

USING MOBILE COMMUNICATION TOOLS IN WEB BASED INSTRUCTION

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Approval of the Graduate School of Natural and Applied Sciences

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## **ABSTRACT**

### USING MOBILE COMMUNICATION TOOLS IN WEB BASED INSTRUCTION

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This thesis investigates the perceptions of students about using mobile communication tools in web-based instruction. A mobile learning portal that can be used by different mobile devices was designed for this purpose. This portal included a mobile discussion forum and a course information system. Sixty undergraduate and five graduate students from METU/CEIT department used this portal as a supportive learning activity in three different courses throughout two-three, and four-week periods. The discussion subjects related to course content were created by instructors in these courses and students used this portal by sending messages or creating new subjects. Assignment results and announcements were inserted into the system by the instructors of these courses. A user evaluation instrument was developed by the researcher and validated by field experts. At the end of the study, perceptions of students were collected about mobile learning, mobile learning technologies and mobile

discussion forums by using this instrument. Descriptive statistics were calculated according to the responses of students.

The study results show that most of the students enjoyed using mobile technologies in education and they want to use mobile technologies in other courses. Although they like using mobile technologies, they did not increase the level of learning and motivation of the students much. Furthermore, mobile technologies did not increase the communication between students and between students and teachers despite their highly developed communication capabilities. Students could easily use the mobile technologies but small screen sizes and limited keypads hindered them from performing the operations. According to students, the cost of using mobile technologies is quite important whereas the data communication security is not important.

**Keywords:** mobile learning, m-learning, mobile education, mobile technologies, discussion forum

## ÖZ

### WEB TABANLI ÖĞRETİMDE MOBİL TEKNOLOJİLERİN KULLANILMASI

AVENOĞLU, Bilgin

Yüksek Lisans, Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü

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Bu tez öğrencilerin, web tabanlı öğretimde mobil teknolojilerin kullanılması ile ilgili algılarını araştırmaktadır. Bu amaçla, farklı tipte mobil cihazlar ile erişilebilen bir mobil öğrenme portalı geliştirilmiştir. Bu portal mobil bir tartışma listesi ile bir ders bilgi sisteminden oluşmaktadır. ODTÜ/BÖTE bölümünden altmış beş lisans ve beş lisansüstü öğrenci bu portalı üç farklı ders için yardımcı öğrenme aracı olarak iki, üç ve dört haftalık süreler boyunca kullandılar. Bu derslerde, tartışma konuları ders içeriğiyle ilişkili olarak dersin öğretim üyeleri tarafından oluşturuldu ve öğrenciler bu konulara mesajlar atarak ya da yeni konular açarak sistemi kullandılar. Ayrıca öğrenciler ders ile ilgili duyurulara ve ödev sonuçlarına bu sistemden ulaştılar. Kullanıcı değerlendirme anketi araştırmacı tarafından geliştirildi ve uzmanlar tarafından geçerliği kontrol edildi. Çalışmanın sonunda öğrencilerin, mobil öğrenme, mobil öğrenme teknolojileri ve mobil tartışma listeleri hakkındaki algıları toplandı. Öğrencilerin yanıtlarına göre betimleyici istatistikler çıkarıldı.

Toplanan sonuçlara göre öğrenciler mobil teknolojileri eğitimde kullanmaktan hoşlandılar ve diğer derslerde de mobil teknolojileri kullanmak istediler. Mobil teknolojileri kullanmayı sevmelerine rağmen öğrenciler bu teknolojilerin öğrenme düzeylerine çok fazla katkı yapmadığını ve motivasyon düzeylerini çok etkilemediğini düşünmektedirler. Ayrıca sonuçlar, asıl faydaları iletişimin artmasını sağlamak olan mobil teknolojilerin, öğrencilerin kendi aralarındaki ve öğrenciler ile öğretim üyeleri arasındaki iletişimi yeteri kadar artırmadığını ortaya koydu. Öğrenciler mobil teknolojileri kullanmakta zorlanmadılar fakat yine de mobil cihazların ekranlarının küçük olması ve küçük tuş takımları işlemleri yapmalarını zorlaştırdı. Sonuçlar öğrencilerin mobil cihazları kullanma maliyetine çok önem verdiklerini fakat veri iletişim güvenliğine çok önem vermediklerini de ortaya çıkardı.

**Anahtar Kelimeler:** mobil öğrenme, m-öğrenme, mobil eğitim, mobil teknolojiler, tartışma listesi

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## **CHAPTER 1**

### **1 INTRODUCTION**

The use of information and communication technology has been growing since the invention of computers and internet. These technologies enable students to learn independent of time and location. However, learners need computer and internet access to acquire knowledge. Most of the time carrying a computer and finding an internet access point are the major constraints for learners (Kurbel, 2002). Mobile communication technologies can support such situations and they can prepare more flexible learning environments for learners.

Development of time and location-bound education can be seen in four levels. In traditional formal education as the first level, teacher and students had to be physically in the same classroom setting. Face to face interaction was the major communication way between teacher and students. By distance education as the second level, with the development of communication and transportation technologies in the industrial age, teacher and students were separated by space and time. Communication was done between teacher and students by using traditional mail, phone, radio and television. Electronic revolution and the invention of internet lead to e-learning that has become the third level. Since then different types of media like text, audio, video, hypertext and simulations and two-way communication have being used commonly in education. The new era m-Learning or mobile learning that constitute the fourth level in the education is beginning with the use of mobile communication tools like Palm, Pocket PC and Cellular Phone recently. According to Dye (2003), "m-Learning is learning that can take place anytime, anywhere with the help of a mobile computer device. The device must be capable of presenting learning content and providing wireless two-way communication between teacher(s) and



student(s).” (p. 4). Sariola (2001) indicates that “Characteristic of mobile learning is the opportunity to break away from teaching that takes place in a classroom, and to move to another location via information networks. Another distinctive feature of mobile learning is that it enables learners to enter an information network at the precise moment when it is necessary by using a portable learning device and a wireless network” (p. 2).

The general purpose of this study is to find out the perceptions of students towards using mobile communication tools as supportive learning activities in a course. In this study, a mobile learning portal was used to determine the perceptions of students. This portal includes an asynchronous discussion forum and a course information service.

### **1.1 Background of the Problem**

The use of mobile phones in everyday life has reached tremendous level. Statistics show that, at March 2004, 1.050.400.000 people had mobile phones all over the world and this number will increase to 1.108.200.000 at June 2006 (GSM World, 2004). In Turkey approximately 27 million people have mobile telephones by end of 2003 (ITU, 2004). Most of the people use these phones for communication with others. In reality these devices have more capability than only audio communication. Major phone vendors like Motorola, Ericsson and Nokia have agreed to support internet access by different technologies (especially WAP). According to Jo et al. (2002) that probably 484 million people will be accessing the Internet via mobile devices by 2005 (as cited in Grumet, 2000). Liotto (2004) shows a graphic about voice and data communication. This graphic shows that voice communication will reach a saturation level at 2010. On the contrary video and data communication will comprise % 70-80 of all mobile communication at 2010. Mobile phones are not the only mobile devices that have small physical characteristics and communication capability. Handheld

computers like Palms and Pocket PCs have more capabilities than mobile phones. Millions of people have been using handheld computers all over the world. 4.4 million Palm devices, 1.6 million Hewlett Packard PDAs and 1.3 million Sony PDAs sold by 2002 (Kavurmacı, 2003). The use of handheld computers is limited in Turkey comparing to Europe and USA. There are not so many projects about using mobile devices for educational purposes in Turkey. Although limited usage for now, probably we will start using these devices within several years. Conversely, many projects have been implemented for the past five years in Europe and USA. These projects have been trying to use mobile devices in education. These projects show that mobile devices can be used for different purposes: communication with teacher and students (Lim and Lee, 2002, Seppala and Alamaki, 2003), taking whole course from distance (Giunta, 2002, Roberts et al., 2003), reading and accessing course materials (Waycott, 2002, Meisenberger and Nischelwitzer, 2004), taking quizzes and exams (Homan, 2003, Whattananarong, 2004), playing learning games (Ketamo, 2002), using in outdoor activities (Rieger and Gay, 2004), using different activity programs in classroom (Tatar et al., 2003), managing lessons, tracking students' records, online registration for courses. According to results of these projects, using mobile devices increase attendance to courses, collaboration between students, communication between teachers and students, study time for students by increasing the flexibility of time and location. Increasing usage of mobile devices and the results of the projects show that mobile devices can bring new opportunities to education and there is need to develop some applications and implement them in real environments.

## **1.2 Purpose of the Study**

Rapid development of mobile technology exposes some opportunities for education. Beside opportunities, this rapid development shows that working situations of students and teachers, institutional investments on technology, type and content of courses, administrative issues of institutions will be effected and changed within the short time. Most people use mobile phones in daily life. These mobile devices will be used in education and they will change situations and environments. Requirements of mobile communication tools for different educational environments, the type of usage for teachers and students, hardware and software standards of mobile communication tools and advantages /disadvantages of these devices are uncertain today. We do not know anything about whether these devices can be used in education or not.

At the beginning it is obvious that we should develop some mobile projects to see the advantages and disadvantages of mobile devices in education. Clearly, there is a need to determine how students think about using mobile technology as a supportive learning material and information services.

## **1.3 Significance of the Study**

One important reason for this study is that this is one of the first research studies done about mobile learning in Turkey. Beside this, mobile portal that was developed for this research is one of the first mobile educational applications in Turkey.

It is obvious that mobile learning will contribute towards better student results, rapid access to information and anytime, anywhere learning. These properties show that mobile learning will be of public interest in the near future.

Using mobile communication tools will effect institutions, learners and their families' economy. Mobile communication tools cheaper than PCs and

there is no need for cables (network) to work with them. Investments and expenditures will decrease by mobile learning.

This study will also provide administrators with information on how and where to invest for mobile technology. Perceptions of students about mobile education can give some cues about mobile software and hardware requirements.

#### **1.4 Statement of the Problem and Research Questions**

The general purpose of this study is to explore the perceptions of students about using mobile communication tools in web-based instruction. Further, this study will include development of a mobile portal, selection of appropriate tools for this software and implementation of this portal with students. The main research question and sub questions are:

What are the perceptions of students about using mobile communication tools in web-based instruction?

1. What are the perceptions of students about mobile learning?
2. What are the perceptions of students about mobile learning technologies?
3. What are the perceptions of students about mobile discussion forums?

#### **1.5 Assumptions**

For this study, the following assumptions are proposed:

1. Participants are not experienced users about mobile communication tools for accessing the internet yet.
2. Mobile device simulators that were used in this study, accurately represent real mobile devices.
3. The participants will respond accurately to all questions.

4. The measures employed are reliable and valid indicators of the constructs to be studied.
5. The data was accurately recorded and analyzed.
6. The research, data gathering, and findings and conclusions of the study represent “good research.”
7. It was assumed that the research methodology was appropriate to find the solutions.

### **1.6 Limitations**

This study is limited to subjects who agree to participate voluntarily. Validity of this study is limited to the reliability of the instruments used, and the honesty of the subjects' responses to the instruments. Limited amount and type of mobile devices were used in this study. The effects of the advantages and disadvantages of these devices on the results should not be generalized to other devices. The results can be generalized to devices only which have similar characteristics with the devices that were used in this study. Many students were used mobile device simulators because they do not have mobile devices or mobile network access. These simulators can be used on desktop computers by mouse pointer. This can not completely represent the real characteristics of mobile devices.

The participants in this study were selected from three different courses and the researcher was not the instructor of these courses. This may affect the perceptions of students because if the researcher was the instructor, the motivation of students towards class activities would be higher.

## 1.7 Definitions of Terms

*BöteMobile*: Mobile learning portal that was developed during this study was named as ***BöteMobile***. This mobile learning portal can be accessible through mobile phones, handheld devices, tablet PCs and personal computers by using internet connection. This portal mainly includes a mobile discussion forum and a course information system.

*m-Learning*: m-Learning is learning that can take place anytime, anywhere with the help of a mobile computer device (Dye, 2003).

*GSM (Global System for Mobile Communications)*: The most widely used communication protocol. GSM is used generally for mobile telephone calls. GSM enables 9.6 Kbps data transfer rate.

*GPRS (General Packet Radio Service)*: GPRS allows users to be connected to the network at all times. GPRS transfer rate is between 30 and 100 Kbps and only the traffic generated by the user is billed.

*Bluetooth*: Bluetooth wireless technology is a short-range radio technology. Bluetooth makes it possible to transmit signals over short distances between telephones, computers and other devices and thereby simplify communication and synchronization between devices (Georgiev et al., 2004).

*UMTS (Universal Mobile Telecommunications System)*: UMTS is known as third generation mobile communication system. This technology is capable of data transfer speed up to 2 Mbps. This speed is appropriate for different media like animations and videos.

*SMS (Short Messaging System):* Short Message Service is a feature available with some wireless phones that allow users to send and/or receive short alphanumeric messages (Martin, 2000).

*MMS (Multimedia Messaging System):* MMS is used for sending pictures or music files.

*WAP (Wireless Application Protocol):* WAP is the first global standard for internet services over mobile phone networks. It is capable of displaying “mini websites”.

*Pocket PC:* Pocket PC term is used for Windows CE or Windows Mobile operating system based handheld computers. These devices have same capabilities with Palm based handheld computers.

*Palm:* Palm term is used for Palm operating system based handheld computers.

*PDA (Personal Digital Assistant):* PDA term is used for small handheld computers that have Palm, Pocket PC, Windows Mobile or Symbian operating systems. These devices have processors up to 400 MHz and they have RAM and ROM memories, small screen and keyboards. Most of them have office applications and internet browsing capabilities.

## **1.8 Thesis Outline**

Chapter 1 of this thesis is presented the introduction, the statement of the problem, the purpose of the study, the questions to be answered, the significance of the study, the definitions of terms, the assumptions, limitations and organization of the study.

Chapter 2 is a review of recent literature and includes results of researches and projects related to mobile learning.

Chapter 3 presents the structure of the mobile learning portal and its development processes, the methodology used in the study, including a description and rationale of the sample, the data collection procedures, a description of instrument development, and the methods of analysis of the data.

Chapter 4 shows the results and statistics about statements in the instrument used in this study.

Chapter 5 discusses the results of the statements and makes some comparisons with other studies.

Chapter 6 draws some conclusions according to results of the study and makes some recommendations for further researches.



## **CHAPTER 2**

### **2 LITERATURE REVIEW**

The extensive development in mobile communication tools over the past five years is slowly being integrated into education. Mobile devices with adequate properties are ubiquitous today. They have low prices, good communication capabilities, enough processor speeds and also appropriate physical characteristics for reading, writing and navigating the web. The main concern with the mobile communication tools is to determine appropriate characteristics for education and implement real projects. In the near future institutions will not make big investments for big PC labs and networking. Students will access information independent of time and location. These advancements will change the working situations of people in the education. Most of the people in education unable to use mobile communication tools up to now and this will be disadvantage for both people and institutions.

The purpose of this chapter is to review the research literature to explore the ways that mobile communication tools can be used in education. Current research projects implemented in real situations will be examined.

#### **2.1 Distance Learning**

The terms “Distance Education” and “Distance Learning” are used interchangeably in books or in other media (Sherry, 1996). Keegan (2005) quotes shorter definitions of these terms from the glossary of distance education terms of The World Bank web site:

Distance education: Teaching and learning in which learning normally occurs in a different place from teaching.

Distance learning: Term often used as synonymous with distance education, not strictly correctly since distance education includes teaching as well as learning.

Stortingsmelding (1988-89, cited in Dye, 2003) gives a detailed definition of distance learning: "Distance education is education where teacher and pupils/students are separated by space and/or time. Technical media are used to impart knowledge and to make possible real to-way-communication, in support of the process of teaching..." (p.1)

## **2.2 E-Learning**

E-Learning is defined by the Open and Distance Learning Quality Council (2005) in the UK as "E-Learning is the effective learning process created by combining digitally delivered content with (learning) support and services." Kenya Education Network (2005) gives important words about this definition:

- effective - learning that succeeds
  - combining - the combination of ICTs and pedagogy makes the difference (some call it blended learning)
  - digitally delivered content - content delivered electronically by CDs, cell phones, the computer, and the Internet
  - support - support provided by tutors, facilitators or course coordinators
- Paulsen et. al. (2002) gives the properties of online education:

"Online education is characterized by:

- The separation of teachers and learners which distinguishes it from face-to-face education
- The influence of an educational organization which distinguishes it from self-study and private tutoring
- The use of a computer network to present or distribute some educational content

- The provision of two-way communication via a computer network so that students may benefit from communication with each other, teachers, and staff.”(p.23)

### **2.3 Web-based Instruction**

Khan (1997, cited in Kavaklı, 2004) defines the Web-based Instruction as "...a hypermedia-based instructional program which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported” (p.9). Relan and Gillami also (1997, cited in Henke, 2005) define WBI as: "...the application of a repertoire of cognitively oriented instructional strategies within a constructivist and collaborative learning environment, utilizing the attributes and resources of the World Wide Web."

Web-based Instruction has some advantages when compared to traditional instructor-led training (Kruse, 2005):

- Access is available anytime, anywhere, around the globe.
- Per-student equipment costs are affordable.
- Student tracking is made easy.
- Possible "learning object" architecture supports on demand, personalized learning.
- Content is easily updated.

### **2.4 Computer Mediated Communication**

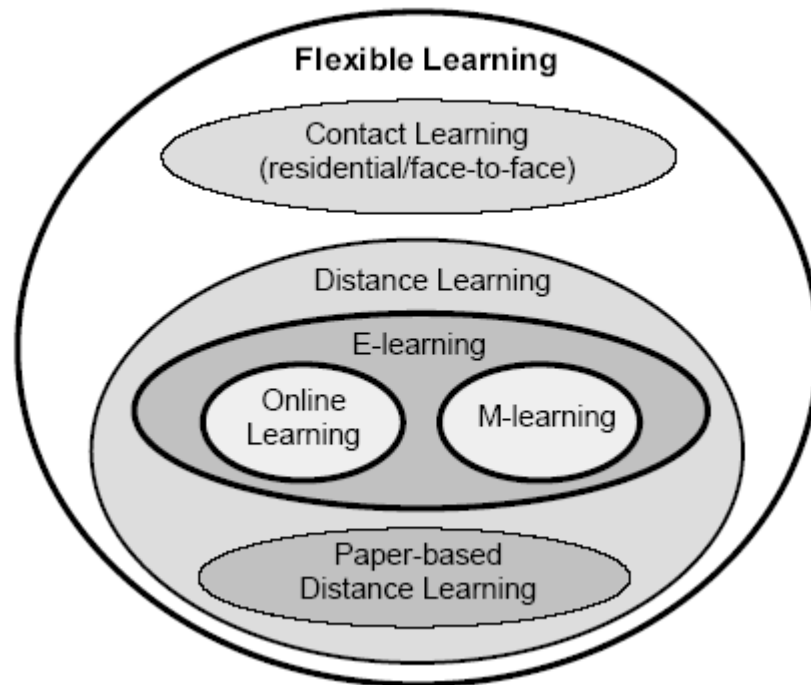
Ebbelink (2005) defines computer-mediated communication as “Computer-mediated communication is the exchange of information between persons by way of computer networks, this can be all kinds of information, for example text, images, audio, and video. The exchange of information can be

real time communication or synchronous, this means that people are communicating with each other at the same time. An other form of communication is asynchronous, this means that people are communicating at different times. They can send and receive their messages at any time they want.”

There are some systems that can be used for computer-mediated communication: E-mail, World Wide Web (WWW), Newsgroups, Computer Conferencing, Audio Conferencing, Video Conferencing, Voice Mail Systems and IRC. These systems support texts, graphics, images, audio and video as mediums for communication.

## **2.5 Mobile Learning**

Mobile learning is generally defined as e-learning through mobile devices (Trifanova and Ronchetti, 2003). Users have to find a personal computer with internet access to learn something in e-learning. This is not a completely anytime anywhere learning (Meisenberger and Nischelwitzer, 2004). According to Brown (2003) “Mobile technologies have the power to make learning even more widely available and accessible than we are used to in existing e-learning environments” (p.1). He proposes Figure 1 as a diagram of flexible learning.



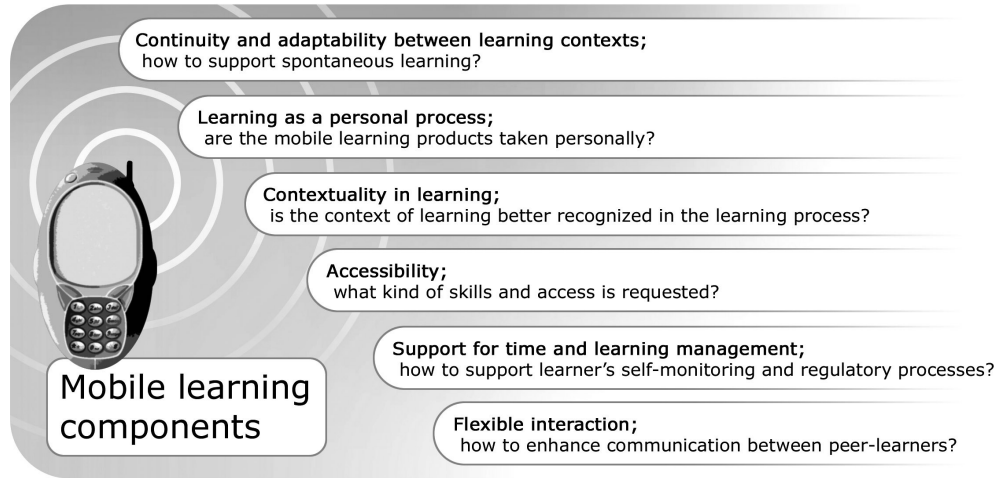
**Figure 1:** The subsets of flexible learning (Source: Brown, 2003)

This diagram shows that m-learning is a subset of e-learning and e-learning is a subset of distance learning. Even though this assumption is generally true, learning modes have superior characteristics with respect to others. For example, m-learning provides location awareness applications to learners (Trifanova and Ronchetti, 2003) but it is very hard to distribute course content to mobile devices.

Since m-learning is a new concept, components of it have just investigated by few researchers. Leung and Chan (2003) say that mobile learning framework includes four levels:

- Mobile learning applications,
- Mobile user infrastructure (browser, handheld devices, mobile phones),
- Mobile protocol (adoption of content with WAP or other protocols),
- Mobile network infrastructure (cellular systems, satellites, etc.) (p.1)

This framework shows the components of m-learning by looking from technical perspective. Beside this, Pehkonen and Turunen (2003) propose m-learning components for designing learning actions and materials (Figure 2).



**Figure 2:** Mobile Learning Components (Source: Pehkonen and Turunen, 2003)

Many researchers (Strauss, 2004; Robson, 2004) believe that mobile technologies bring new opportunities to traditional learning in the classrooms and lifelong learning outside the classrooms. Berger (2001) lists the implications that mobile technology can bring to teaching and learning:

- Better realization of “anywhere, anytime”,
- Freedom of organization in and out of the classroom,
- Collaboration among students separated geographically,
- Transparent connection to nets,
- Remote sensing and integration of information,
- Shift from “anywhere, anytime” to “everywhere, everytime” (p.58).

According to Singh (2003), mobile learning is a paradigm shift and it changes existing situations in learning:

**From desktop to PDAs:** The mobile user interface needs to move from a ubiquitous and uniform Web browser to a more personal and context-sensitive

experience. From just-in-time to real-time. Just-in-time means learners can access what they need when they need it. The new paradigm is more proactive and pushes information to people.

