Small group usability
Opinions		Positive
Opinions		The best use
Opinions	Change in opinions	From negative to positive
Opinions	Change in opinions	From neutral to positive
Opinions	Change in opinions	Stable at positive
Opinions	Change in opinions	From positive to more positive
Opinions		Novelty effect
Opinions		Willing to use the system
Opinions		Usability of the system in other courses
In class technologies		

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## CURRICULUM VITAE

**Family name:** İSLİM  
**First names:** Ömer Faruk  
**E-Mail Address:** islim@metu.edu.tr – omerfarukislim@gmail.com

### **Education:**

- 2010-2015: Ph.D., Middle East Technical University, Graduate School of Natural and Applied Sciences, Computer Education and Instructional Technology, Ankara, Turkey.
- 2009-2010: English Preparation Class, Middle East Technical University, Department of Basic English, Ankara, Turkey.
- 2007-2009: M.S., Gazi University, Institute of Educational Sciences, Computer Education and Instructional Technology, Ankara, Turkey.
- 2003-2007: B.S., Gazi University, Gazi Faculty of Education Computer Education and Instructional Technology, Ankara, Turkey.

### **Professional Experience:**

- March 2010-September 2015: Research Assistant, Middle East Technical University, Computer Education and Instructional Technology, Ankara, Turkey.
- August 2013-August 2014: Visiting Scholar, The University of Oklahoma Department of Educational Psychology and Technology, Norman, OK, USA
- March 2009-March 2010: Research Assistant, Middle East Technical University, Informatics Institute, Ankara, Turkey.
- March 2008-March 2009: IT Teacher, Ministry of National Education, Yozgat, Turkey.

- September 2007 – March 2008: IT Teacher & IT Specialist, Gazi University Foundation Private Schools, Ankara, Turkey.
- June 2006 – June 2007: Part-Time Content Expert, Gazi University, Informatics Institute, Ankara, Turkey.
- March 2006 – September 2007: Part-Time Web Designer, Gazi University, Computer Centre, Ankara, Turkey.

**Other skills: (e.g. Computer literacy, etc.):**

- Instructional design
- Design and Development of instructional materials
- Development and implementation of web based materials
- Human - computer interaction
- E-Learning
- Graphic design

**Publications:**

- **ISLIM, O. F.** (2009). The Effects of Scamper (Directed Brainstorming) Technique on Learners' Creative Problem Solving and Achievement in the Information and Communication Technologies Course. Unpublished Master Thesis.
- **ISLIM, O. F. & CAGILTAY, K.** (2011) Violence in Computer Games. Proceedings of 5th ICITS 2011 Conference, 22-24 September 2011, Elazig, Turkey.
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- **KAPLAN AKILLI, G., ISLIM, O. F. & SEVIM, N.** IT Teachers' Perception about Using Games in Education. Proceedings of ICERI 2011 Conference, 14-16 November 2011, Madrid, Spain.
- **SEVIM, N., KAPLAN AKILLI, G. & ISLIM, O. F.** (2012). The Perception Of Pre-service ICT Teachers about Using Digital Games in Educational Settings. Proceedings of EDULEARN12 Conference, 2nd-4th July 2012, Barcelona, Spain.
- **KAPLAN AKILLI, G., SEVIM, N., YILDIRIM, C., ISLIM, O. F. & DUMAN, M.** A Phenomenological Investigation of Preschoolers' Experiences in Reading an E-Book (2012). Proceedings of EDULEARN12 Conference, 2nd-4th July 2012, Barcelona, Spain.

- **ISLIM, O. F. & CAGILTAY, K.** (2012). Disability and Assistive Technology. Paper presented at 6th ICITS 2012 Conference, 4-6 October 2012, Gaziantep, Turkey.
- **SOLMAZ EVCIL, E. & ISLIM, O. F.** (2012). Kullanılabilirlik Kavramı ve Kullanılabilirlik Ölçümleri. Paper presented at 6th ICITS 2012 Conference, 4-6 October 2012, Gaziantep, Turkey.
- **ISLIM, O. F. & CAGILTAY, K.** (2013). ODTÜ Açık Ders Malzemeleri Sisteminin Etkililik Araştırması. Paper presented at AB2013 Conference, 23-25 January 2013, Antalya, Turkey.
- **ISLIM, O. F., SEVİM, N. & KAPLAN AKILLI, G.** BÖTE Öğrencilerinin Bölümlerine Yönelik Algısı: ODTÜ BÖTE Örneği Paper presented at 7<sup>th</sup> ICITS Conference, 6-8 June 2013, Erzurum, Turkey.
- **ISLIM, O. F. & CAGILTAY, K.** (2013). Eğitimde Mobil Cihazlar ile Anlık Geri Bildirim Sistemi presented at 7<sup>th</sup> ICITS Conference, 6-8 June 2013, Erzurum, Turkey.
- **CICEK, F., UGUR-ERDOGMUS, F., ISLIM, O. F., CAGILTAY, K., KAPLAN AKILLI, G., KARASU, N. & ÇAKIR, H.** (2013) Özel Eğitim İçin Yenilikçi Eğitim Teknolojileri: Uzman Görüşleri (Innovative Educational Technologies for Special Education: Expert Opinions). Paper presented at 1<sup>st</sup> ITTES Conference, 26-28 June 2013, Trabzon, Turkey.
- **CICEK, F., ISLIM, O. F., CAGILTAY, K. & CAPA AYDIN, Y.** (2013). Evaluation of a Mobile Phone Based Immediate Feedback System. Paper presented at AECT2013 Conference, Anaheim, CA, USA.
- **DEBACKER, T., GOLDMAN, J. & ISLIM, O. F.** (2014) Concept Mapping on iPads with Baiboard HD to Promote Student Learning. Paper Presented at SITE2014 Conference, Jacksonville, FL, USA
- **GUREL KOYBASI, N. A., CEVIK, R., ISLIM, O. F. & CAGILTAY, K.** (2014). Use of OpenCourseWare from the Viewpoint of Undergraduate Students: Case of OER for Physics Laboratory Experiments. Paper presented at OCWC Global 2014, Ljubljana, Slovenia.
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- **ESERYEL, D., ISLIM, O. F. & SANCHEZ, K.** (2014). A phenomenological investigation of instructional design students' experiences in digital storytelling. Paper presented at AECT2014, Jacksonville, FL, USA.
- **ISLIM, O. F. & CAGILTAY, K.** (2014). Effectiveness study of METU Open CourseWare. Paper presented at AECT2014, Jacksonville, FL, USA.