**From courseware to performance-ware:** The stand-alone learning content model needs to transform to a context-driven, task-sensitive, performance-support model. Examples include guided tasks, instructions, job-aids, and reference-ware. In addition, standards need to be defined to interchange performance-objects, which are delivered within the context of a job-task, with leaning-objects, which focus on modular course content.

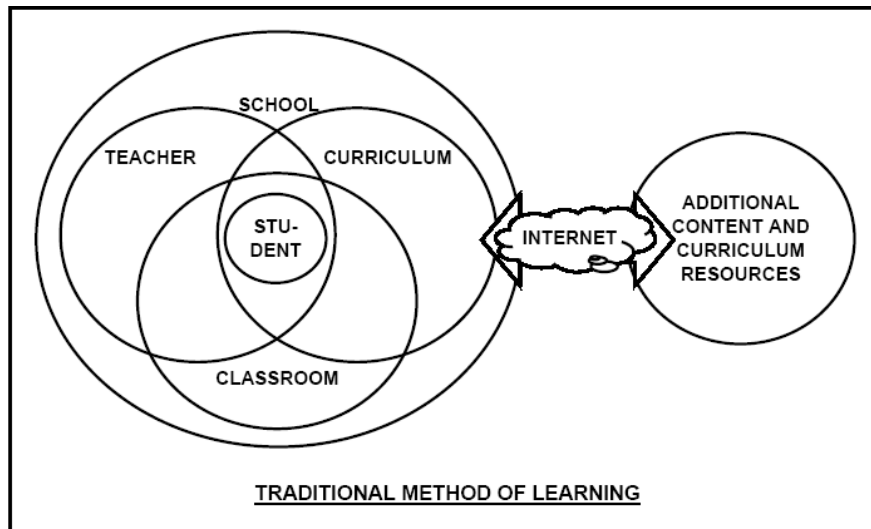
**From course management to business workflow:** Business workflow and processes become the delivery platform for mobile learning and performance support.

**From instructional design to performance-based design:** Compiling content and courses transforms into job, task, activity, and business application context analysis. This links workflow to granular content.

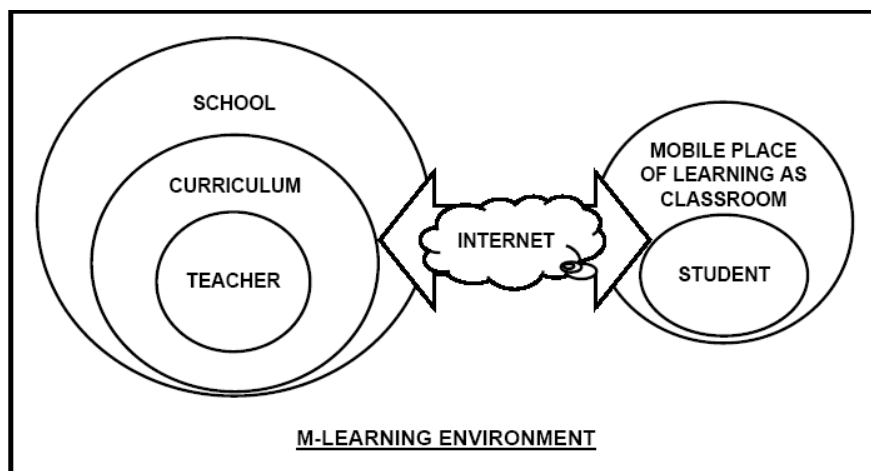
**From mouse-and-click to pen-and-voice interface:** New forms of interactivity include small or non-existent keyboard interfaces. In the future, pen-based handwriting-recognition and voice-recognition tools to capture and access information will become the norm.

**From centralized server to peer-to-peer networks:** Peer-to-Peer networks facilitate communication, collaboration, and resource sharing at the edge of the Internet--compared to the traditional client/server networking model (p.1-2).

It is obvious that mobile learning will change the concept of traditional learning environment and both student-student and student-teacher relationship. Sharma and Kitchens (2004) present these changes that are presented in Figure 3 and 4 below.



**Figure 3:** Traditional Method of Learning (Source: Sharma and Kitchens, 2004)



**Figure 4:** M-Learning Environment (Source: Sharma and Kitchens, 2004)

There are many studies that show the distinct features of mobile devices for education. Attawell (2003; quoted from Smith and Kenth, 2003) say that handheld computers assist students' motivation, help organizational skills, encourage a sense of responsibility, help support both independent and



collaborative learning, act as reference tools, track students' progress and deliver assessment. Milrad (2004) explains the number of features that mobile technologies have for education:

- **Portability:** One can take the computer to different sites and move around within a site. Mobile and wireless applications enable ubiquitous learning. The bounds of the classroom can now be extended to the limits of wireless networks.
- **Social interactivity:** As mobile and wireless technologies enable peer-to-peer communication, students will have a way to interact directly with one another. Students can exchange data and collaborate with other people face to face.
- **Individuality:** Can provide unique scaffolding that is customized to the individual's path of investigation.
- **Context sensitivity:** Digital systems provide the ability to automatically log and aggregate usage, which can be used to design collaborative filtering systems, predictive user interfaces, etc. in the design of mobile applications.
- **Connectivity:** Can connect handhelds to data collection devices, other handhelds, and to a common network that creates a true-shared environment
- **Merging digital and physical realms:** In stationary settings, the digital and physical worlds are more or less separated (users "look into" and manipulate the digital world on the computer screen). In contrast, in mobile systems these realms may be combined. Sensors, smart rooms and ambient environments capture real-world information of users and devices and represent it in a format that is usable in the digital realm. Geographical information systems (GIS) are building on these and other properties to create many other new and innovative applications. (pp.155-156)

Beside the new features and opportunities there are some limitations of mobile technologies. McLean (2003) identifies the obstacles in mobile learning:

- Limited memory and storage are major inhibitors.
- Screens are generally too small for the use of any sophisticated applications.
- Intermittent connectivity is a major barrier.
- Cross-platform solutions are not yet possible.
- Links to learning management systems or enterprise systems are in an embryonic stage of development.
- The industry is plagued by proprietary solutions.
- Transmitting across different browsers and platforms is almost impossible.
- Existing applications are not easily integrated to the mobile technology environment.
- Start-up costs are invariably high.
- Tracking outcomes is difficult.
- Security is a major issue.
- Cost of accessing major third-party networks is punitive.
- Multiple permissions are necessary in terms of negotiated access.
- Continuous technology development militates against stability and sustainability in terms of mounting viable m-learning applications. (p.6)

Kurbel and Hilker (2002) investigate characteristics of mobile communication with respect to e-learning and m-learning platforms. They analyze the four major areas supported by e-learning platforms with regard to features that can reasonably be enhanced by providing access through mobile devices. They illustrate displaying learning content on WAP/UMTS based devices. According to Kurbel and Hilker mobile learning platform can support all four primary areas of course management: administration, content, communication and assessment. Kurbel and Hilker say that retrieving content

through mobile devices is particularly interesting for mobile students. Because of the low bandwidth today audio-based lectures can be offered for first step. Also because of the small screens and data communication speed, texts and figures can be used in WAP based mobile devices. They say that the next step is video based lectures. These types of lectures require bandwidth and transmission speed that will become available with UMTS in the near future. Kurbel and Hilker say that for communication in m-learning, text-based tools like chat tools and SMS messages are only of limited utility, because text-input in these devices is not user friendly. Communication tools like e-mail and discussion forums can be mobilized, yet data input facilities are again a limiting factor. Authors suggested that developing a discussion forum using voice messages for asynchronous communication on a mobile platform is a challenging task. Kurbel and Hilker say that like other platforms an m-learning platform needs some administrative components like login, registration for course, checking authorizations, etc. Kurbel and Hilker say that assessment features are also candidates for mobile access. True/false, multiple choice and audio-based testing may be quite comfortable for mobile learning except open-ended question because of the user unfriendly of text-input.

Learning and Skills Development Agency in United Kingdom conducted a survey from December 2001 through January 2002 (Attewell and Smith, 2003) with young adults (16-24) to find the answers for the following questions:

- How young adults use their mobile phones,
- What the future take-up of new services and facilities on mobile phones and other technology devices might be,
- Whether mobile phones were likely to be used beyond a short-term fad,
- Whether young adults would be willing to use their phones for literacy and numeracy learning.

According to results of 746 completed questionnaires, young adults generally used their phones for telephone calls, text messaging and playing

games. Most wanted mobile phone functionalities are music and radio. Most of the young adults want to purchase a PDA, but they concern about their cost. Young adults like to use mobile phones and half of them want to play mobile phone games to improve their spelling, reading and math skills.

## 2.6 Mobile Devices

Trifanova et. al. (2003) say that “In general by mobile device we mean PDAs and digital cell phones, but more generally we might think of any device that is small, autonomous and unobtrusive enough to accompany us in every moment and can be used for educational purposes.” (p.1). The main types of mobile devices currently in the market are Palm based devices, Pocket PC based devices and Symbian based mobile phones. Recent advancement in the market is smart phones which are produced by merging PDA’s and mobile phones (Robson, 2004). Mobile devices have some benefits for education (Jo et. al., 2002):

- **Portability and mobility:** because of the small size and lightweight of wireless devices, students find them convenient to use and carry with them.
- **Flexibility:** students and educators can access the server from almost anywhere (AT/AP). This includes while traveling or waiting in a queue.
- **Convenience:** Whenever students need to contact teachers or urgently need information from the Internet, remote access is available to them. In particular, accessing the server through WAP is very fast (just a few seconds), compared with connecting the network using a modem.
- **Remote Accessibility:** Students can add or update information remotely.
- **Ease of use:** Using a PDA provides a larger screen than a mobile phone only. Also, it is convenient for user input.

- **Utility:** A PDA provides some of the capabilities of a standard computer, such as processing and storing data (p.4).

Many studies show that mobile phones have some restrictions for using in education. Meisenberger and Nischelwitzer (2004) define these restrictions:

- The limited processing power and resources,
- The variety of screen sizes and the general low resolution of the display,
- The variety of different input possibilities,
- The variety of different operating systems.(p.2)

Tatar et. al. (2003) implemented a study in K12 schools to evaluate the use of handheld technology for education in collaboration with Palm Inc. Students used graphic and animation programs in math and science courses. Students used Match-My-Graph and Slot Machine applications to draw graphical representations of mathematical functions. Students also used Sketchy program to produce animations. The teachers in the study reported that using Palms contribute positively to students' learning (very much %72). Teachers agree (%84) that using handhelds improve the quality of learning activities.

Selecting the appropriate mobile devices for educational purposes affects the quality of learning. According to Singh (2003) the factors below should be taken into account when selecting a mobile device:

- Cost,
- Battery life,
- Display size,
- Data input,
- Form factor,
- Processing power,
- Storage capacity,
- Communications options,
- Security,
- Application development tools,

- IT supports.(p.3)

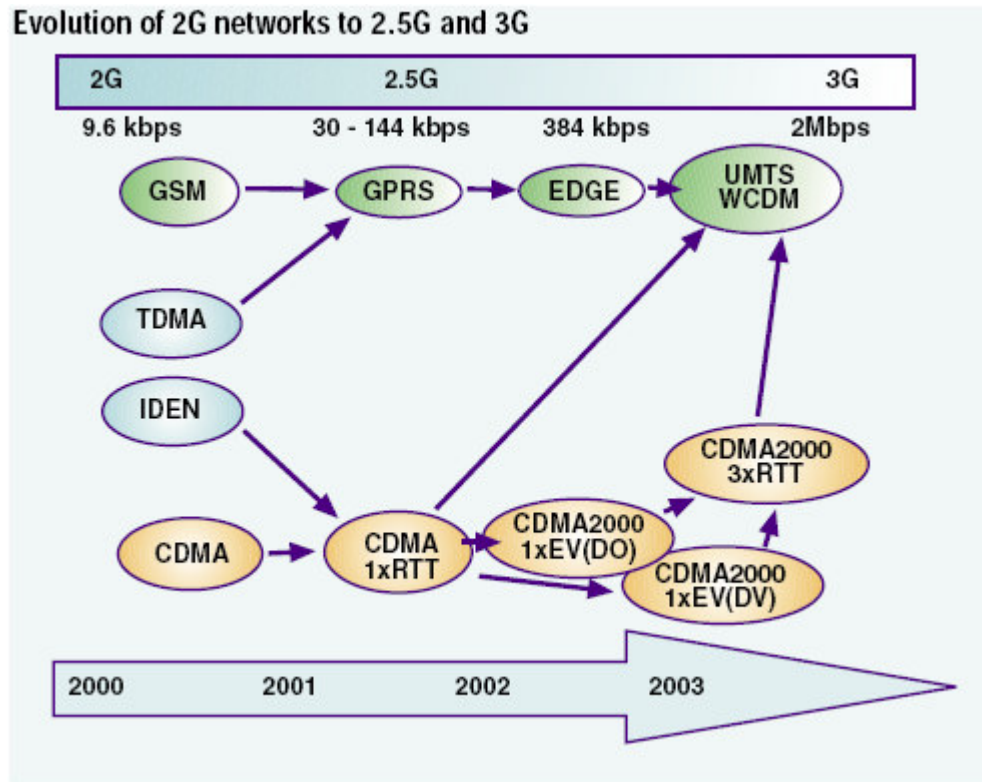
Bulun et. al. (2004) says that we can investigate the mobile devices in four main categories and they provide a table that compares these categories (Table 1).

**Table 1:** Comparison of Mobile Devices That Can Be Used for Mobile Education  
(Source: Bulun et. al., 2004)

Type of Device	Weight	Capability	Battery Life	Penetration
Mobile Phone	60-120 g	*	****	****
Handheld PC	90-200 g	**	***	**
Tablet PC	80-1200 g	***	**	*
Notebook	1500-400 g	****	**	***

## 2.7 Mobile Networking

One of the main components of mobile learning is wireless networking. Being wireless, give students the opportunity to learn from anywhere not only in front of the computers or in classrooms. There are different technologies for being wireless and bandwidth and speed rates of these technologies affects the types of applications in mobile learning. GSM/GPRS networks and Wi-Fi networks are most common communication technologies today. Singh (2003) says that “Wi-Fi is the faster wireless standard and is gaining momentum as airports, hotels, malls and coffee start to install Wi-Fi hotspots.”(p.3). CDMA and UMTS networks are future networks that allow high connection speed. Figure 5 shows the different networks and bandwidth rates.



**Figure 5:** Evolution of 2G networks to 2.5G and 3G (Source: IBM, 2001)

Beside these technologies, there are other device-to-device technologies. IR (Infra-red) and Bluetooth technologies are device-to-device technologies that can be used for data communication within short distances.

Mobile learning applications must take into account the speed rate of the networks. Some networks allow the simulations or videos but some others allow only voice communication or text-based messaging. Figure 6 shows the services provided by different networks.

Examples of Data Services for 2G, 2.5G and 3G networks			
Services	2G	2.5G	3G
e-mail	Short Messages (SMS)	Text-based with small attachments	Full Attachments
Instant Messaging	Short Messages (SMS)	Text-based	With Audio/Video Clips
Web Browsing	Short Text Screens	100KB Web (text+image) page takes approx. 30 seconds to download	100KB Web page takes approx. 2 seconds to download
Streaming Audio/Video	No	Short clips	Yes
VoIP	No	Limited	Yes
File Transfers	No	500KB document takes approx. 2 mn to download	500KB document takes approx. 10 seconds to download
Access to Corporate Applications	Very limited	Text-based	Yes
Access to corporate intranet, Databases	Very limited	Text-based	Yes
Location-based Services	No	Limited	Yes

**Figure 6:** Examples of Data Services for 2G, 2.5G and 3G Networks  
(Source: IBM, 2001)

## 2.8 Mobile Applications

Mobile learning provides different applications to students and teachers. Jones et. al.(2002) say that “Using wireless technology, students will be able to view and download outlines of web-lectures, check assignment deadlines and class schedule changes, perhaps even submit work via email. Other tasks include organization of students’ personal timetables (not unlike using a Personal Information Manager or PIM), communication with student



administration, communication with lecturers and tutors through SMS (short message service) and email. Interaction is important. It is certainly possible to maintain student-to-student and student-to-lecturer interaction in a wireless e-learning environment.” (p.3)

Main mobile learning application development environments are Java Micro Edition and Microsoft.NET Compact Framework. Most mobile phones support Java in the market. Some smart phones and Pocket PC based devices support Microsoft.NET Compact Framework. Scripting languages such as WML, XHTML and cHTML can be used for developing browser based applications.

Meisenberger (2004) developed a Java based application which is Mobile Learning Engine (MLE). MLE is a computer-aided and multimedia-based learning application created for mobile phones. MLE presents learning objects written in XML, an open and international standard. Learning objects can be defined by teachers and tutors and they can be used without connecting to server after downloading the phone. MLE supports interactive questions, intelligent help and audio and video playing.

Waycott (2002) evaluates the use of PDAs as tools for reading course materials on a distance education course. In her research, masters' students on an Open University course were supplied with Palm m105 PDAs to access and read course materials. Students' perceptions of this experience were evaluated using questionnaires and interviews. The results of this research suggest that the integration of a new tool into existing activities is a two-way process. PDAs introduce new possibilities and constraints to the activity. Socio-cultural factors like user's personal preferences for device characteristics, past experience and the time available to learn to use the new tool affect the success with which the new tool is integrated into an activity. Waycott says that the relationship between the new tool and existing tools is also important. If the PDA complements rather than conflicts with existing tools, it is more likely to be successfully adopted.

Giunta (2003) from Research Unit of University of Roma investigated student use of mobile learning in Italy in project supported by the “Leonardo da Vinci programme of the European Union”. In this research, answers of the 17 students of the fourth and fifth year of the degree in Electronic Engineering were analyzed. Students were provided by SIM cards for GPRS usage. All students used their mobile telephones with these SIM cards and they read a technical course on the WAP topic. Students filled Likert type instruments. Results show that this mobile learning experience is not particularly fun (only 18%) and, according to the students’ experience, not encouraging to take another mobile learning course (70% negative report). As a consequence, mobile learning cannot be recommended as a method of study to others for the 65% of students. Most of students perform the study of the mobile learning course at their home (70%). Three main results emerged from this study. First, Ericsson’s mobile terminal emulator for standard internet connection resulted too difficult to be installed and masked the students’ opinion on the WAP course. Second, students referred that the displays of the GPRS mobile phones are too small to effectively look at the WAP course. Third, WAP course is quite interesting for the students.

Ketamo (2002) investigated developing a geometry learning game for handheld devices that adapts to the user’s behavior. This study included two stages. In the first stage two experimental groups and a control group used PC based geometry game. In the second stage, adaptive learning game was implemented for Compaq iPaq handheld computer and another experimental group used this game. This experimental group was compared with the groups in the first stage. All students in groups are six years old pre-school pupils. In the game users were asked to find and mark the required polygon. According to results researcher says that handheld computers with a touch screen are likely to be faster to use than PC’s with a mouse. The most important result is that all

low skilled pupils reached the level of the group. Researcher suggests that handheld computers need improvement on the user interface.

## **2.9 Mobile Messaging**

Mobile learning supports messaging applications for students and teachers. It allows communication and interaction both synchronous and asynchronous (Brown, 2003). Communication and interaction are the main characteristics of contemporary constructivist paradigm. Attawell and Smith (2003) say that “The role of phone calls and messaging in friendship rituals such as gift giving and sharing (Taylor and Harper, 2002; Bauman, 2003) suggests the mobile phone has potential as a collaborative learning platform.” (p.4)

SMS is widely used for text messaging to send short messages (160 characters) within short time in daily life (Stone et. al., 2001). According to statistics SMS is already used more than e-mail in Europe (Brown, 2003). The latest developments in technology allow sending video, audio and images through MMS (Brown, 2003).

Houser et. al. (2002) investigated using mobile phone messages for vocabulary acquisition. In this research vocabulary lessons including contexts, examples –less than 100 words- were sent to mobile phones in space intervals to facilitate learning. Houser et. al. (2002) investigated usability in the first phase. Results show that: 88% of volunteers studied the lessons every day. Half the students orally practiced their new vocabulary, and 75% mentally reviewed. Students enjoyed this method and they liked the brevity and informal writing style. In the second phase Houser et. al. (2002) investigated the contributions of this method to learning. In this phase three students groups were investigated by pre-test and post-test scores on vocabulary lesson messages. Results show that SMS lessons significantly promote learning. Also results show that students receiving SMS lessons learned significantly more words than students studying

the same material via mobile phone web and paper. %75 of the students said that they preferred mobile phones to PCs. The question of “Is this a valuable teaching method?” was responded by %65 of the students as positive and by %28 of students as somewhat. %89 of students said that they wished to continue learning on their phones.

## **2.10 Mobile Discussion Forums**

Web based discussion forums “... are used by learners to discuss topics related to courseware, their current learning task or the learning project they are working on” (Helic et. al., 2002, p.1). Discussion forums allow asynchronous communication between both student-student and teacher-student. Asynchronous communication allows participants to share their ideas independent of time and analyze and reflect their ideas before sending to forum (Sheard et. al. 2003). Discussion forums encourage students to actively participate to learning process and enables collaboration between students. Akers say (1997) that, “students can interpret and analyze others’ writings, reflect on their knowledge and readings, present their points of view and provide pointers to information that support their ideas” (p.2). These properties support the view of constructivism.

Helic et. al. (2002) says that discussion forums are widely used by learning communities because of the simple and intuitive nature of the forum applications. They say that one of the important problems with discussion forums is information retrieval. They propose that semantic modeling can be a solution for this problem. Ontology and Taxonomy are two models of semantic modeling. Taxonomy is the hierarchy of subjects and sub-subjects.

Hill (2002) claims that there are two important restrictions with discussion forums:

1. Discussion groups can be accessible only via personal computers (PC's)

2. Participants have to enter the discussion site to check for new activity.  
(p.1)

These restrictions can be overcome by using mobile technologies. Engaging from anywhere and anytime by using mobile devices can make the discussion forums active and SMS functionality can solve the checking the discussion forum site problem.

Lim and Lee (2002) conducted a research at National Institute of Education in Singapore. A WAP and web enable discussion forum site was used by 20 students. They identified four key findings in this study:

- There are technical and physical constraints of WAP technology that may be addressed by its complementary use with web technology and the role adopted by the instructor.
- WAP technology complements web technology to mediate e-discussion in a learning community.
- Pivotal role taken by the instructor to facilitate e-discussion
- The language used in WAP-based forum is unique. It is not a feature in formal writing nor does it resemble the messages found in the web-based forum. (p.4)

### **2.11 Mobile Usability**

The key problem with mobile devices is usability. Mobile devices have small screens, small keypads and the technology for speech recognition is insufficient for educational purposes (Malliou et. al., 2002).

Uther (2002) lists some usability principals for mobile learning:

- Only show the relevant information
- Do not use empty rows
- Allow easy access to specific information
- Consider the possible variations in context

- Do not use superfluous rich media elements
- Minimize the need for user input
- Test applications on emulators with different display size
- Do not use long pages to avoid scrolling
- Avoid wide elements and tables to avoid horizontal scrolling
- Provide consistent navigation method
- Put links to main pages on every page
- Provide Back links
- Put explanatory texts for images
- If application will be used for both mobile and fixed Internet, give priority for mobile internet design issues.

Another important problem with mobile learning is using existing Pc-based application without redesigning. Malliou et. al. (2002) says that this can result in a frustrating or nearly unusable mobile service. Sharma and Kitchens (2004) say that mobile technologies require new pedagogical and technological views to be innovative.

Kiili (2002) investigated the usability of Nokia 7110 mobile phone and WAP in his research project. He evaluated Nokia 7110 on the basis of learnability, memorability and errors. In order to study the usability of Nokia 7110 mobile phone, a case study carried out in two schools in Finland in 2001. Two groups (60 fourth and fifth graders of the Rauma training school and Nanus elementary school) took three lessons of 45 minutes on the use of Nokia 7110 WAP mobile phone. In the first lesson students made tasks dealing with basic functions of the mobile phone such as sending messages and changing the settings. In the second and third lesson students planned a holiday trip with the help of WAP services. The results show that basic tasks in the first lesson are easy to learn and 81.25% of subjects are successful. The second and third lesson tasks are much harder and only 33.75% of subjects are successful. Kiili says that collected results from structured observation show that:

- Learnability of basic functions is very good but the use of WAP services are hard to learn.
- The cues of the user interface are not direct subjects to the right path.
- WAP services are the lack of feedback.
- User interface of Nokia 7110 needs some improvements. Navi Roller confuses users. The inconsistency of the Navi Roller and the shortcut button causes some problems; subjects can't understand the logical differences between them. (p.2)

Kiili suggested that there is a need for development for mobile services and terminals before they are widely approved as a part of education. Kiili says that a key question in applying mobile terminals to education is usability and the easiness of usage.

## **2.12 Summary of Literature Review**

Mobile communication tools will lead to “anytime, anywhere learning”. Physical and usability characteristics of mobile communication tools will change components of education and facilitate some works both inside and outside the classroom. Inside the classroom it seems that handheld computers allow efficient and rapid recording of data and this is often needed in group collaboration projects. This information can then be saved on a computer, printed, or even beamed to the teacher's handheld computer. Teachers can also use handheld computers to record in-class assessment data, anecdotal information, and grading of presentations and oral participation. Teachers can also use these devices outside the classroom to organize grades and lesson plans, to assess grades and organize their daily activities.

Most of the researches show that mobile communication tools will be complementary media rather than conflicting with or replacing existing

technology. Mobile communication tools will be used easily for vocabulary acquisition, reading small texts, and listening audio-based courses.

Increasing collaboration between students, ubiquitous communication, increasing attendance to courses, increasing motivation and time and location independence will be major advantages of mobile communication tools. Small screen sizes, low data communication speeds, poor data input capabilities and small amount of data storage will be major disadvantages of mobile communication tools.

### **2.13 Implications For Literature Review**

Rapid access to information is needed for most people living in information age. Computers and internet technology have been used largely to meet these needs. Although it is said that people can access information through the computer just in time, it is not completely true because in schools and universities, all computers are in the computer lab. If someone wants to access to internet, he/she has to go computer lab and probably wait some time to find a free computer. Most people say that computer labs are not the location that learning occurs. Because of these, mobility will be the inevitable reality within several years. Institutions should try to implement mobile technologies both into classroom and distance courses or activities. Real “anytime, anywhere learning” can occur only by mobile technologies. There are different issues with these devices, because they have different properties with respect to PCs and laptop computers.



## CHAPTER 3

### 3 METHOD

The purpose of this study is to find out the perceptions of students about using mobile communication tools in web based instruction. During this study, to acquire the perceptions of students, a mobile learning portal that is accessible through Palms, Pocket PCs and mobile phones (approximately one hundred fifty different mobile phones in the market) was developed. This mobile learning portal was named as “**BöteMobile**” and it was made accessible to public at <http://ideas.metu.edu.tr/botemobile> adress. This portal presents different user interfaces according to mobile device that is being used. Five graduate and sixty undergraduate students from Computer Education and Instructional Technology department of Middle East Technical University used this portal within a course and perceptions of students were collected with data collection instruments.

This chapter includes the research questions and research hypotheses, the structure of the system and a description of the research methodology.

#### 3.1 Research Questions

What are the perceptions of students about using mobile communication tools in web-based instruction?

1. What are the perceptions of students about mobile learning?
2. What are the perceptions of students about mobile learning technologies?
  - What are the perceptions of students about mobile applications?
  - What are the perceptions of students about mobile devices?
  - What are the perceptions of students about mobile communication technologies?
3. What are the perceptions of students about mobile discussion forums?

This study includes three main questions. First question tries to find out the perceptions of students about mobile learning through the impressions of mobile technologies on students. The main assumption in this research question is because of the communication and small hardware features of mobile devices, students will use these devices whenever and wherever they want and this will increase the study time for courses, communication between student-student and student-teacher and motivation of students towards course.

The second question is related perceptions of students about mobile applications, mobile devices and mobile communication technologies. In other words, this question will try to find out that whether software, hardware and network technologies of mobile devices are appropriate for education. The perceptions of students about small hardware characteristics for mobile devices, different usability issues of mobile applications and speed and error rates of mobile networks will be analysed.

The third question is related the perceptions of students about mobile discussion forums. This question will try to find out whether discussion forums appropriate for mobile learning. Differences between mobile discussion forums and browser based web discussion forums will be analysed according the results of this question.

The statements in the user evaluation instrument (Appendix B) were designed to find the answers to above questions and they try to generalize the perceptions of students by looking the effects of this specific study.

### **3.2 Methodology**

This study was designed to obtain data from students' perceptions after using mobile learning portal for two, three and four week period. In this period some course activities with mobile learning portal were organized for students to familiarize them using mobile communication tools for learning. Students were

selected from three different courses in Computer Education and Instructional Technology Department in Middle East Technical University. At the end, students were given two instruments: user information instrument (Appendix A) and user evaluation instrument (Appendix B). User evaluation instrument (Appendix B) was validated by experts and reliability score was calculated at the end.

### **3.2.1 Population and Sample**

This study includes undergraduate and graduate students in three different courses in department of Computer Education and Instructional Technology at Middle East Technical University. Fifty five undergraduate students from CEIT 4300314 Computer Networks and Communications course, eighteen undergraduate students from CEIT 4300439 Object Oriented Web and Mobile Programming course and nineteen graduate students from 4300521 Distance Education Theory, Research and Practice course were invited to participate in this study. Totally sixty five students actively participate to this study. It can be said that this is a convenient sample selection method. The results are expected to be generalizable to all undergraduate and graduate students in Computer Education and Instructional Technology department in Middle East Technical University. It should not be generalized to other departments' students because students in this study are experienced web users and they already used web based discussion forums in other courses.

Students were participated from these three courses:

- CEIT4300439 – Object Oriented Web and Mobile Programming  
(Totally 16 students, 5 of them is also in CEIT4300314 course)
- CEIT4300314 – Computer Networks and Communication  
(Totally 49 students, 5 of them is also in CEIT4300439 course)

- CEIT4300521 – Distance Education: Theory, Research and Practice  
(Totally 5 students)

29 of the 65 students in this study are between 18 and 22 years old and 36 of the 65 students are between 23 and 27 years old. 48 students are male and 17 students are female. Most of the students (60) are undergraduate students and only 2 students are Msc. and 3 students are Phd. students. The students in this study are very experienced internet users: 34 of them have been using the Internet for 3 to 5 years and 30 of them have been using the Internet for more than 5 years. Students also use Internet at least 1 hour and most of them use Internet more than two hours.

### **3.2.2 Research Design**

Students in Object Oriented Web and Mobile Programming course used mobile portal for a one month period, students in Computer Networks and Communication course used mobile portal for a three week period and students in Distance Education course used mobile portal for a two week period. Every week a new subject related to course was created and at least one information mail was sent to students.

Students generally used “Openwave” phone simulator to use mobile learning portal. These simulators and help documentation of mobile portal and simulator were distributed to students in a CD. This documentation was also including the required steps to connect to the internet from mobile phones according to GSM operators. Students had the option of using simulators or mobile phones. At the end of the periods students were given user information form (Appendix A) and user evaluation instrument (Appendix B). Data were collected and descriptive statistics were used to calculate for every statement in the questionnaire. The activities used in one month period can be seen in Table 16.

Most of the students in this sample participated from Computer Networks and Communication (CEIT4300314) course. This is a third year must course. Two class activities and one homework activity were organized in this course. Also, two lab assignment results were announced from mobile learning portal. Announcement emails were sent to all students in every week to motivate them to use **BöteMobile**.

Object Oriented Web and Mobile Programming (CEIT4300439) course is a fourth year elective course. Three different subjects were created by instructor and assignments were given to students in this course. The results of first homework were announced from mobile learning portal. Announcement emails were sent to all students in every week to motivate them to use **BöteMobile**.

Distance Education: Research, Theory and Practice (CEIT4300521) course is a graduate course. Two subjects created within two weeks and students were invited to discussion. Announcement emails were sent to all students in every week to motivate them to use **BöteMobile**.

**Table 2: “BöteMobile” Course Activities in One Month Period**

	CEIT4300439	CEIT4300314	CEIT4300521
3 March	<b>Introduction</b>		
9 March		<b>Introduction</b>	
10 March	<b>First Assignment</b> (Write your term projects and send at least two messages to other students' projects)	<b>Registration</b>	
15 March	<b>Remainder Email</b> <b>First Assignment Results</b>		
17 March	<b>Second Assignment</b> (How must be design of mobile software)	<b>First Class Activity</b> (Network Topologies)	<b>Introduction</b> <b>First Subject Creation</b> (Distance Education Theories)
22 March	<b>Remainder Email</b>		
23 March			<b>Remainder Email</b>
24 March	<b>Third Assignment</b> (Software – Time – Design and Budget Relationship)	<b>Second Class Activity</b> (Network Cables) <b>First Lab Assignment Results</b>	<b>Second Subject Creation</b> (Mobile learning as a method of distance education)
26 March	<b>Remainder Email</b>		
28 March		<b>Assignment (OSI Layers)</b> <b>Remainder Email</b>	<b>Remainder Email</b>
29 March	<b>Remainder Email</b>		
30 March	<b>Remainder Email</b>	<b>Remainder Email</b>	
31 March		<b>Second Lab Assignment Results</b> <b>Remainder Email</b>	

### **3.3 Instrumentation**

Mobile Learning is quite a new concept in education and existing research include specific learning activities and methods. There was not any standardized instrument appropriate for collecting perceptions of students. Because of this, a user information instrument (Appendix A) and a user evaluation instrument (Appendix B) were developed. The statements related to mobile learning were developed by revising the instrument of previous study by Giunta (2002) and the statements in the mobile discussion forum section of user evaluation instrument (Appendix B) were also developed by revising the instrument of Wu and Hiltz's (2004) previous study.

User information instrument was used for collecting demographic information like name/surname, age, gender, internet usage background and mobile device usage background.

Evaluation instrument was developed to collect perceptions of students. This instrument was validated by expert views. Four Assistant Professors in Instructional Technology field, one Assistant Professor in Educational Science field and one Phd. Student in Instructional Technology field gave their opinions and made some improvements to instrument.

Reliability analysis of user evaluation instrument (Appendix B) was conducted by using SPSS. Cronbach's Alpha value was found 0,893 for unstandardized items and 0,891 for standardized items. This value can be acceptable for social science researches because Fraenkel and Wallen (1996) say that reliability should be at least 0.70 and preferably higher. Item analysis was also conducted for all items in the instrument and four items produced unreliable results. The value 0.895 was selected as a limit for unreliability. The values above this value were defined as unreliable. The results of item analysis can be found on results section of this document for every item.

### **3.4 Data Analysis**

This study uses descriptive statistics to investigate the level of perceptions towards statements in the instrument (Appendix B). Descriptive statistics including frequencies, means, standard deviations and variances for the statements are examined. Graphics were drawn for every item by using frequencies.

The user evaluation instrument (Appendix B) was divided into 5 parts according to research questions and sub questions of this study. Statements between 3 and 14 were prepared to find out the perceptions of students towards mobile learning. These statements include communication, motivation, and ease of use concepts. Statements between 15 and 19 were prepared to find out the perceptions of students about mobile devices. Statements related to screen size, limited keypad and graphic view concepts were designed. Statements between 20 and 33 were prepared to find out the perceptions of students about mobile application's properties like navigation, searching and labeling. Statements between 34 and 35 were prepared to find out the perceptions of students about mobile communication technologies like network speed and network errors. Statements between 36 and 46 were prepared to find out the perceptions of students about mobile discussion forums.

Statements in the user evaluation instrument (Appendix B) represent these research questions and sub questions:

- 1.** What are the perceptions of students about mobile learning?  
(Statements 3 through 14)
- 2.** What are the perceptions of students about mobile learning technologies?
  - What are the perceptions of students about mobile devices?  
(Statements 15 through 19)
  - What are the perceptions of students about mobile applications?  
(Statements 20 through 33)



- What are the perceptions of students about mobile communication technologies?

(Statements 34 through 35)

3. What are the perceptions of students about mobile discussion forums?

(Statements 36 through 46)

### **3.5 Software Design**

During this study a mobile learning portal which included an asynchronous discussion forum and a course information system was developed according to characteristics of mobile devices, student requirements and mobile usability principals. Discussion forums are appropriate learning tools for mobile devices. Students can send and read short texts, get key answers and ask key questions in discussion forums. Also there are some disadvantages of discussion forums for mobile devices. The tree like structure of discussion forums may hinder to find desired information because users have to visit many pages.

Course information system was designed to get important informations like exam dates and results and news about the course. Reading course content and getting exams were excluded from this system, because of inappropriate features of these activities for mobile devices. These activities also can be used with mobile devices but they need different design issues and different implementation techniques.

Forum Module and Course Module were selected according to Uther's (2002) recommendations. Uther (2002) recommends that "... kinds of learning applications could be ones that would not require much user input, could be easily adapted to a small screen and can also be performed within a variety of user situations" (p.2).

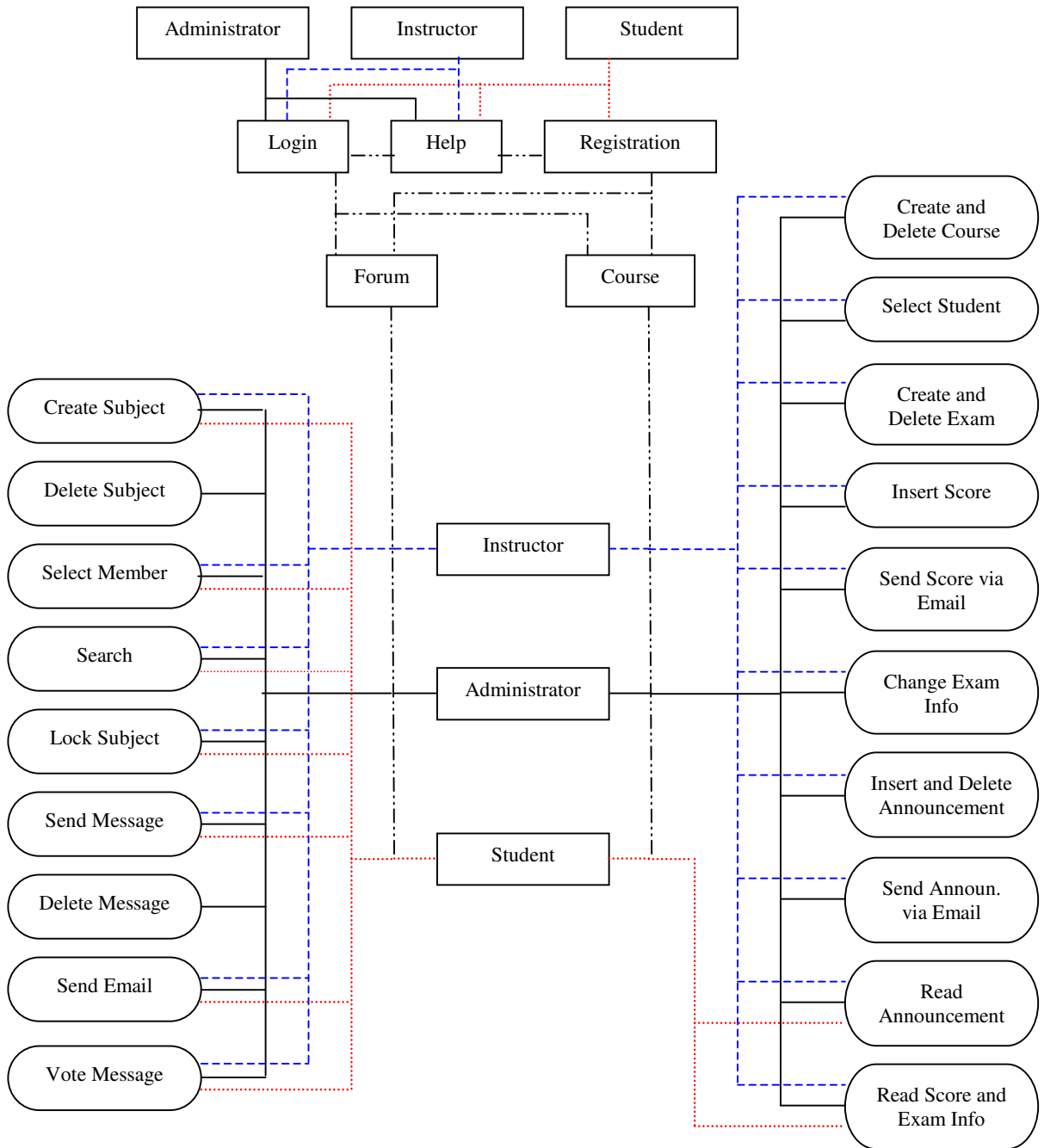
This portal was designed to allow three different user roles which are students, instructors and administrators. By separating the roles of users, mobile learning portal has a structured design and this improve the flexibility of system for administration.

### 3.6 Portal Structure

“**BöteMobile** Mobile Learning Portal” includes two main modules: Forum module and Course module (Figure 7). Beside these, this portal includes Registration System, interactive Help System and web-based Administration System. All users have to use Registration System once to register as a student in **BöteMobile**. Users can be given other roles in the system by using Administration System. Registered users have to use “Login” form to enter the system. After login, users can use Forum Module, Course Module, Help System and Administration (for only users who have administrator role) System. Administration System can be used by handheld devices and web based browsers, it can not be used by mobile phones which have WAP, XHTML or CHTML based browsers.

Forum Module, Course Module, Help System and Registration System in “**BöteMobile** Mobile Learning Portal have two different user interfaces: one for web based browsers (like IE and Netscape) and one for mobile phones. Handheld devices can see both interfaces according the browser type of the device. The first user interface uses images, icons and coloured HTML tables. The second user interface uses numbers and character markings instead of images and icons. Structure of the pages was not changed according to interface types, because users can use many devices to access same pages. This property can increase the recognition of pages.

# BöteMobile

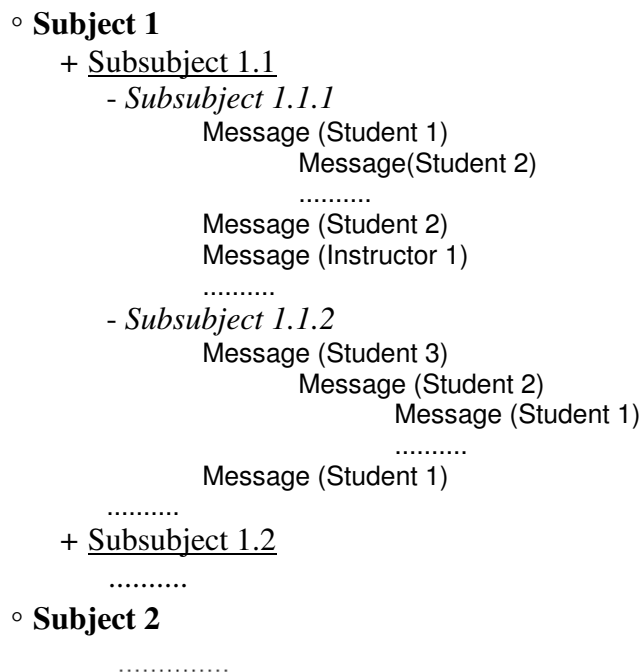


**Figure 7: “BöteMobile Mobile Learning Portal” Structure**

### 3.6.1 Forum Module

Forum module is an asynchronous discussion forum. Typical forum subject and message hierarchy can be seen in Figure 8. Forum module allows these operations:

- Creating subjects and sub subjects,
- Selecting members to subjects or making accessible to public,
- Locking/Unlocking subjects to prevent/allow sending messages,
- Sending messages and reply messages,
- Searching keywords in subjects and messages,
- Voting messages,
- Sending emails to members of the subject,
- Sending individual emails to messages,
- Deleting subjects and messages (for administrators)



**Figure 8:** Typical forum hierarchy.

Forum module in **BöteMobile** uses tree like structure for subjects and messages. In this structure subjects and messages can be created one within the other. This allows grouping subjects according the properties of the course or course subjects. This grouping may allow finding information quickly if someone knows the subjects and sub subjects, but in contrast the depth of the tree can lead to path losing in the pages.

Two different subject types can be created in Forum Module. A student or instructor can create a subject and make it accessible to public or they can select members from members list to restrict the public access.

Forum module tracks new messages and subjects according to users last login time and alerts user by using different images for web based interfaces and by using different markings for phone based interfaces. Users can recognize the most popular subjects or messages and whether there are new messages or subjects by looking their icons or markings.

Forum module allows searching words within subjects and messages and they can go into these subjects and messages by one click. Searching techniques are very important for mobile applications because they decrease the access time to find information.

Forum module also allows sending emails to whole subject members or to individual subject member. Users write their email addresses when registering to system and these addresses are used automatically for sending emails. There is no need to write email addresses everytime.

Forum Module allows voting messages to show importance of messages to other members. Students can give numbers between 1 and 10 to show their ideas about messages. Students can also prefer to read messages that have high votes.

Only administrators have rights to delete messages and subjects. This allows controlling forum structure and prevents sending unrelated messages.

### **3.6.2 Course Module**

Course module gives information about courses and examinations.

Course module allows these operations:

- Creating courses and exams under courses (for instructors),
- Inserting student scores and exam dates (for instructors),
- Sending examination results via e-mail (for instructors),
- Reading exam scores and dates (for students and instructors),
- Inserting and deleting announcements for a course (for instructors),
- Sending announcements via e-mail (for instructors),
- Reading announcements (for students and instructors),
- Deleting courses and exams (for administrators and instructors)

Course Module has different operations for students and instructors. Students use Course Module to see the examination or homework results and due dates. Instructors have to make assignments and insert scores for students to give them this opportunity. Instructors must create courses and assign students to these courses. They also must create examinations or homeworks under courses and insert the results. Only students that instructors assigned to courses can see the courses, examinations and homeworks.

Course Module has announcement section. Students can read the most recent announcements related to courses. Instructors can insert announcements and they can send this announcement by using e-mail to all students at the same time. Instructors can also delete the old or wrong announcements.

### **3.7 User Roles**

“*BöteMobile* Mobile Learning Portal” allows three different user roles to access the system: Student, Instructor, and Administrator

#### **3.7.1 Student Role**

The main user role in the system is “Student”. System allows registration process and assigns “Student” role to registered users. Students can login the system and use asynchronous discussion forum and course information system.

Students can create subjects and sub subjects and they can select members to these subjects or allow subjects to open to public in asynchronous discussion forum. Students can lock and unlock their own subjects to enable or disable sending messages. Students can send messages and reply messages to other messages. Students can send email to all members of the subjects, send individual messages to reply a message and vote messages to determine the importance of the messages.

Students can use course information system only for looking to exam notes, exam dates and announcements. Instructors assign students to courses and students can see only these courses.

#### **3.7.2 Instructor Role**

Instructors have all rights that students have. Beside these, instructors can create and delete courses and exams. Instructors can assign students to courses, insert student scores, send student scores via e-mail, insert exam dates, insert/delete announcements and send announcements via e-mail. Instructors must register from the Registration System and then administrator assigns “Instructor” role to them by using Administration System.

### 3.7.3 Administrator Role

Administrators have all rights that instructors have. Beside these, administrators can delete subjects and messages. Administrator role is the only role that has rights to use Administration System.

### 3.8 Usability

Mobile learning portal was designed according to usability principals for mobile devices. Some usability guidelines were collected (Buchanan et. al., 2001; Serco Usability Service, 2000; Uther, 2002) and implemented to mobile learning portal. Beside this, some of the important problems found in other studies (Ramsey and Nielsen, 2000; Duda et. al., 2001) were took into consideration.

Uther (2002) says that, only the relavant information must be shown for mobile devices because screen sizes are small. Beside this, not all of the mobile device screen sizes are same. In **BöteMobile**, pages and objects in these pages were designed for small screen sizes. The software components used in pages have facility to adjust themselves according to screen size.

Navigation is more important for small screen devices. Serco (2000) usability guideline offers that “Use clear and unambiguous category links, so users can easily decide what path to take”. **BöteMobile** menus and navigation path between pages were designed according to this principal.

Labeling of menus and items is another important issue in mobile software design. Ramsay and Nielsen (2000) recognized that unclear labels and menu choices written in technical terms affects users perceptions towards mobile web sites.

Most of the mobile devices have limited keypads and it is very hard to write long texts with these keypads. Duda et. al. (2001) indicate that systems without or with minimal direct text input are more expected than others.



Discussion forums can not be without text input but subject names and messages can be as short as possible.

Users can use such a learning portal with different media. They may want to use from different mobile devices or PC based browsers. Variations in characteristics of these devices expose a recognition problem. Users should easily recognize the same pages and processes when they see them in different devices. Recognition rather than recall is one of the ten usability principals of Nielsen (1994).

### **3.9 Software System**

“**BöteMobile** Mobile Learning Portal” was developed by using .NET Framework 1.1 software development platform. Microsoft Visual Studio.NET 2003 was used as an integrated development environment. ASP.Net Mobile Internet Toolkit components were used for accessing the portal from different mobile devices. Visual C#.NET programming language was used for programming the components and ADO.NET was used for accessing the SQL Server 2000 database. Internet Information Server 6.0 was used as a web application server to deliver mobile learning portal to the web.

Microsoft .Net Framework 1.1 software development platform was used because it provides a powerful solution for mobile web application developers. Microsoft .Net Framework 1.1 includes ASP.Net Mobile Internet Toolkit components that can produce different markup language according to client devices. With this technology, the time to spend for interoperability issues can be decreased and more time can be used for the business problem (Wigley and Roxburgh, 2002).

## CHAPTER 4

### 4 RESULTS

#### 4.1 Introduction

In this chapter, the findings of the research are presented. Results were collected by using “User Information Instrument (Appendix A)” and “User Evaluation Instrument (Appendix B)” and descriptive statistics were calculated. User evaluation instrument contains forty six statements categorized in three sections. This chapter includes the statements and results.

#### 4.2 Results

The tables below show the results of user information form (Appendix A). These tables give detailed statistics about the participants in this study.

**Table 3:** How many years have you been using the Internet?

Never	Little than 1 year	1-3 year	3-5 year	6 and more
0	0	1	34	30

**Table 4:** How many times do you use Internet daily?

Never	Nearly 1 hour	1-2 hour	2-3 hour	3-4 hour	4-5 hour	More than 5 hour
0	5	16	16	3	10	15

**Table 5:** Where do you connect to the Internet?

Home	Work	School	Dormitory	Other
19	6	50	34	8

**Table 6:** What are the activities you mostly use on the Internet?

E-mail	Shopping	News	Game	Search	Weather	Chat	Banking	E-learning	Download
55	10	40	7	54	6	28	15	39	43

**Table 7:** Do you have a mobile device?

Mobile Phone	Pocket PC	Palm	Smartphone	Other
63	0	1	2	0

**Table 8:** How many years have you been using mobile phone?

Little than 6 months	6 month - 1 year	1-2 year	2-3 year	3-4 year	4-5 year	More than 5 year
0	1	3	4	12	23	22

**Table 9:** How many years have you been using mobile device (Other than mobile phone)?

Little than 6 months	6 month - 1 year	1-2 year	2-3 year	3-4 year	4-5 year	More than 5 year
1	0	0	0	1	0	0

**Table 10:** How many times do you use your mobile phone to speak someone in one day?

1-2 times	3-4 times	5-6 times	7-8 times	9-10 times	11 and more
16	22	9	3	5	9

**Table 11:** How many times do you send SMS in one day?

1-2 times	3-4 times	5-6 times	7-8 times	9-10 times	11 and more
32	14	2	1	1	7

**Table 12:** Have you ever been used a mobile device to connect to the Internet?

Yes	No
31	34

**Table 13:** Do you want to buy an Internet enabled mobile device?

I want	Neutral	I don't want	Already have
17	10	5	30

The figures below show the results of user evaluation form (Appendix B). There are twelve statements related to mobile learning perceptions of students, twenty one statements related the perceptions of students about mobile technologies and eleven statements related to mobile discussion forums. Student perceptions about mobile technologies were divided into three parts. First part includes statements related to mobile hardware technologies like screen size and keypad of the mobile devices. Second part includes statements related to mobile software technologies. These statements were designed to acquire the perceptions of students about some different standards of mobile software like small labels, short help pages and deep menus. Third part includes statements related to mobile communication technologies and these statements try to acquire the perceptions of students related to data communication speed of mobile networks.

In this section, statements were examined in the same order with user evaluation questionarrie (Appendix B). Mean score, standard deviation and variance were calculated by given numeric representations to statements' choices. (Strongly Disagree : 1, Disagree : 2, Neutral : 3, Agree : 4, Strongly Agree : 5)

The first two statements are related to users' preferences about mobile device usage. Users had the option of using mobile phones, handheld devices or simulators.

**Statement 1:** *Which type of mobile devices did you generally use to access “**BöteMobile** Mobile Learning Portal”?*

Most of the students (59 of the 65 students) reply that they mostly used Openwave mobile phone simulators to access **BöteMobile**. Only 6 of the 65 students reply that they mostly used their own mobile phones to access **BöteMobile**.

This statement excluded from reliability analysis because it is not relevant with the perceptions of students.

**Statement 2:** *What is the brand and model of the mobile device that you used for accessing “**BöteMobile** Mobile Learning Portal”?*

6 of the 65 students used Nokia 6600, Nokia 2650, Motorola Mpx200, Samsung Sgh800, Sony Ericsson T310, Nokia 8310 mobile phones to access **BöteMobile**. Indeed 44 students had WAP supported mobile phones and 36 students had GPRS supported mobile phones. Most of these students prefer to use Openwave simulator instead of their own mobile phones.

This statement is also excluded from reliability analysis because it is not relevant with the perceptions of students.

#### 4.2.1 Research Question 1: What are the Perceptions of Students about Mobile Learning?

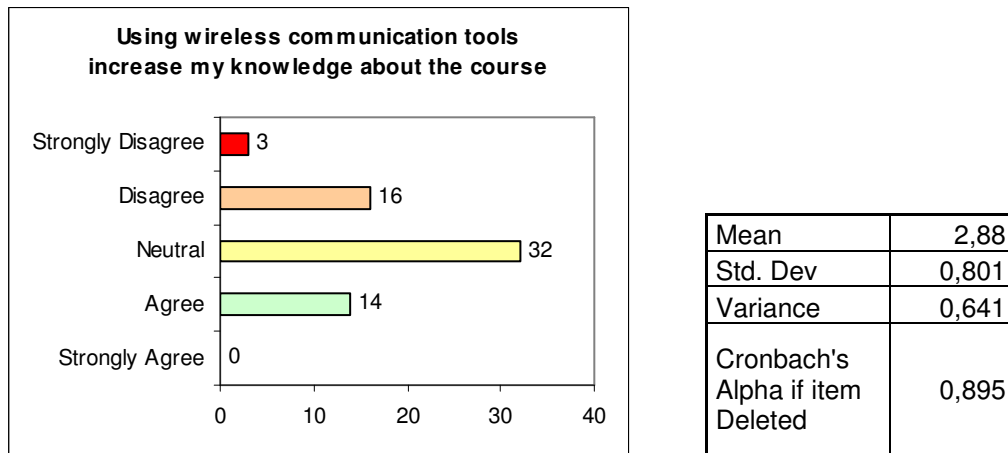
The main research problem in this study is the perceptions of students about mobile learning. Twelve statements were prepared for this purpose.

**Statement 3:** *Using mobile communication tools increase my knowledge about the course.*

All of the students replied to this statement and most of them are neutral (32) or disagree (16 disagree and 3 strongly disagree) and only 14 students are agree with with this statement.

The mean score of the students who used their own mobile phones is 2,83. 2 of these students disagree, 3 of these students neutral and 1 of these students agree with this statement.

In reliability analysis, this statement was found reliable because the Cronbach's Alpha does not increase much if this item is deleted from the instrument.



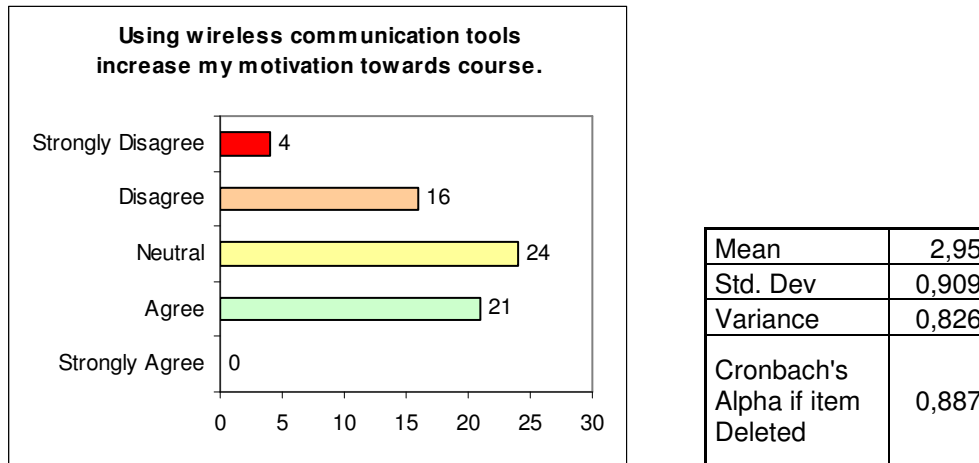
**Figure 9:** Graph of “Using mobile communication tools increase my knowledge about the course”

**Statement 4:** *Using mobile communication tools increase my motivation towards course.*

All of the students replied to this statement but most of the students do not agree (4 strongly disagree + 16 disagree) or neutral (24) with this statement.

The mean score of the students who used their own mobile phones is 3,00. 1 of these students strongly disagree, 1 of these students disagree, 1 of these students neutral and 3 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



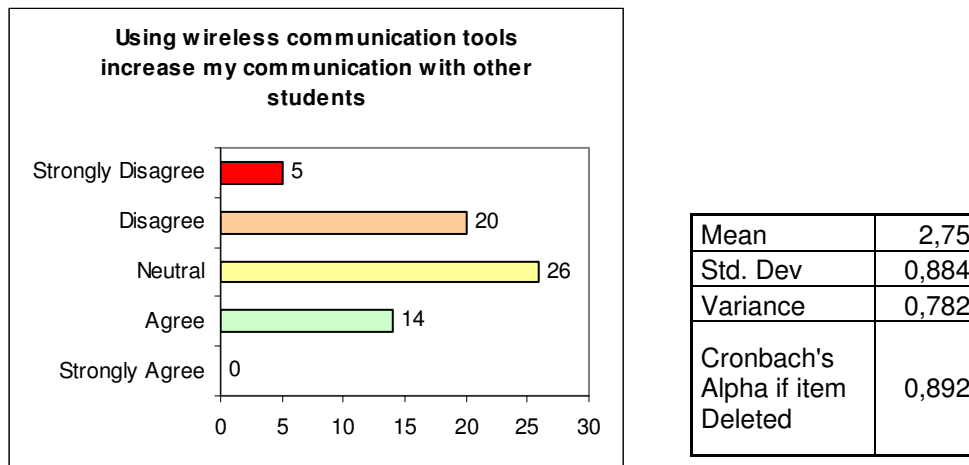
**Figure 10:** Graph of “Using mobile communication tools increase my motivation towards course”

**Statement 5:** *Using mobile communication tools increase my communication with other students.*

All of the students replied to this statement. Most of the students do not agree (5 strongly disagree and 20 disagree) or neutral (26) with this statement.

The mean score of the students who used their own mobile phones is 3,33. 1 of these students disagree, 1 of these students neutral and 3 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is not affected much.



**Figure 11:** Graph of “Using mobile communication tools increase my communication with other students”

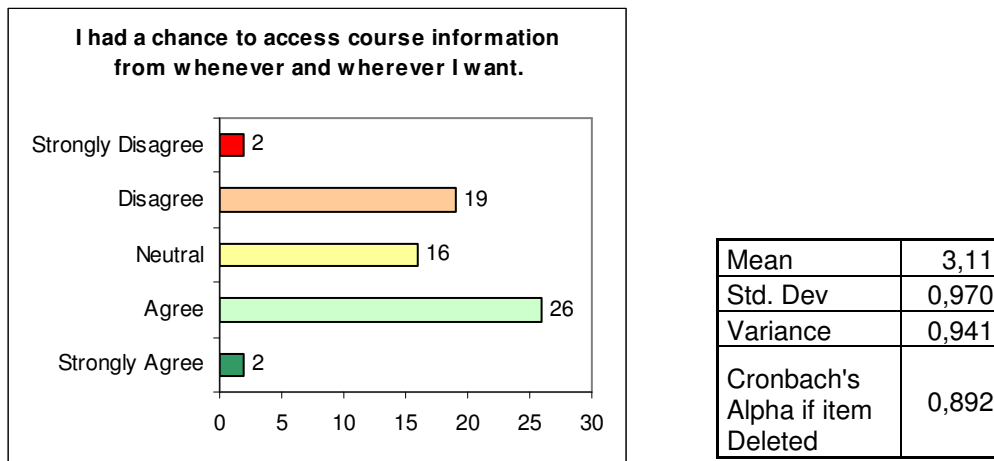


**Statement 6:** *I had a chance to access course information from whenever and wherever I want.*

All of the students replied to this statement. Most of the students do not agree (2 strongly disagree and 19 disagree) or neutral (16) with this statement.

The mean score of the students who used their own mobile phones is 3,50. 1 of these students strongly disagree, 1 of these students neutral, 3 of these students agree and 1 of these students strongly agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is not affected much.



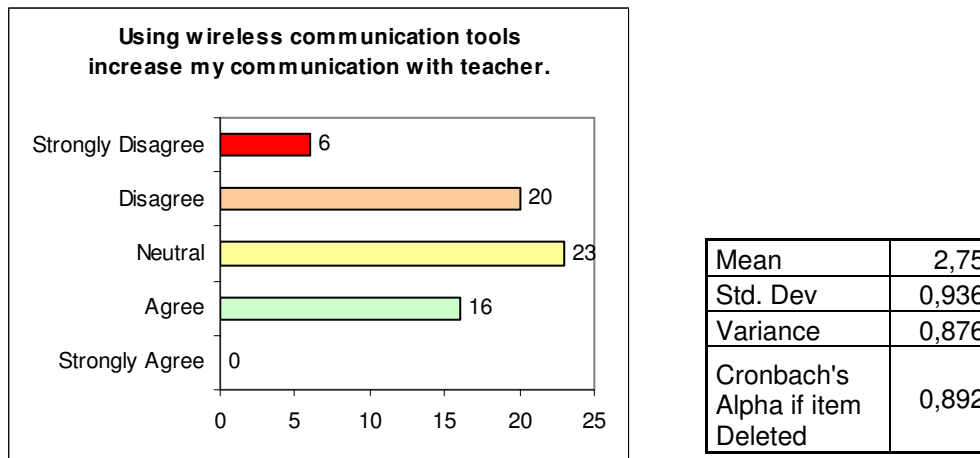
**Figure 12:** Graph of “I had a chance to access course information from whenever and wherever I want”

**Statement 7:** *Using mobile communication tools increase my communication with teacher.*

All of the students replied to this statement. Most of the students do not agree (6 strongly disagree and 20 disagree) or neutral (23) with this statement.

The mean score of the students who used their own mobile phones is 3,17. 1 of these students strongly disagree, 2 of these students neutral and 3 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is not affected much.



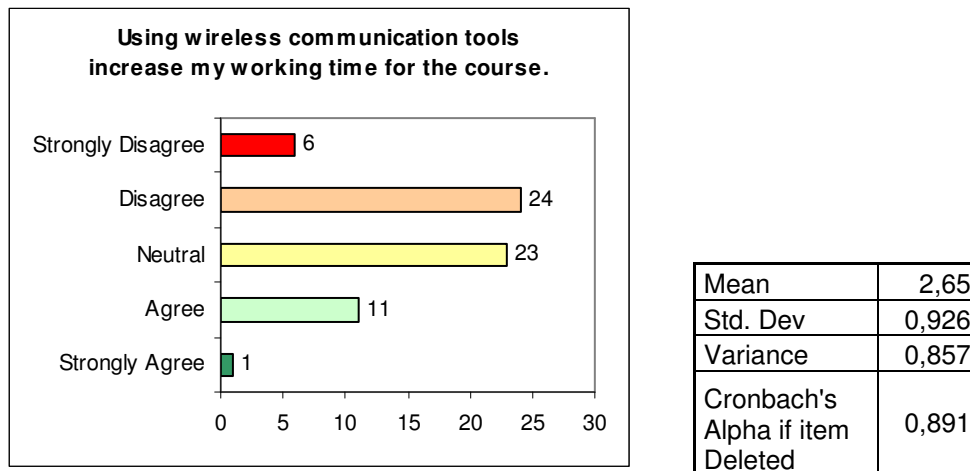
**Figure 13:** Graph of “Using mobile communication tools increase my communication with teacher”

**Statement 8:** *Using mobile communication tools increase my working time for the course.*

All of the students replied to this statement. Most of the students do not agree (6 strongly disagree and 24 disagree) or neutral (23) with this statement.

The mean score of the students who used their own mobile phones is 2,67. 1 of these students strongly disagree, 1 of these students disagree, 3 of these students neutral and 1 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is not affected much.



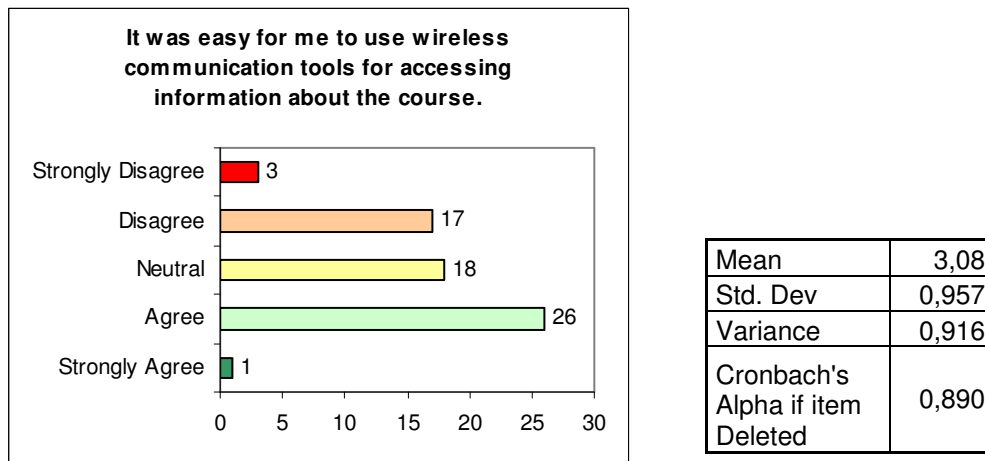
**Figure 14:** Graph of “Using mobile communication tools increase my working time for the course”

**Statement 9:** *It was easy for me to use mobile communication tools for accessing information about the course.*

All of the students replied to this statement. Most of the students do not agree (3 strongly disagree and 17 disagree) or neutral (18) with this statement.

The mean score of the students who used their own mobile phones is 3,83. 1 of these students neutral and 5 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



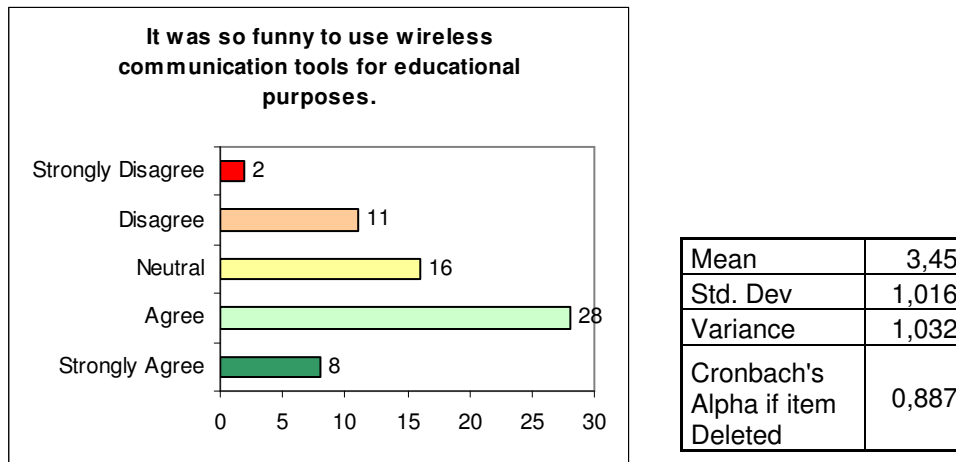
**Figure 15:** Graph of “It was easy for me to use mobile communication tools for accessing information about the course”

**Statement 10:** *It was so fun to use mobile communication tools for educational purposes.*

All of the students replied to this statement. Most of the students agree (28) or strongly agree (8) with this statement

The mean score of the students who used their own mobile phones is 4,17. 1 of these students neutral, 3 of these students agree and 2 of these students strongly agree with this statement.

In reliability analysis this statement was found considerably reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



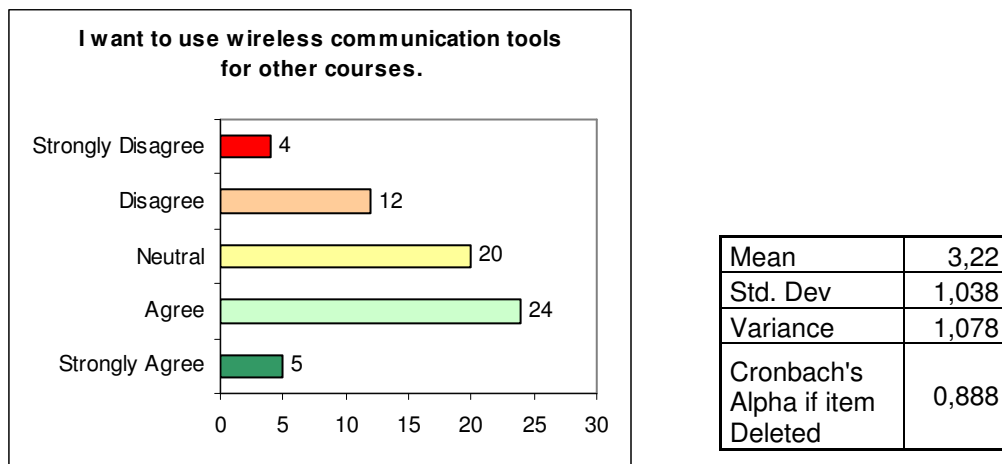
**Figure 16:** Graph of “It was so fun to use mobile communication tools for educational purposes”

**Statement 11:** *I want to use mobile communication tools for other courses.*

All of the students replied to this statement. Some of the students agree (24) or strongly agree (5) with this statement but some of them disagree (4 strongly disagree and 12 disagree) or neutral (20) with this statement.

The mean score of the students who used their own mobile phones is 3,50. 1 of these students strongly disagree, 2 of these students neutral, 1 of these students agree and 2 of these students strongly agree with this statement.

In reliability analysis this statement was found considerably reliable, because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



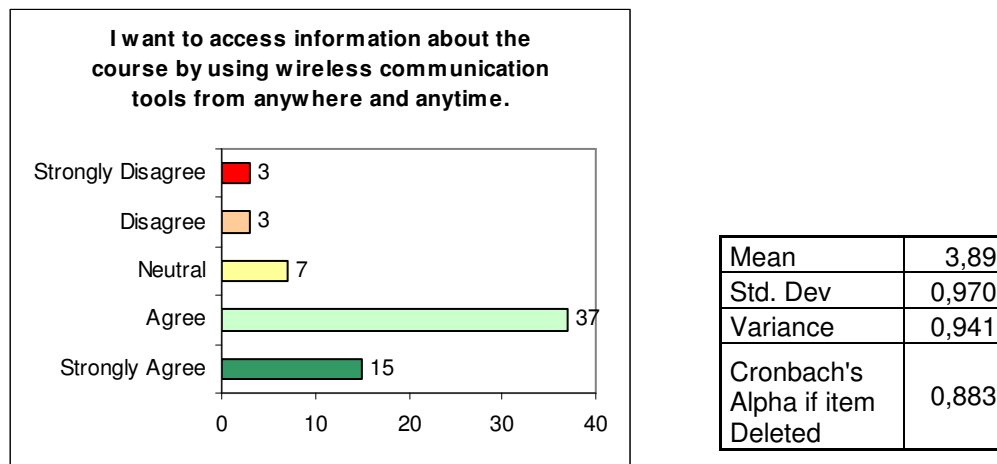
**Figure 17:** Graph of “I want to use mobile communication tools for other courses”

**Statement 12:** *I want to access information about the course by using mobile communication tools from anywhere and anytime.*

All of the students replied to this statement. Most of the students agree (37) or strongly agree (15) with this statement.

The mean score of the students who used their own mobile phones is 4,17. 1 of these students strongly disagree, 1 of these students agree and 4 of these students strongly agree with this statement.

In reliability analysis this statement was found considerably reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



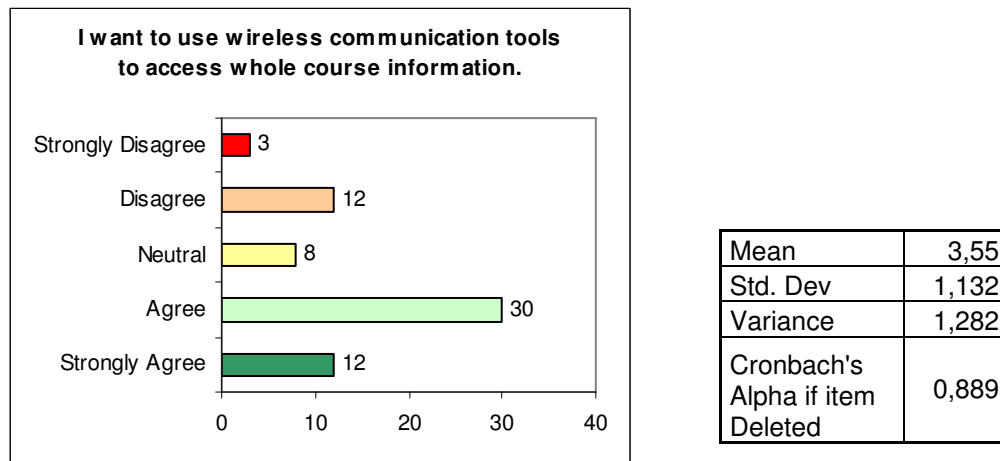
**Figure 18:** Graph of “I want to access information about the course by using mobile communication tools from anywhere and anytime”

**Statement 13:** *I want to use mobile communication tools to access whole course information.*

All of the students replied to this statement. Most of the students agree (30) or strongly agree (12) with this statement.

The mean score of the students who used their own mobile phones is 4,17. 1 of these students strongly disagree, 1 of these students agree and 4 of these students strongly agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



**Figure 19:** Graph of “I want to use mobile communication tools to access whole course information”



**Statement 14:** *What problems may hinder you to use mobile communication tools for a course?*

52 students replied to this statement. Students ordered the items in this statement by giving numbers between 1 and 7.

This statement is excluded from reliability analysis because the data type is different from other statements. The table below shows frequencies of each item for students' rankings. For example: 30 students put the "High cost" item at the first rank. The percentage column shows the level of importance for each item.

**Table 14:** What problems may hinder you to use mobile communication tools for a course?

	1	2	3	4	5	6	7	Percentage (%)
High cost	30	5	2	5	3	5	2	19,85
Slow data connection speed	2	23	8	7	8	3	1	17,12
Small size of the screen	9	8	7	7	6	11	4	14,87
Limited keypad	4	5	16	4	6	10	7	14,26
Quality of data that can be accessed by small device	4	4	5	17	8	7	7	12,96
Unsecure connection		4	1	5	8	9	25	7,91
Long time to find an information	3	3	13	7	13	7	6	13,03

#### 4.2.2 Research Question 2: What are the Perceptions of Students about Mobile Technologies?

The statements in this part are divided in three sections. First five statements are related to mobile hardware technologies. Next fourteen statements are related to mobile software technologies and last two statements are related to mobile communication technologies.

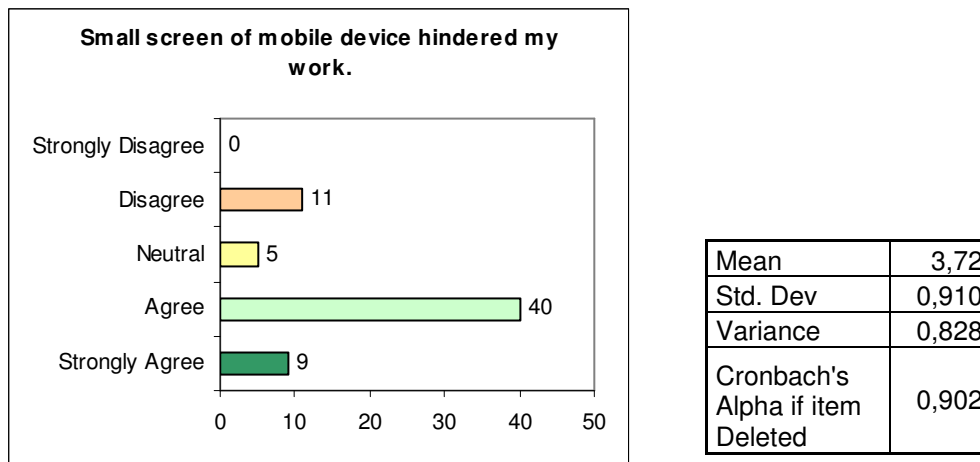
#### 4.2.2.1 Research Question 2.1: What are the Perceptions of Students about Mobile Hardware Technologies?

**Statement 15:** *Small screen of mobile device hindered my work.*

All of the students replied to this statement. Most of the students agree (40) or strongly agree (9) with this statement.

The mean score of the students who used their own mobile phones is 4,00. 1 of these students disagree, 3 of these students agree and 2 of these students strongly agree with this statement.

In reliability analysis this statement was found unreliable because if we delete this item from the instrument the Cronbach's Alpha is increasing. It seems unreliable because most of the students select the same choice. Although it is unreliable, this statement gives important information about usage characteristics of mobile devices.



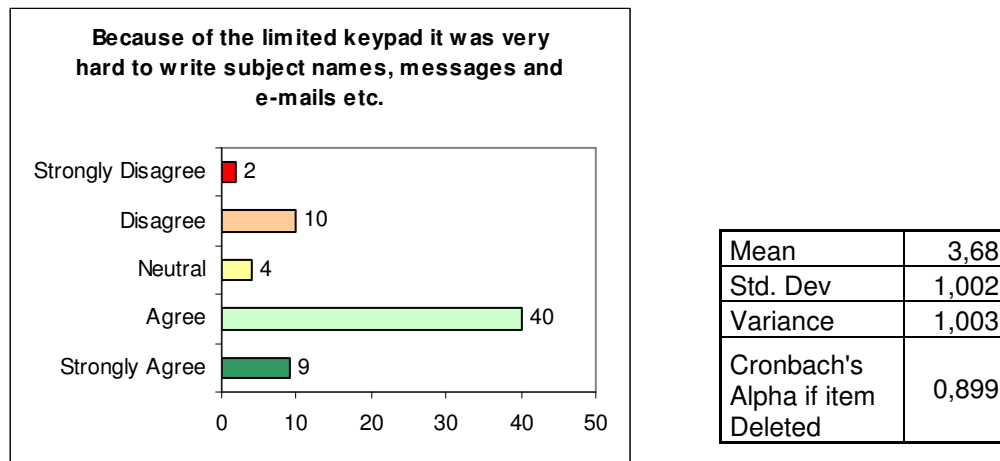
**Figure 20:** Graph of “Small screen of mobile device hindered my work”

**Statement 16:** *Because of the limited keypad it was very hard to write subject names, messages and e-mails.*

All of the students replied to this statement. Most of the students agree (40) or strongly agree (9) with this statement.

The mean score of the students who used their own mobile phones is 4,17. 1 of these students neutral, 3 of these students agree and 2 of these students strongly agree with this statement.

In reliability analysis this statement was found unreliable because if we delete this item from the instrument the Cronbach's Alpha is increasing.



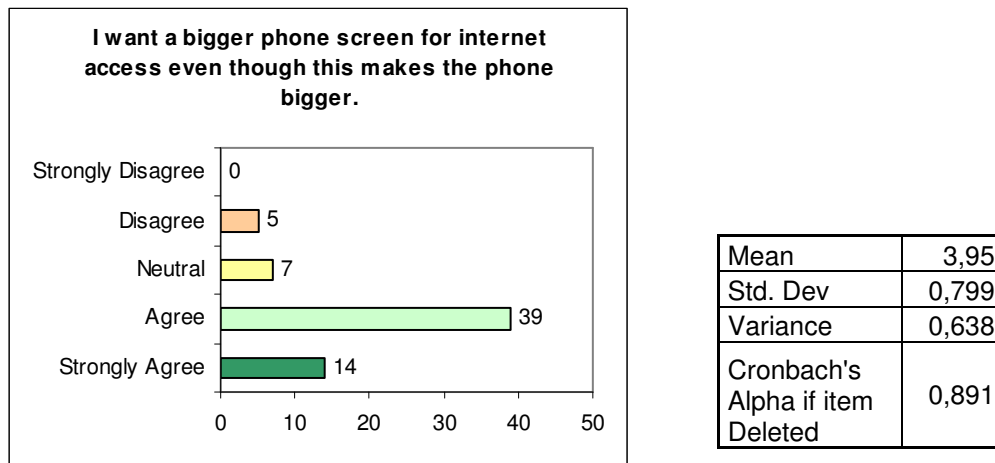
**Figure 21:** Graph of “Because of the limited keypad it was very hard to write subject names, messages and e-mails”

**Statement 17:** *I want a bigger phone screen for internet access even though this makes the phone bigger.*

All of the students replied to this statement. Most of the students agree (39) or strongly agree (14) with this statement.

The mean score of the students who used their own mobile phones is 4,67. 2 of these students agree and 4 of these students strongly agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



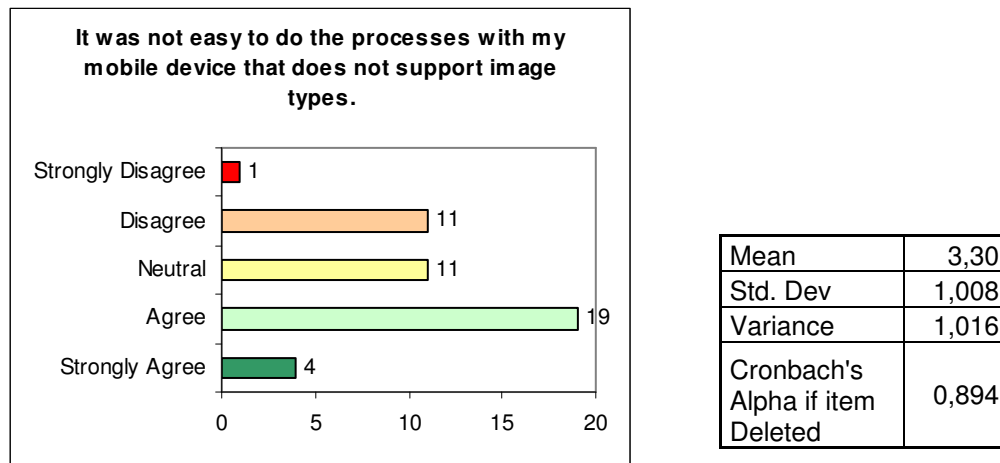
**Figure 22:** Graph of “I want a bigger phone screen for internet access even though this makes the phone bigger”

**Statement 18:** *It was not easy to do the processes with my mobile device that does not support image types.*

47 of the 65 students reply to this statement. 19 students agree and 4 students strongly agree with this statement.

The mean score of the students who used their own mobile phones is 4,00. 1 of these students neutral, 2 of these students agree and 1 of these students strogly agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is not much affected.



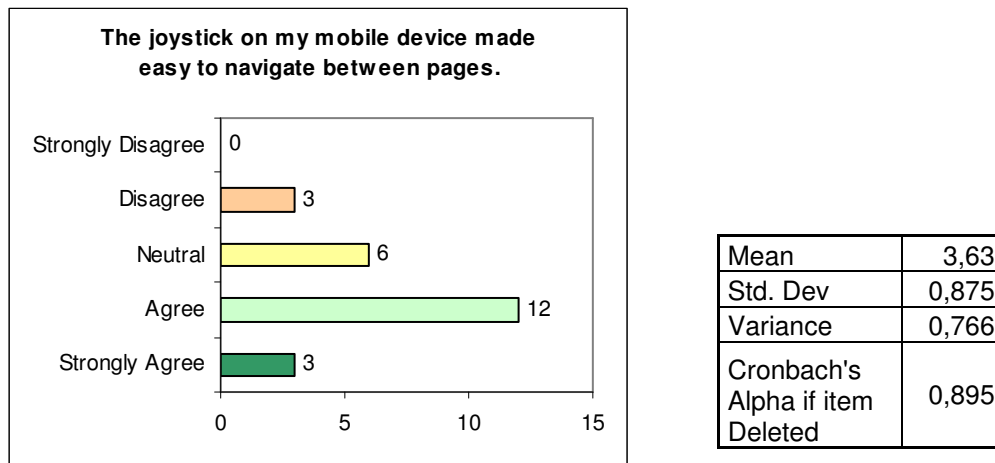
**Figure 23:** Graph of “It was not easy to do the processes with my mobile device that does not support image types”

**Statement 19:** *The joystick on my mobile device made easy to navigate between pages.*

Only 24 of 65 students replied this statement. Most of the students are agree (12 agree and 3 strongly agree) with this statement.

The mean score of the students who used their own mobile phones is 4,67. 1 of these students agree and 2 of these students strongly agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is not much affected.



**Figure 24:** Graph of "The joystick on my mobile device made easy to navigate between pages"

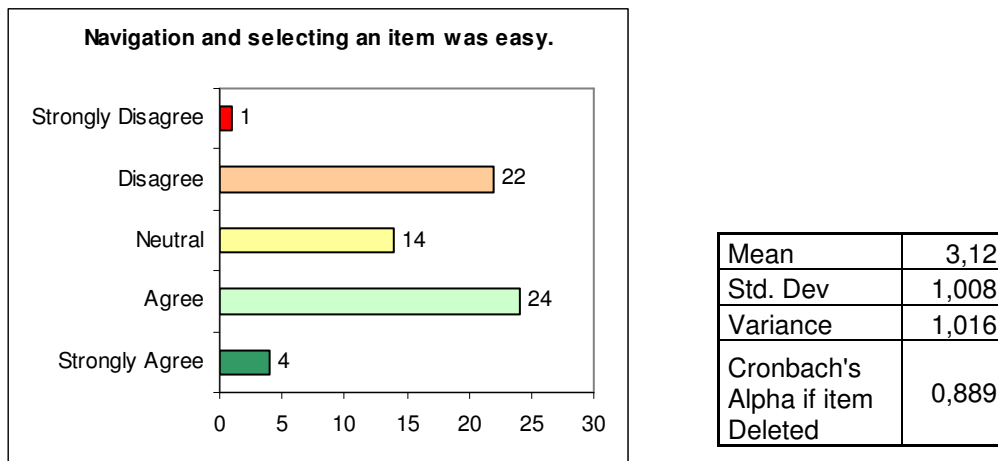
#### 4.2.2.2 Research Question 2.2: What are the Perceptions of Students about Mobile Software Technologies?

**Statement 20:** *Navigation and selecting an item was easy.*

All of the students replied this statement. Number of agree and disagree students are similar. 23 students are disagree (22 disagree and 1 strongly disagree) and 28 students are agree (24 agree and 4 strongly agree) with this statement.

The mean score of the students who used their own mobile phones is 4,00. 1 of these students disagree, 3 of these students agree and 2 of these students strongly agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



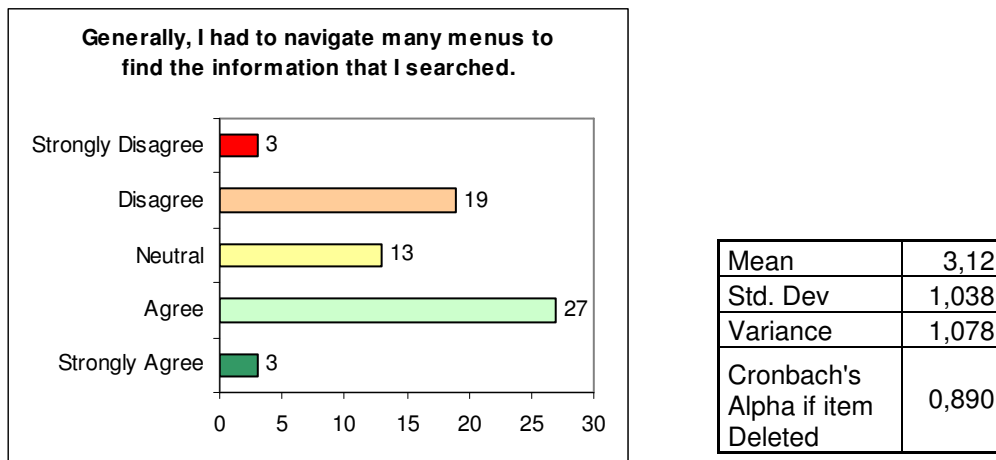
**Figure 25:** Graph of “Navigation and selecting an item was easy”

**Statement 21:** *Generally, I had to navigate many menus to find the information that I searched.*

All of the students replied this statement. Number of agree students higher than disagree students. 22 students are disagree (19 disagree and 3 strongly disagree) and 30 students are agree (27 agree and 3 strongly agree) with this statement.

The mean score of the students who used their own mobile phones is 2,50. 1 of these students strongly disagree, 3 of these students disagree, 1 of these students neutral and 1 of these students strongly agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



**Figure 26:** Graph of “Generally, I had to navigate many menus to find the information that I searched”

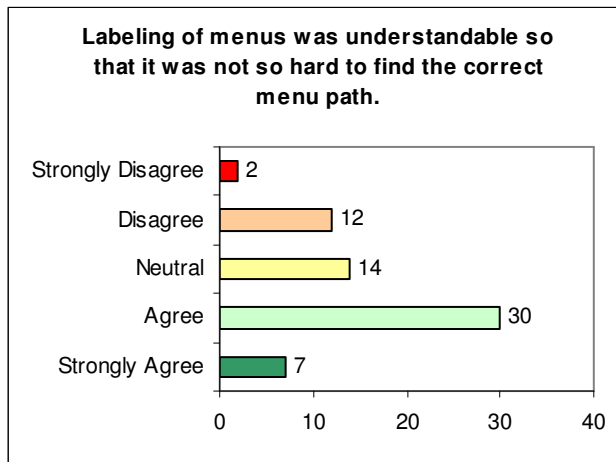


**Statement 22:** *Labeling of menus was understandable so that it was not hard to find the correct menu path.*

All of the students replied this statement. Number of agree students (30 agree and 7 strongly agree) higher than disagree students (12 disagree and 2 strongly disagree).

The mean score of the students who used their own mobile phones is 3,67. 3 of these students neutral, 2 of these students agree and 1 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



Mean	3,43
Std. Dev	1,015
Variance	1,030
Cronbach's Alpha if item Deleted	0,891

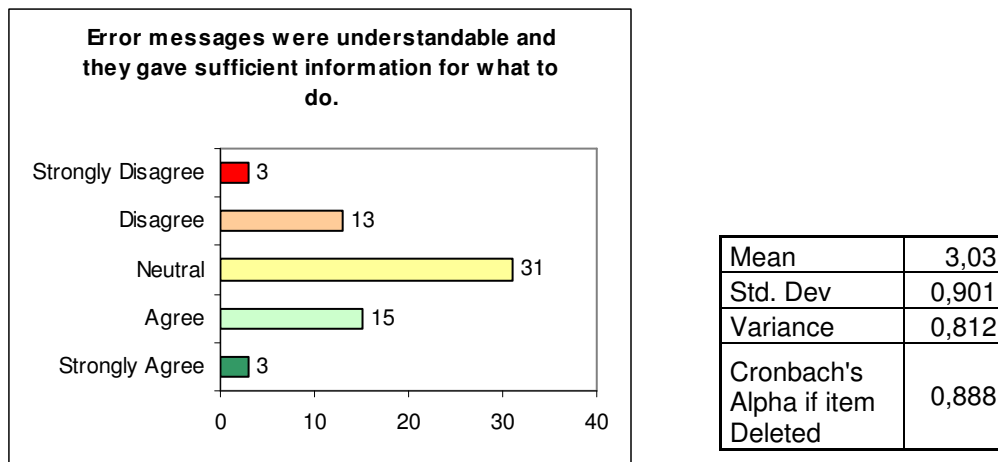
**Figure 27:** Graph of “Labeling of menus was understandable so that it was not hard to find the correct menu path”

**Statement 23:** *Error messages were understandable and they gave sufficient information for what to do.*

All of the students replied this statement. Number of agree (15 agree and 3 strongly agree) and disagree (13 disagree and 3 strongly disagree) students are nearly equal, but number of neutral students (31) are higher than others.

The mean score of the students who used their own mobile phones is 3,17. 1 of these students strongly disagree, 4 of these students neutral and 1 of these students strongly agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



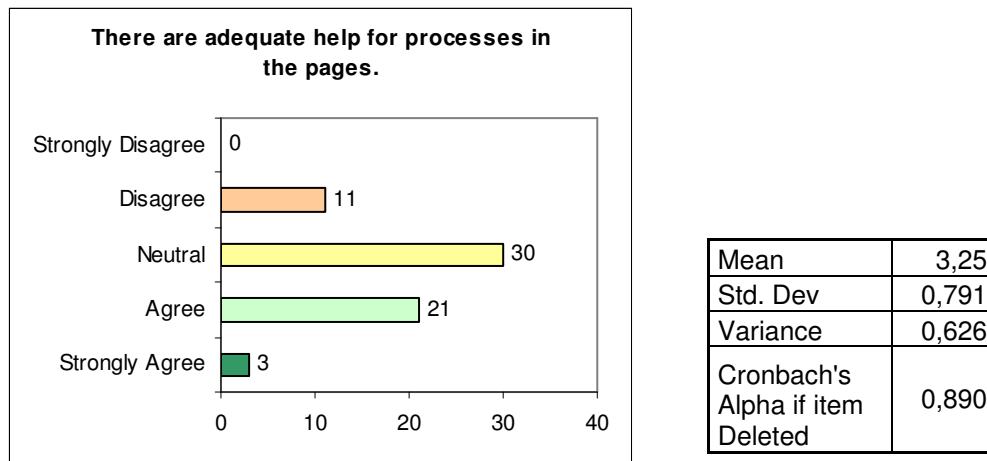
**Figure 28:** Graph of “Error messages were understandable and they gave sufficient information for what to do”

**Statement 24:** *There are adequate help for processes in the pages.*

All of the students replied this statement. 30 students are neutral, 11 students are disagree and 24 students (21 agree and 3 strongly agree) are agree with this statement.

The mean score of the students who used their own mobile phones is 3,33. 4 of these students neutral and 2 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



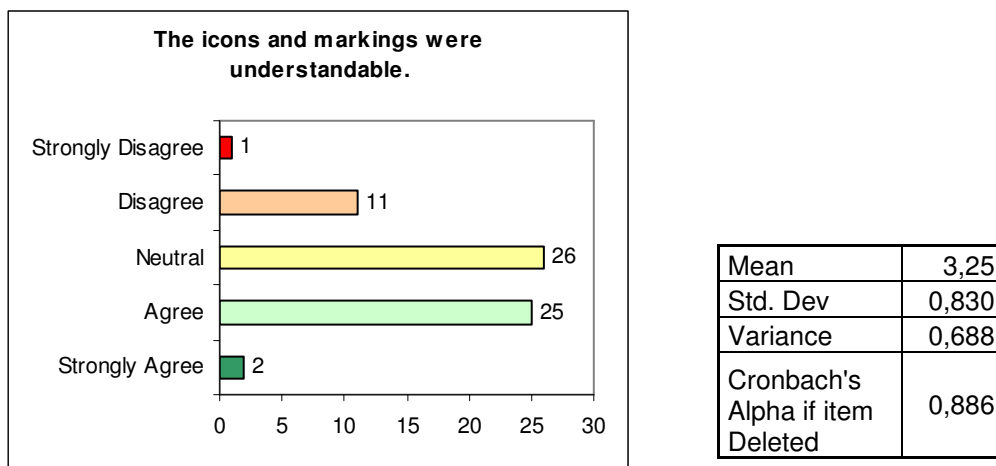
**Figure 29:** Graph of “There are adequate help for processes in the pages”

**Statement 25:** *The icons and markings were understandable.*

All of the students replied this statement. Number of neutral students (26) are nearly equal to number of agree students (25 agree and 2 strongly agree).

The mean score of the students who used their own mobile phones is 3,00. 2 of these students disagree, 2 of these students neutral and 2 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



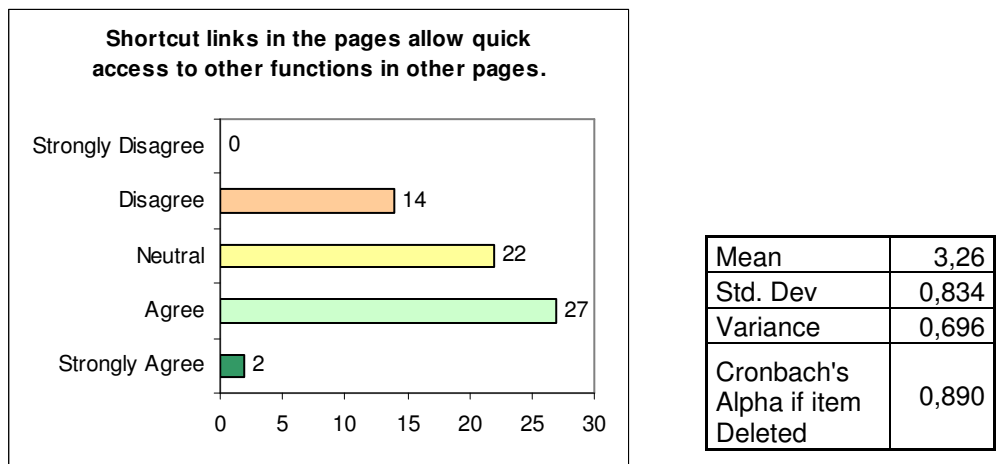
**Figure 30:** Graph of “The icons and markings were understandable”

**Statement 26:** *Shortcut links in the pages allow quick access to functions in other pages.*

All of the students replied this statement. Most of the students (27 agree and 2 strongly agree) agree that shortcut links allow quick access to other pages.

The mean score of the students who used their own mobile phones is 3,00. 1 of these students disagree, 4 of these students neutral and 1 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



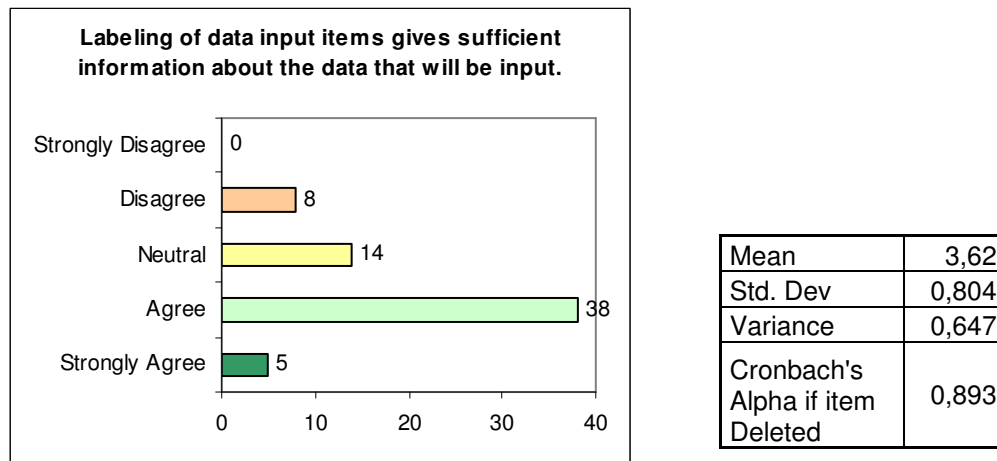
**Figure 31:** Graph of “Shortcut links in the pages allow quick access to functions in other pages”

**Statement 27:** *Labeling of data input items gives sufficient information about the data that will be input.*

All of the students replied this statement. Most of the students (38 agree and 5 strongly agree) agree with this statement.

The mean score of the students who used their own mobile phones is 4,17. 5 of these students strongly agree and 1 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is not much affected.



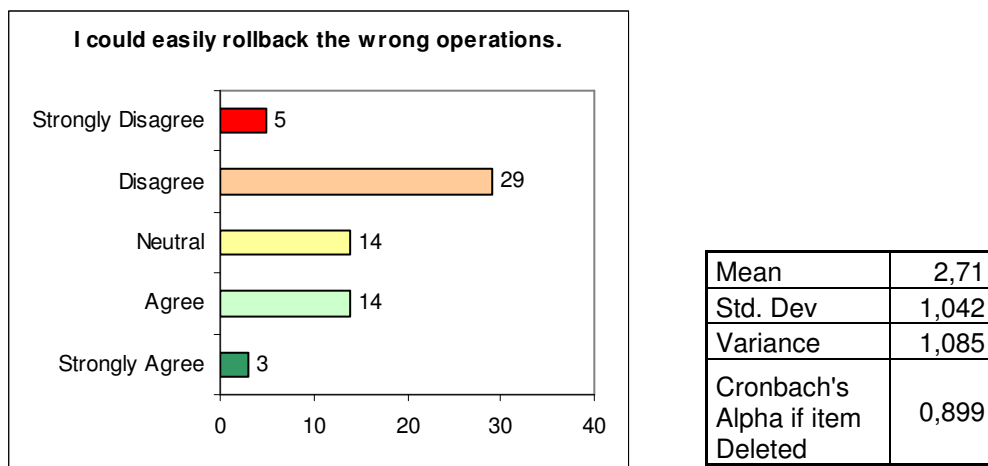
**Figure 32:** Graph of “Labeling of data input items gives sufficient information about the data that will be input”

**Statement 28:** *I could easily rollback the wrong operations.*

All of the students replied this statement. Most of the students (29 disagree and 5 strongly disagree) disagree with this statement.

The mean score of the students who used their own mobile phones is 2,67. 2 of these students strongly disagree and 4 of these students neutral with this statement.

In reliability analysis this statement was found unreliable because if we delete this item from the instrument the Cronbach's Alpha is increasing.



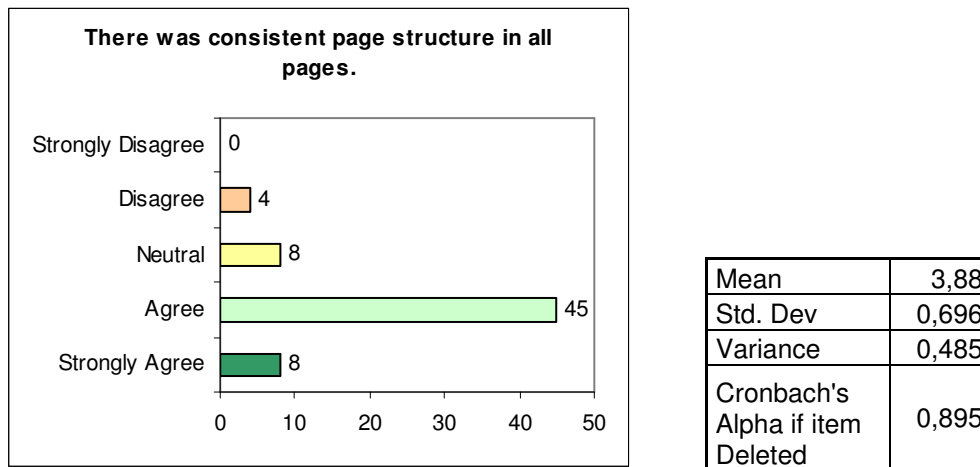
**Figure 33:** Graph of “I could easily rollback the wrong operations”

**Statement 29:** *There was consistent page structure in all pages.*

All of the students replied this statement. Most of the students (45 agree and 8 strongly agree) agree with this statement.

The mean score of the students who used their own mobile phones is 4,17. 5 of these students agree and 1 of these students strongly agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha does not increase much.



**Figure 34:** Graph of “There was consistent page structure in all pages”

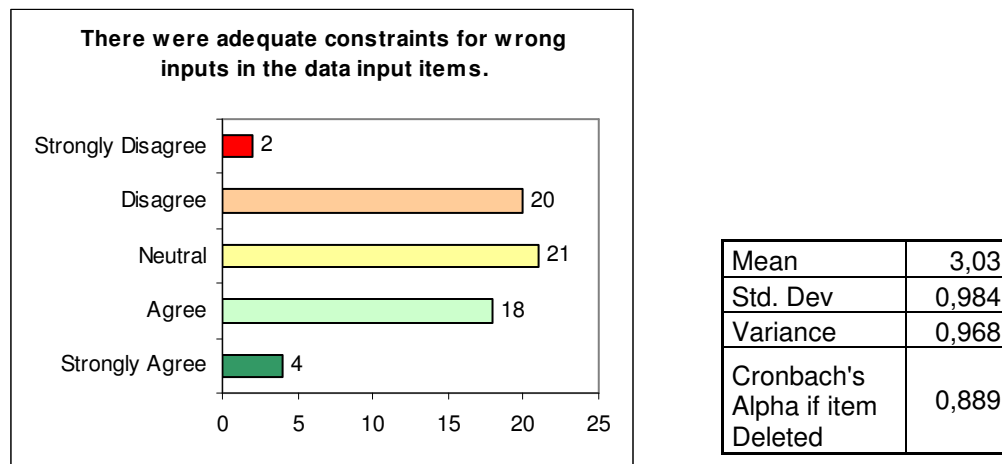


**Statement 30:** *There were adequate constraints for wrong inputs in the data input items.*

All of the students replied this statement. The number of agree (18 agree and 4 strongly agree) and disagree (20 disagree and 2 strongly disagree) students are similar.

The mean score of the students who used their own mobile phones is 3,00. 1 of these students disagree, 4 of these students neutral and 1 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



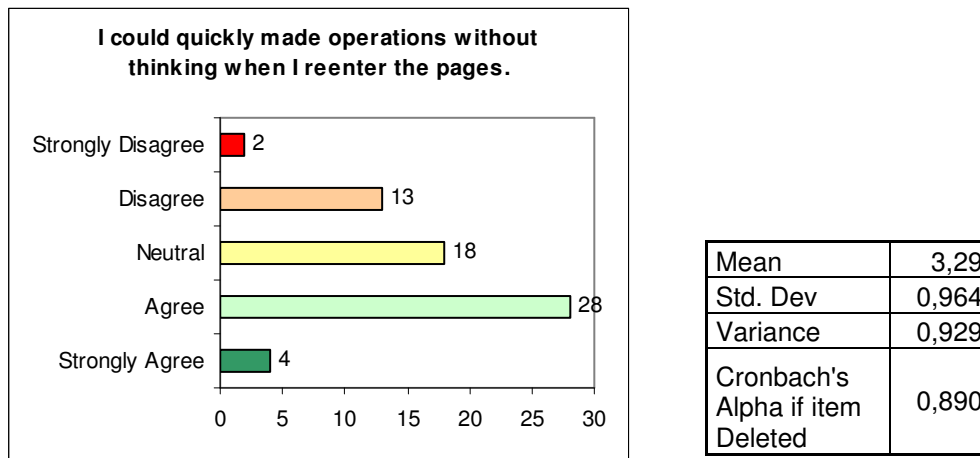
**Figure 35:** Graph of "There were adequate constraints for wrong inputs in the data input items"

**Statement 31:** *I could quickly made operations without thinking when I reenter the pages.*

All of the students replied this statement. Most of the students (28 agree and 4 strongly agree) agree with this statement.

The mean score of the students who used their own mobile phones is 3,17. 2 of these students disagree, 1 of these students neutral and 3 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



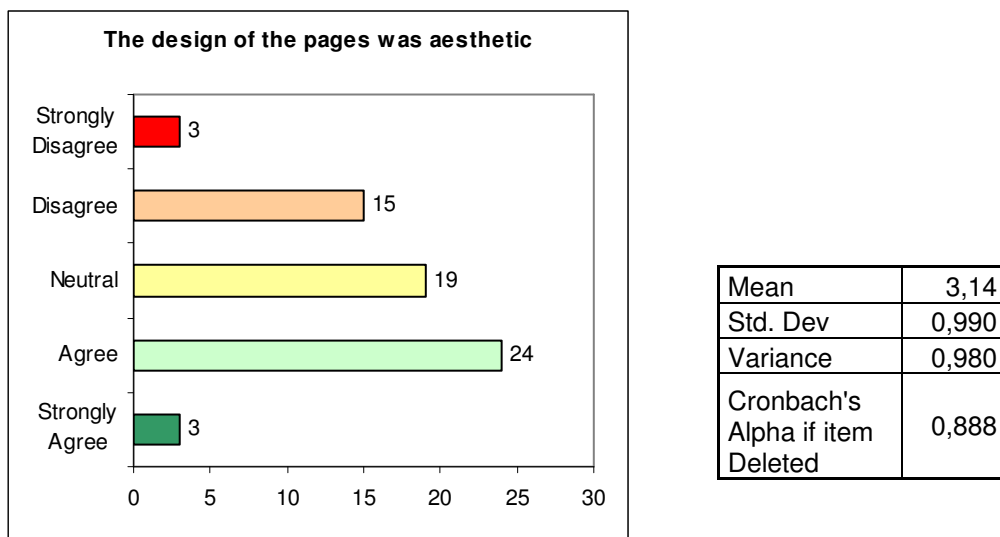
**Figure 36:** Graph of “I could quickly made operations without thinking when I reenter the pages”

**Statement 32:** *The design of the pages was aesthetic.*

64 of the 65 students replied this statement. Most of the students (24 agree and 3 strongly agree) agree with this statement.

The mean score of the students who used their own mobile phones is 3,17. 2 of these students disagree, 1 of these students neutral and 3 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



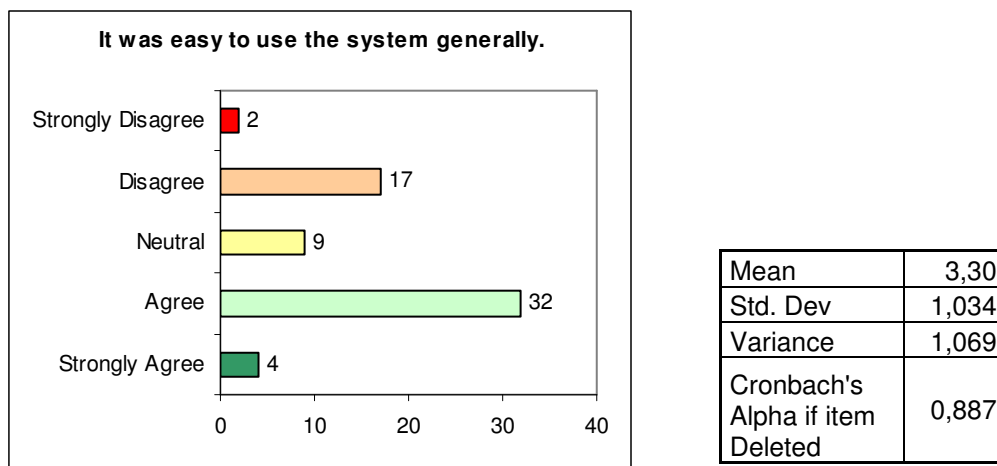
**Figure 37:** Graph of “The design of the pages was aesthetic”

**Statement 33:** *It was easy to use the system generally.*

64 of the 65 students replied this statement. Most of the students (32 agree and 4 strongly agree) agree with this statement.

The mean score of the students who used their own mobile phones is 3,83. 1 of these students neutral and 5 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



**Figure 38:** Graph of “It was easy to use the system generally”

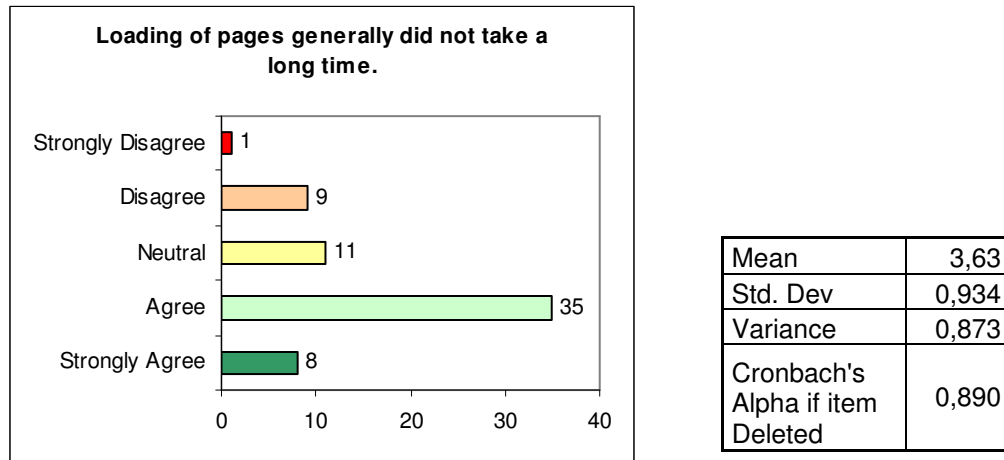
#### 4.2.2.3 Research Question 2.3: What are the Perceptions of Students about Mobile Communication Technologies?

**Statement 34:** *Loading of pages generally did not take a long time.*

64 of the 65 students replied this statement. Most of the students (35 agree and 8 strongly agree) agree with this statement.

The mean score of the students who used their own mobile phones is 3,33. 2 of these students disagree and 4 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



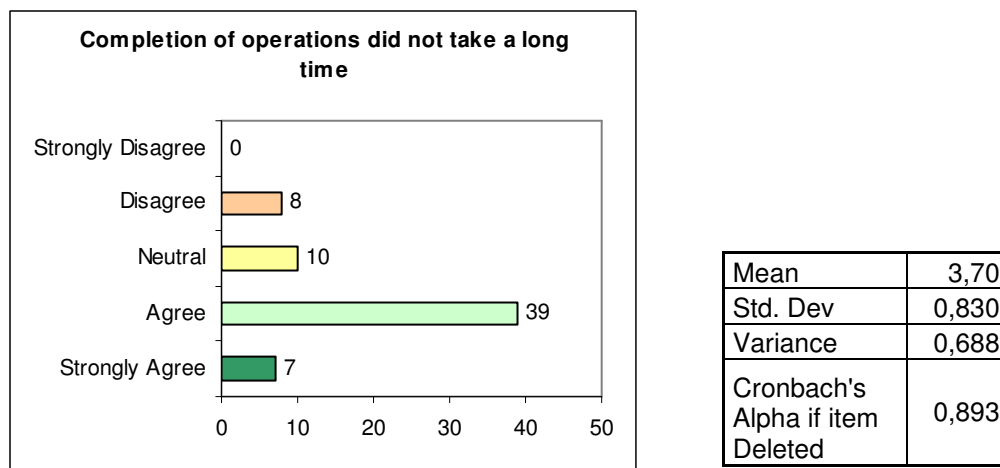
**Figure 39:** Graph of “Loading of pages generally did not take a long time”

**Statement 35:** *Completion of operations did not take a long time.*

64 of the 65 students replied this statement. Most of the students (39 agree and 7 strongly agree) agree with this statement.

The mean score of the students who used their own mobile phones is 3,50. 1 of these students disagree, 1 of these students neutral and 4 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



**Figure 40:** Graph of “Completion of operations did not take a long time”

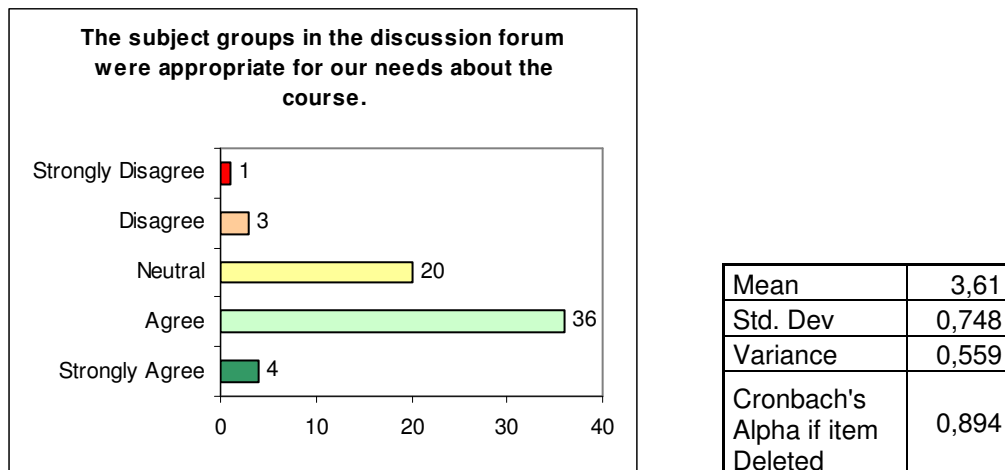
### 4.2.3 Research Question 3: What are the Perceptions of Students about Mobile Discussion Forums?

**Statement 36:** *The subject groups in the discussion forum were appropriate for our needs about the course.*

64 of the 65 students replied this statement. Most of the students (36 agree and 4 strongly agree) agree with this statement.

The mean score of the students who used their own mobile phones is 3,67. 1 of these students disagree, 1 of these students neutral, 3 of these students agree and 1 of these students strongly agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha does not increase much.



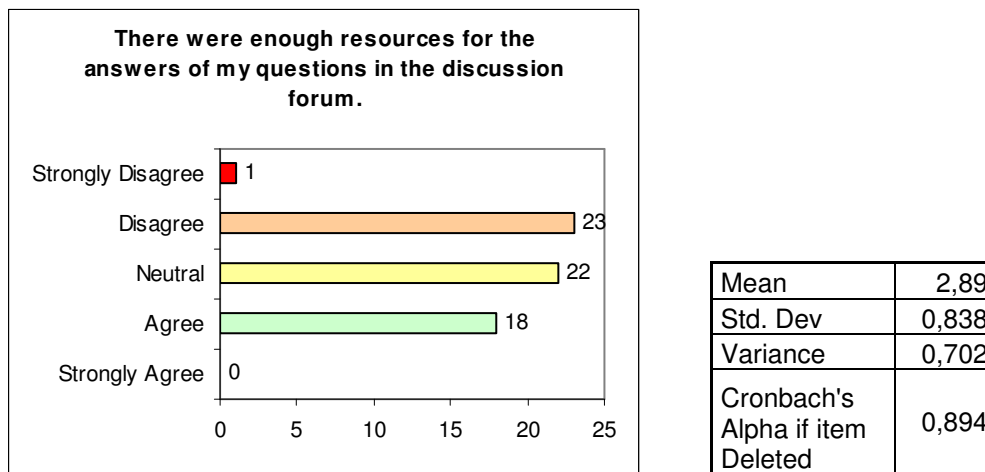
**Figure 41:** Graph of “The subject groups in the discussion forum were appropriate for our needs about the course”

**Statement 37:** *There were enough resources for the answers of my questions in the discussion forum.*

64 of the 65 students replied this statement. Most of the students disagree (23 disagree and 1 strongly disagree) or neutral (22) about this statement.

The mean score of the students who used their own mobile phones is 2,50. 1 of these students strongly disagree, 1 of these students disagree and 4 of these students neutral with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha does not increase much.



**Figure 42:** Graph of “There were enough resources for the answers of my questions in the discussion forum”

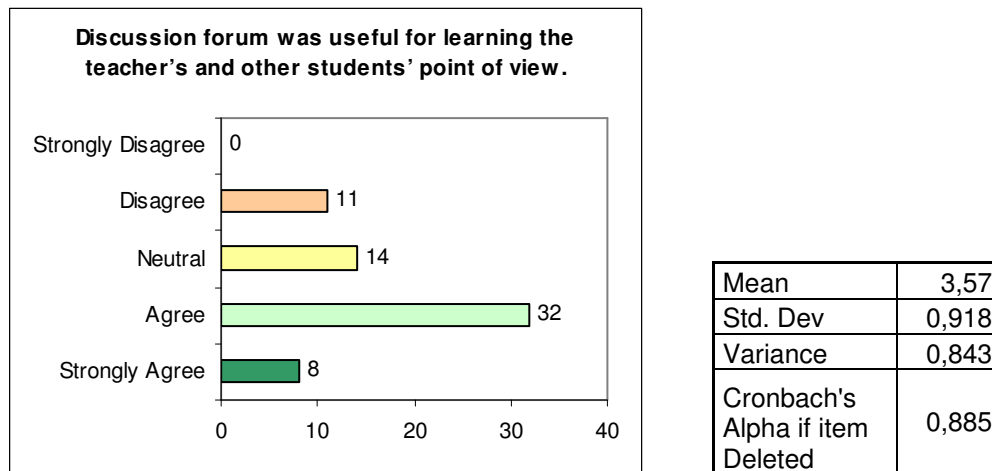


**Statement 38:** *Discussion forum was useful for learning the teacher's and other students' point of view.*

All of the students replied this statement. Most of the students (32 agree and 8 strongly agree) agree with this statement.

The mean score of the students who used their own mobile phones is 3,67. 2 of these students neutral and 4 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



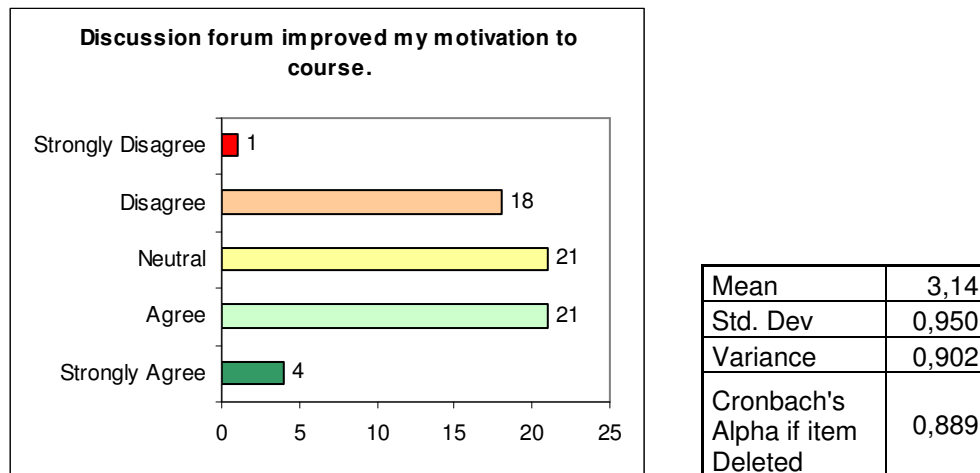
**Figure 43:** Graph of “Discussion forum was useful for learning the teacher’s and other students’ point of view”

**Statement 39:** *Discussion forum improved my motivation to course.*

All of the students replied this statement. Number of agree (21 agree and 4 strongly agree), disagree (18 disagree and 1 strongly disagree) and neutral (21) students are similar.

The mean score of the students who used their own mobile phones is 2,83. 2 of these students disagree, 3 of these students neutral and 1 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



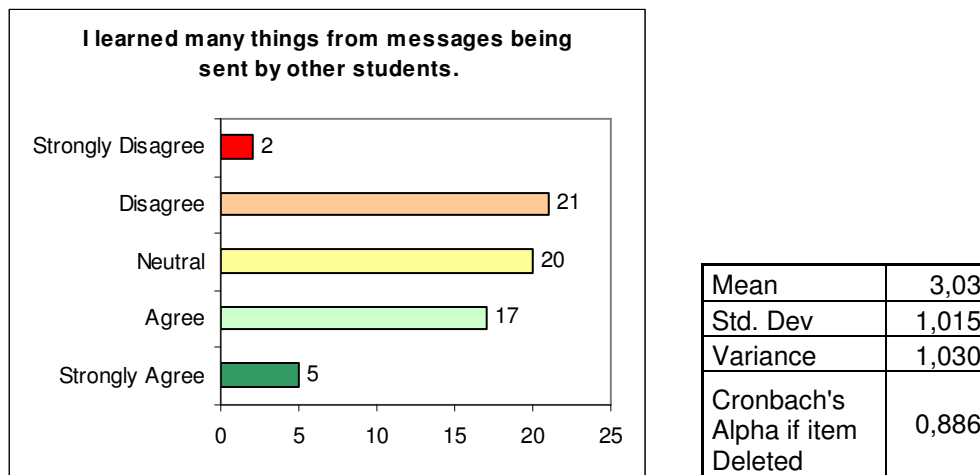
**Figure 44:** Graph of “Discussion forum improved my motivation to course”

**Statement 40:** *I learned many things from messages being sent by other students.*

All of the students replied this statement. Number of agree (17 agree and 5 strongly agree), disagree (21 disagree and 2 strongly disagree) and neutral (20) students are similar.

The mean score of the students who used their own mobile phones is 3,17. 2 of these students disagree, 2 of these students neutral, 1 of these students agree and 1 of these students strongly agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



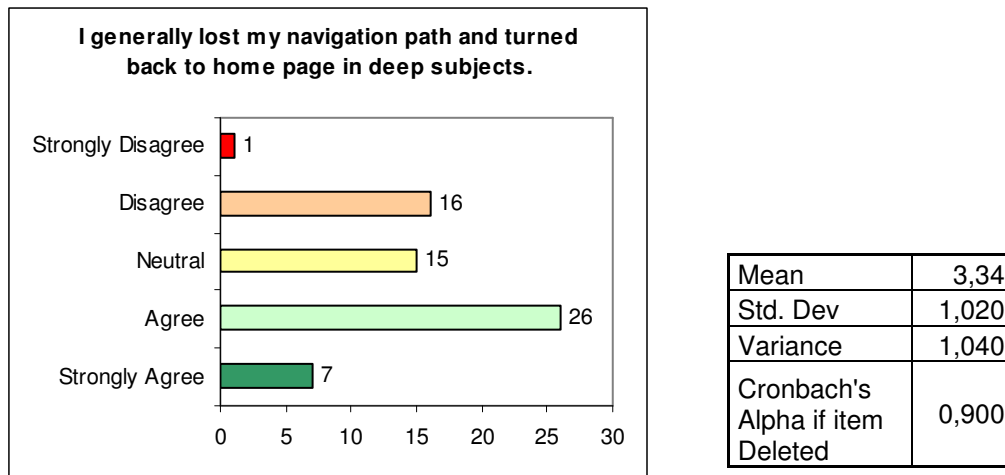
**Figure 45:** Graph of “I learned many things from messages being sent by other students”

**Statement 41:** *I generally lost my navigation path and turned back to home page in deep subjects.*

All of the students replied this statement. Most of the students (26 agree and 7 strongly agree) agree with this statement.

The mean score of the students who used their own mobile phones is 3,00. 2 of these students disagree, 2 of these students neutral and 2 of these students agree with this statement.

In reliability analysis this statement was found unreliable because if we delete this item from the instrument the Cronbach's Alpha is increasing.



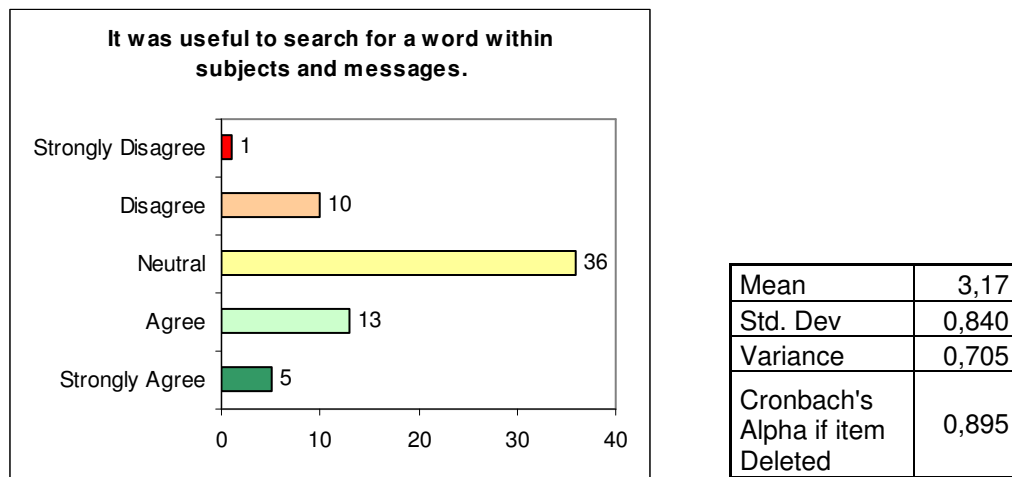
**Figure 46:** Graph of “I generally lost my navigation path and turned back to home page in deep subjects”

**Statement 42:** *It was useful to search for a word within subjects and messages.*

All of the students replied this statement. Most of the students (36) are neutral with this statement.

The mean score of the students who used their own mobile phones is 3,17. 1 of these students disagree, 3 of these students neutral and 2 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha does not increase much.



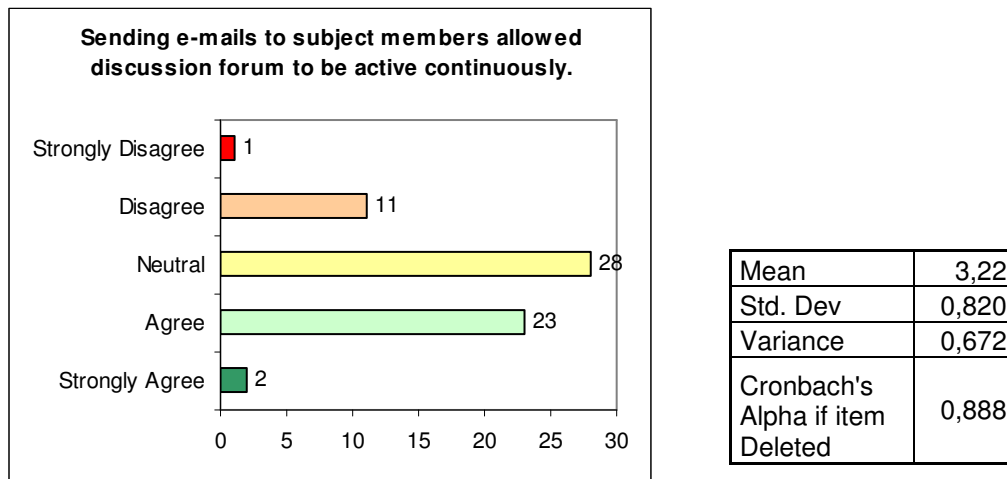
**Figure 47:** Graph of “It was useful to search for a word within subjects and messages”

**Statement 43:** *Sending e-mails to subject members allowed discussion forum to be active continuously.*

All of the students replied this statement. Most of the students (28 of the 65) are neutral with this statement.

The mean score of the students who used their own mobile phones is 3,50. 1 of these students disagree, 1 of these students neutral and 4 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



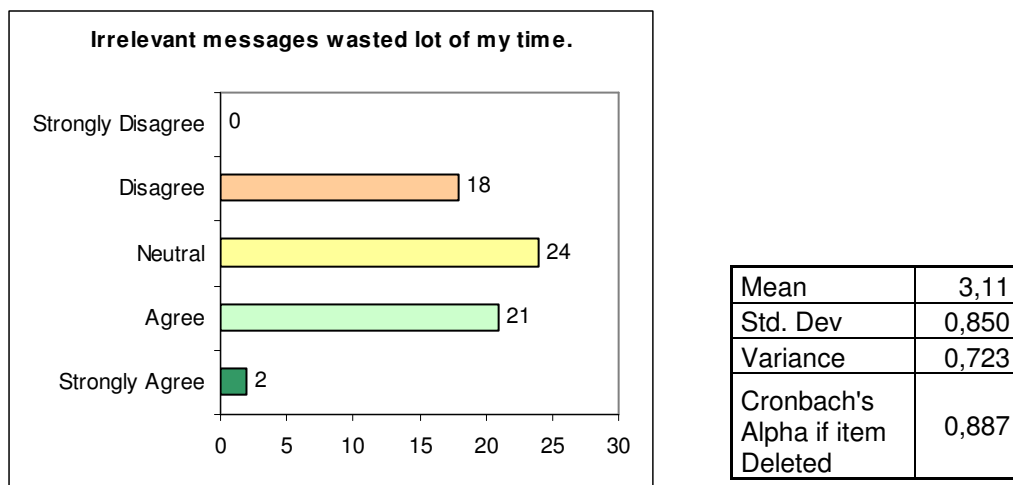
**Figure 48:** Graph of “Sending e-mails to subject members allowed discussion forum to be active continuously”

**Statement 44:** *Irrelevant messages wasted lots of my time.*

All of the students replied this statement. Number of agree (21 agree and 2 strongly agree), disagree (18 disagree) and neutral (24) students are similar.

The mean score of the students who used their own mobile phones is 2,67. 3 of these students disagree, 2 of these students neutral and 1 of these students agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



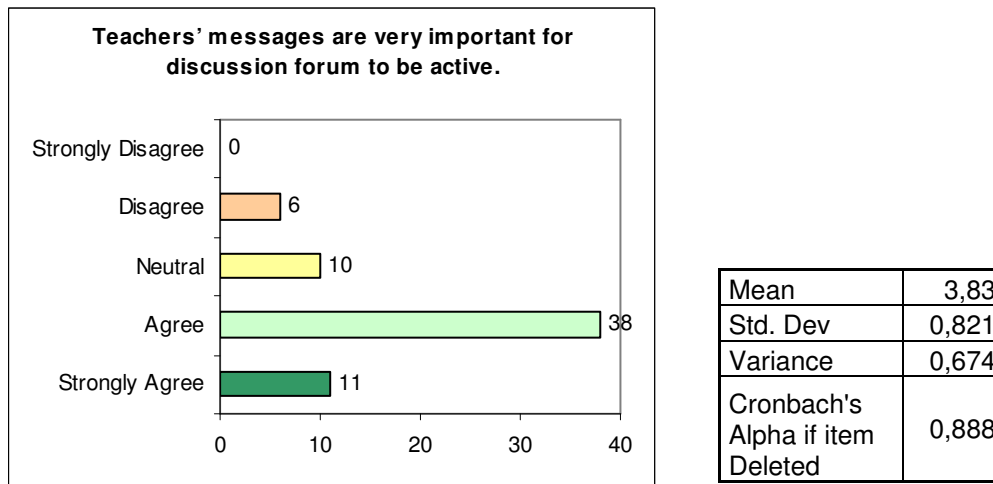
**Figure 49:** Graph of “Irrelevant messages wasted lots of my time”

**Statement 45:** *Teachers' messages are very important for discussion forum to be active.*

All of the students replied this statement. Most of the students are agree (38 agree and 11 strongly agree) with this statement.

The mean score of the students who used their own mobile phones is 4,33. 4 of these students agree and 2 of these students strongly agree with this statement.

In reliability analysis this statement was found reliable because if we delete this item from the instrument the Cronbach's Alpha is decreasing.



**Figure 50:** Graph of “Teachers’ messages are very important for discussion forum to be active”

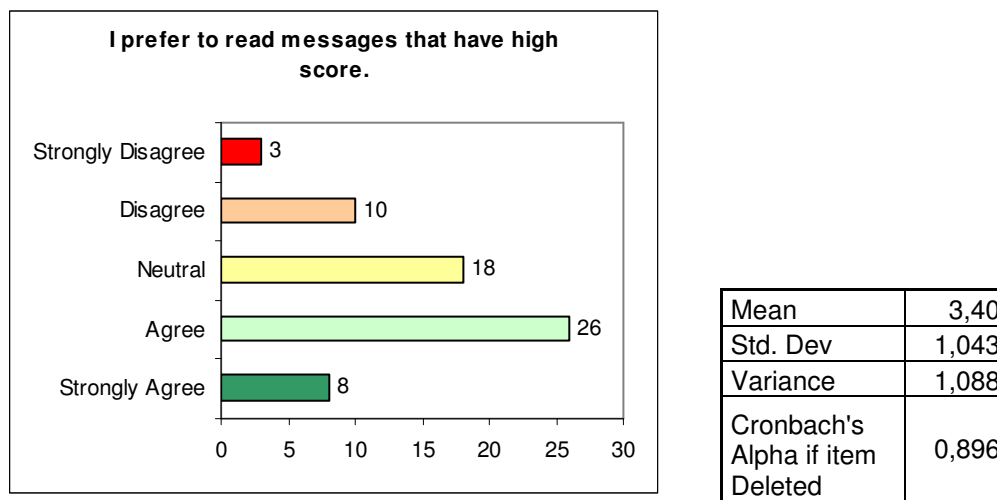


**Statement 46:** *I prefer to read messages that have high score.*

All of the students replied this statement. Most of the students are agree (26 agree and 8 strongly agree) with this statement.

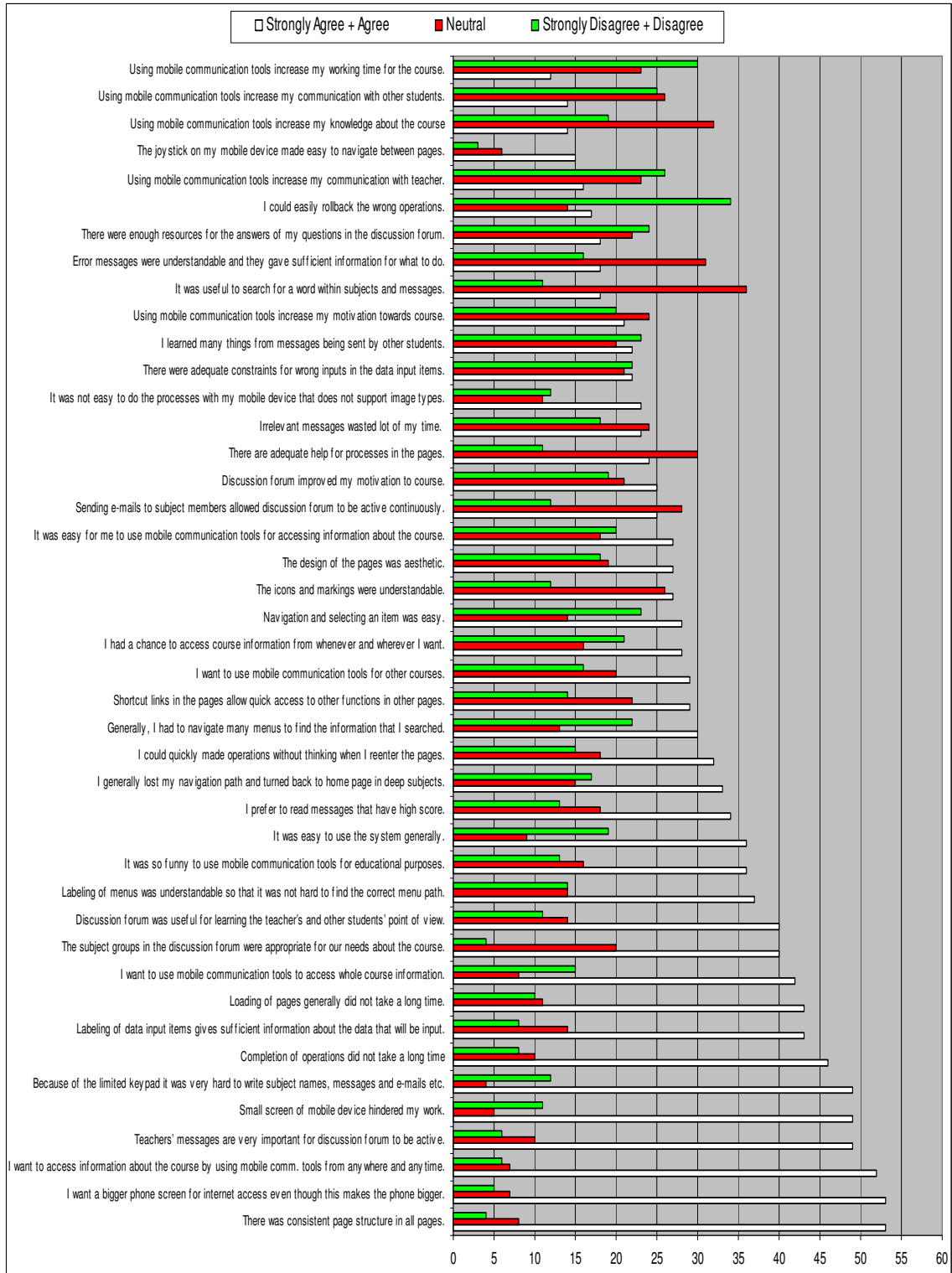
The mean score of the students who used their own mobile phones is 3,67. 1 of these students strongly disagree, 1 of these students disagree, 1 of these students agree and 3 of these students strongly agree with this statement.

In reliability analysis this statement was found unreliable because if we delete this item from the instrument the Cronbach's Alpha is increasing much.



**Figure 51:** Graph of “I prefer to read messages that have high score”

The Figure 52 below shows the overall results of the statements in this study by graphics. These results were ordered according the responses of students'. Positive results were put in the bottom of the graphic and negative results were put on the top of the graphic. “Strongly Agree” and “Agree” results and “Strongly Disagree” and “Disagree” results were added to make easy to understand the graphic.



**Figure 52: Graphical Results of All Statements**

## CHAPTER 5

### 5 DISCUSSION

According to results of Statement 3 (*Using mobile communication tools increase my knowledge about the course*) mobile communication tools did not increase the knowledge of students. Students used this mobile learning portal as supportive learning activities in a course. Forum subjects generally were designed by the instructor of the course according to course content. All of the students replied to this statement and most of them are neutral or disagree with this statement. This is because students generally replied to instructor's messages only and did not read other students' messages. Results of this statement show that mobile communication devices can be used in supportive learning activities rather than replacing the face-to-face instruction or computer based instruction.

Similar result was found in a study in Seneca College (Roberts et. al., 2003). In this study although instructors were moderately satisfied with using PDAs they did not think that using PDAs contribute to student learning. Also contrasting results were found in same study but in Northern Alberta Institute of Technology. In this institute using PDAs improved the students' grades.

Milrad (2004) quoted from Jonassen et al. that to make learning meaningful, technologies must allow learners to be engaged in these activities:

- Knowledge construction,
- Conversation,
- Articulation,
- Collaboration,
- Authenticity,
- Reflection

Students did not see that learning through mobile devices is a meaningful learning. The activities that are organized with mobile devices in this study could

not engage the students into above learning activities. Students reflected their ideas by messages but they did not read and criticize the other students' ideas. This prevented the construction of knowledge and collaboration.

Houser et. al. (2001) also found better results in their vocabulary learning via mobile phone email study. They found statistically significant results that SMS lessons promoted learning.

Wang et. al. (2003) conducted a study with mobile phones and PDAs. The system in their study suggested concepts and quizzes as learning guidance through students' mobile phones and PDAs. %73.4 of students found concept suggestion useful and %79.8 of students found quiz suggestion useful. Also the grades of the experiment group were found better than control group.

According to results of Statement 4 (*Using mobile communication tools increase my motivation towards course*) mobile communication tools did not increase the motivation of students. Using mobile phone simulators may have been affected the results of this statement. If students were used real mobile phones or handheld devices results would be more positive.

Scheele et. al. (2002) found contrasting results in their study. According the results of their study, interactive lecture which all students equipped with Pocket PCs or Palm PDAs, was found interesting and students were more attentive during interactive lecture. Researchers also say that "We believe that the improved learning success is a result of the much higher motivation and level of attention of the students during Interactive Lectures." (p.3)

According to results of Statement 5 (*Using mobile communication tools increase my communication with other students*) mobile communication tools did not increase the communication between students. Generally it is expected that students will respond positively to this statement because the main advantage of mobile communication tools is "communication". The type of usage of mobile communication tools negatively affected this conclusion. The reason for this is probably similar with statement three. Students did not prefer to read or reply

other students' messages. Using mobile communication tools asynchronously may be another reason for this result. Students did not use these devices for speaking with other students or teacher. Sending or reading messages do not interactive communication ways between students or teachers.

Giunta (2002) found relatively better results with this statement in his similar study. In his study %15 of the students strongly agree, %35 of the students agree and %50 of the students uncertain with the statement "Mobile learning is convenient for communication with other course students".

Current research paradigms are moving towards constructivist models and collaboration and interaction between students are the main learning strategies. Milrad (2004) argues that "...knowledge is jointly constructed in interaction". Lundin and Magnuson (2003), says that "In collaborative learning, discussions among the participants are essential" (p.275). Attawell and Savil-Smith (2003) list the advantages of palmtop computers for learning and they put "help support both independent and collaborative learning" (p.5) statement in this list. These sentences show that mobile discussion forums -because of their known communication capabilities- can help collaborative learning and they can increase the interaction between students. The results of this statement do not prove the reliability of these sentences.

Results of Statement 6 (*I had a chance to access course information from whenever and wherever I want*) show that most of the students did not have a chance to access course information from anywhere and anytime. Using mobile phone simulators negatively affected this statement because it eliminates the most important function of mobile devices that they allow access to information from anywhere and anytime.

However, 28 students (26+2) agree with this statement. Accessing information from anywhere and anytime is the main concept in mobile learning. Hummel and Hlavacs (2002) support this view and they say that "It is expected, that the enabling technologies foster a paradigm shift in learning, stressing on

communication, direct and on demand exchange of information between students and lecturers just-in-time” (p.2).

Statement 7 (*Using mobile communication tools increase my communication with teacher*) shows that mobile communication tools did not increase the communication between students and teacher. Again the type of usage of mobile communication tools negatively affected this conclusion. Instructors generally created subjects and sent first messages to these subjects. They did not reply to students’ messages.

Giunta (2002) again, found relatively better results with this statement in his similar study. Students in his study %50 agree and %50 uncertain with the statement “Mobile learning is convenient for communication with and feedback from the tutor”.

In the future with the increasing usage of handheld devices, the statements related to communication probably will take more positive results. Nyiri (2002) shows his standpoint by saying “Communication is the source from which m-learning emerges” (p.1).

Results of Statement 8 (*Using mobile communication tools increase my working time for the course*) show that, using mobile communication tools did not increase the working time of the students. Total number of messages (293) being sent by students may affect the results of this statement. Students did not waste much time to read or send messages. Beside this, because of the limited keypad they waste their most of the time for writing messages but they do not assume this time for working time.

Giunta (2002) found relatively better results with this statement in his similar study. Students in his study %15 strongly agree, %50 agree and %35 uncertain with the statement “Mobile learning increases access to education and training”.

Results of Statement 9 (*It was easy for me to use mobile communication tools for accessing information about the course*) show that students found easy

to use mobile communication tools. Relatively high number of students who agreed shows that it is not so hard for students to access information about courses. The number of students agreeing with this statement may increase in the future after experiencing with these technologies.

Homan and Wood (2003) conducted wireless quizzing study and they found that the average response to statement “Overall the wireless PDA is difficult to use” is 2.77 (neutral, 1-5 rating, 1 – Strongly Disagree, 5 – Strongly Agree).

Results of Statement 10 (*It was so fun to use mobile communication tools for educational purposes*) show that students enjoyed using mobile communication tools. Furthermore, these results are considerably positive with respect to above statements.

The results of this statement are also more positive than Giunta’s (2002) research. According to result of his research only %18 of students agree with the statement “This mobile learning experience was fun”. %82 of students is uncertain about this statement.

The average response rate is 3.66 (1-to-5 rating, 1 – Strongly Disagree, 5 – Strongly Agree) for the statement “Overall I have enjoyed using the wireless PDA device to take quizzes in class” in Homan and Wood’s (2003) study.

According to results of statement 11 (*I want to use mobile communication tools for other courses*) students want to use mobile communication tools for other courses. If we compare this statement with statement 10, we see that 3 students which found funny to use mobile communication tools do not want to use them for other courses and 4 students which are in similar situation are neutral.

The result in this statement is better than Giunta’s (2002) research. %30 of students are uncertain, %35 of students are disagree and %35 of students are strongly disagree with the statement “According to my experience I would take another mobile learning course”.

Homan and Wood (2003) found similar results with Giunta. The statement “I want to use wireless PDAs in all of my classes to take quizzes” took negative responses and average response was found 2.89 (1-to-5 rating, 1 – Strongly Disagree, 5 – Strongly Agree).

Most of the students want to access course information from anywhere and anytime (Statement 12 - *I want to access information about the course by using mobile communication tools from anywhere and anytime*). This result show that students want to access course information not only in computer labs or classrooms but also in other locations like from home, from bus or train or from dormitory etc.

Wireless and mobile technologies enable students to learn in authentic environments. Milrad (2004) argues that the main point in problem-based learning (PBL) is solving authentic problems in authentic contexts. Problem based learning needs to access learning resources in more flexible way. Cuartielles et. al. (2003) emphasize this by saying “Furthermore access to learning resources need to be much more flexible both in terms of where and when to access these, since a PBL approach implies that learning most often takes place outside the lecture room, and beyond scheduled teaching hours” (p.1).

Results of Statement 13 (*I want to use mobile communication tools to access whole course information*) show that students also want to access whole course information by using mobile communication tools. Giunta (2002) found similar results in his study. %50 of the students is agree, %35 of the students is uncertain and %20 of the students is disagree with the statement “Mobile learning is convenient for studying course content”.

Students mostly agree with studying course content by using mobile devices but there are technical and pedagogical constraints for doing this. Mobile devices have small screens and limited keypads, also most of them do not support videos and animations. These constraints allow only text-based courses. Beside these, mobile devices generally are used in uncomfortable



places for learning like buses or trains or in queues. These constraints allow for small learning activities like taking small quizzes or reading flash cards. Kurbel and Hilker (2002) say that “Preparing multimedia course material by a course designer or instructor is probably not a candidate for mobile support since this type of work is rather done at a fully equipped office than on the road. Viewing that material as a student, however, or looking up a submission deadline for an exercise are examples where mobile access can be quite useful” (p.468).

Instead of web like interface courses, mobile content must be personalized for students and small modules must be designed. Pen, voice, video or symbol input mechanisms must be used instead of text typed input to enhance interactivity (Shotsberger and Vetter, 2000).

Statement 14 (*What problems may hinder you to use mobile communication tools for a course?*) shows that cost of using mobile communication tools is the most important problem for students. In the near future this will not be a problem, because GSM operators continuously decreasing the cost of WAP and GPRS connections. Another important result is that students do not care about the security problems. Students may think that educational content does not need high security. Responses of students’ about small screen size and limited keypad are distributed. They do not have similar ideas on these issues. Students also give importance to slow data connection speed. Today’s technologies do not allow high communication speed. GSM and GPRS are mostly used technologies in Turkey and these technologies allow voice and text-based communication. Small pictures can be used in WAP-based sites with GPRS connection. Sending videos, mp3 files or animations is impossible with GSM/GPRS networks but in the near future this may be possible with UMTS or WI-FI networks.

Results of Statement 15 (*Small screen of mobile device hindered my work*) show that small screen sizes of the mobile devices affect the students’ performances. In statement 14 students did not give high importance to screen

size of the mobile device but they mostly agree with that small screen size hindered the processes.

Homan and Wood (2003) found similar results in their study. The average response rate of “The screen size of the PDA is too small for use as a quizzing tool” was 3.20 (1-to-5 rating, 1 – Strongly Disagree, 5 – Strongly Agree).

Lim and Lee (2002) say that all students in their study either strongly agree or agree that it is difficult to read messages from the small screen.

Although the above results, Uther (2002) says that “The research on readability and comprehension with small screens shows that even for very small displays of only a few lines of text, users can read and understand information well. These findings encouragingly suggest that small devices can be used effectively for presentation of information.” (p.1)

Most of the students used mouse to click keys on the simulator keypad. This may represent similar keypad usage characteristics of the real mobile phones. Results of Statement 16 (*Because of the limited keypad it was very hard to write subject names, messages and e-mails*) show that it is hard to write sentences for forum subjects, messages and emails. %85 of the students in Lim and Lee’s (2002) study are also agree that it is difficult to write messages.

Similarly, Waycott (2002) found similar results in his study with PDAs. Students in his study experienced some difficulties when taking notes about course materials although PDAs have new methods for note taking.

It is interesting that students did not give high importance to limited keypad in statement 14, but in this statement most of them agree that it is hard to use small keypads. Students probably think that they may become accustomed with limited keypads after using some time.

Statement 17 (*I want a bigger phone screen for internet access even though this makes the phone bigger*) shows that most of the students want mobile phones that have big screens. Many mobile phone companies try to make phones smaller for carrying. Increasing usage of mobile phones for

accessing the internet probably will change this trend. Users need bigger screen for browsing or educational applications.

Openwave mobile phone simulator does not support GIF or BMP images. Because of this most of the students saw the appropriate characters instead of images when using **BöteMobile**. Statement 18 (*It was not easy to do the processes with my mobile device that does not support image types*) shows that nearly half of the students found difficult to use text-based screens.

Giunta (2002) also found similar results in his study. %53 of the students is strongly agree and %47 of the students is agree with the statement “For mobile learning to be effective it is necessary to use graphics and illustrations”.

Using images and icons is especially important for educational applications. Dillon (2002) imply the importance of images and icons with these sentences: “Screen ‘real estate’ is a limited commodity, so designers seek means of conveying concepts and actions through the medium of signs, images and symbols. Another reason for iconic interfaces is their independence of language and their presumed ability to cross cultural boundaries” (p.4).

Joysticks are generally used for navigation. Openwave simulator has up, down, right and left keys on it like joystick to make easy to navigate. Students did not assume that these keys completely represent the real joystick characteristics because real joysticks do not include four keys. They only include a bar that can be round around it. Because of this, most of the students did not reply to Statement 19 (*The joystick on my mobile device made easy to navigate between pages*).

Kiili (2002) conducted a study for evaluating WAP usability. In this study he used Nokia 7110 WAP mobile phone. This phone has a navi roller which is a type of joystick. He found that many students had some difficulties with navi roller. Users tried to use navi roller for actions which could be done more easily with other buttons.

Navigation is one of the big problems in mobile software development, because users have to press a key for each link. If there are long links or long texts it may be harder to find desired information. According to results of Statement 20 (*Navigation and selecting an item was easy*) number of agree and disagree students are similar about navigation difficulty.

The results in Giunta's study are better than this study. %18 of the students is strongly agree, % 70 of the students is agree and %12 of the students is uncertain about the statement "Navigation through the mobile learning course was easy". Lim and Lee (2002) also found that students have navigation problems with WAP-enabled discussion forums.

Menu structure in **BöteMobile** was designed to allow quick access to most visited pages. Although, menu deepest could not controlled because students were free to create subjects or send messages one within the other. The list below shows the number of pages students have to visit to achieve some goals in **BöteMobile**:

- Learning assignment grades: 6 pages have to be visited
- Creating a subject at the top level: 5 pages have to be visited
- Sending a message in the top level subject: 6 pages have to be visited
- Read announcement: 6 pages have to be visited

Navigation is one of the most important usability problems in mobile web sites. Users had to move many pages to achieve their goals. Results of Statement 21 (*Generally, I had to navigate many menus to find the information that I searched*) show that many students found difficult to search the desired information in **BöteMobile**. Buchanan et. al. (2001) say that "Indeed, one study suggested that one of the most important factors that discourage use of a WAP site was the number of selection ('clicks') that had to be made to accomplish tasks. The study found that a substantial proportion of the trial users gave up after each click" (p.676)

Small screen sizes of the mobile devices constrain the information presented in the programs. Designers have to limit the labels and additional information about items on the screen. **BöteMobile** was designed according to these principals. Despite of this, it was not so hard to find correct paths for most of the students and they responded positively to Statement 22 (*Labeling of menus was understandable so that it was not hard to find the correct menu path*).

Ramsey and Nielsen (2000) found problems with unclear labels in their study. They say that “Our users often faced unclear labels and menu choices written in special language invented by the WAP designer. .... The need for simple language is even stronger in WAP design, because there is no room to explain non-standard terminology with roll-over effects, icons or captions” (p.2).

The results of the Statement 23 (*Error messages were understandable and they gave sufficient information for what to do*) show that most of the students are neutral about error messages. The reason is most of the students never saw any error messages. Many errors generally occur because of GSM/GPRS network system, but most students used Internet (TCP/IP) network for simulator. The error messages in **BöteMobile** were short texts and they did not give technical information. Students generally had to use “back” button or shortcut links under error messages to recover from errors. The error messages in **BöteMobile** generally tell to users that the site or specifically the process is temporarily offline and recommend trying again later. These types of error messages are more understandable than technical messages. Ramsey and Nielsen do not agree with this type of error messages. They say that “Some sites did tell visitors that the site was temporarily offline. Although this is a step in the right direction, it is not in itself a solution. Users can easily spend two or three minutes getting to the site – which adds up to 15 or even 30 pence to get there” (p.25).

Serco (2000) WAP usability guidelines give importance to error messages and say “Make sure that error messages are meaningful, reassuring and helpful (e.g. ‘connection cancelled’ rather than ‘Unknown Abort X5C’). A service that provides clear feedback will win users’ trust more quickly.” (p.2).

Most of the students are neutral about Statement 24 (*There are adequate help for processes in the pages*) because they generally did not visit the help pages. Instead they asked questions to instructors and researcher when they went to school. Additionally, they may have been read the user manual for help. Many mobile phones do not support images or animations. Because of this, help pages were designed to give sufficient information by using short texts. Only the mobile phones that support messages could see the colored and image added help pages. Help page links were put in the bottom of all pages.

Help pages should be designed as simple as possible because the structure of mobile pages is also complex. Help pages should be put on every page for quick access and they must give sufficient information by using small, simple sentences.

There are icons and images for links, subjects and messages in **BöteMobile** if mobile phone supports images. Otherwise students can only see markings like (\*+), (\*), (\*-). Because most of the students used simulators they saw the markings in the pages. Generally they did not care these markings and concentrated on the subjects and messages. Number of agree and disagree students about icons and marking are similar in Statement 25 (*The icons and markings were understandable*).

The importance of images and icons in mobile pages are higher than web based sites because mobile application designers have to show the required processes on small size pages. Also they have to use small images and icons. Designing this type of images and icons requires professional experience.

Some usability guidelines (Openwave, 2001) suggest using smaller pages (500 bytes or less) to minimize network latencies. This can be a good

usability technique for slow networks. Today's networks have enough data connection speed for using images and icons because they increase the size of the pages.

Due to small screen sizes it is impossible to use pull down menus in small mobile applications. Users have two choices to go to other pages: they can go to home page and select the desired page or they can use shortcut links below all pages. Most of the students are agree with the Statement 26 (*Shortcut links in the pages allow quick access to functions in other pages*) that shortcut links allow quick access to other pages.

Shortcut links improve the usability of mobile applications because users can lose their paths in hierarchic structures and these links help users to go to main pages. Serco (2000) usability guidelines also support this view with the sentence "Provide related cross-links to catch users who go down the wrong path" (p.1).

Like labeling menus and links, labeling of data input items in mobile applications require more sensitivity than web based applications. Long label names should not be used otherwise users have to scroll down to find the input items. If there are many items with long labels it will be a time consuming activity to fill all the items. Most of the students agree with the Statement 27 (*Labeling of data input items gives sufficient information about the data that will be input*).

Most of the students disagree with the Statement 28 (*I could easily rollback the wrong operations*). The main wrong operation that the users can do is clicking the wrong link. Users can recover from this error by pressing 'Back' key on keypad or scrolling down to links section on the page and clicking a link. Another wrong operation that the users can do is sending a message in the wrong level or under wrong subject. At this time it is impossible for students to delete these messages. Only the administrators have rights to delete subjects and messages. Students mostly made this error and they complained about the

permission strategy of the system. This increase the number of disagree students.

Another wrong operation that the users can encounter is network errors. At this time it is impossible to recover from this error. Students can only use 'Back' key to recover.

Results of Statement 29 (*There was consistent page structure in all pages.*) show that most of the students found consistent page design in **BöteMobile**. Designing consistent page structure in all pages of a mobile application is harder than web based applications. Mobile Internet Toolkit components that are used in this mobile application help to achieve this result because these components produces same interface regardless of the mobile device.

The pages in **BöteMobile** generally are designed in three sections. First section includes the functions like 'Create Subject' or 'Send Message'. Second section lists the records from database like subject list or message list. The third section includes links to make easy to navigate between pages. These three sections were put in all pages to make consistent page structure.

Number of agree and disagree students are similar in Statement 30 (*There were adequate constraints for wrong inputs in the data input items*). Mobile Internet Toolkit has enough components to constraint the user inputs. All of the input items in **BöteMobile** were controlled with these components. Openwave (2001) usability guidelines also offer to constrain text input fields with format attribute to only allow valid character types.

**BöteMobile** were designed for accessing from different devices. Similar page structures can be seen in all devices. Structure of the pages can be easily recognized from different devices or same devices. Because of this most of the students agree with the Statement 31 (*I could quickly made operations without thinking when I reenter the pages*).



According to Nielsen (1994) recognition rather than recall is one of the most important usability characteristics of web sites. He says that “Make objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.”

Most of the students found easy to use **BöteMobile** in Statement 33 (*It was easy to use the system generally*). Ring (2001), found similar results in his study. %93 of the students strongly agree/agree with the statement “I found it easy to access the course via the phone.”

Most of the students in this study used mobile phone simulators with internet networks. 6 of the 65 students mostly used GPRS networks. The results of the Statement 34 (*Loading of pages generally did not take a long time*) do not completely represent the connection speed of GPRS networks.

Like the same reasons with Statement 34, the results of the Statement 35 (*Completion of operations did not take a long time*) do not completely represent the connection speed of GPRS networks. Loading of subject lists and message lists can take long time. Many subjects are created and many messages are sent every day. The time for loading these pages can change according to number of subjects/messages.

Subject groups generally were created by instructors of the courses. Instructors selected a subject related to course content of the week. Additionally some students created their own subjects to make discussion about them. Statement 36 (*The subject groups in the discussion forum were appropriate for our needs about the course*) was put in the instrument because the response rate of this statement validates the other statements related to discussion forum.

Most of the students responded negatively to Statement 37 (*There were enough resources for the answers of my questions in the discussion forum*). Although the negative responses of students' in this study, Helic et. al. (2002) says that “Although discussion forums are primarily used as communication

tools, we believe that they have even larger application potential, which goes far beyond a simple communication tool. Particularly, we believe that discussion forums in WBE systems contain tremendous educational potential. For example, these discussion forums contain question and answer dialogues, discussions, or examples made by previous learners.” (p.2.).

Most of the students agree with the Statement 38 (*Discussion forum was useful for learning the teacher's and other students' point of view*). Wu and Hiltz (2004) found similar results in their web based discussion forum study. %23.5 of the students strongly agrees and %54.8 of the students agrees with the statement about discussion forums “A great chance to share opinions among peers and instructor”.

Similarly, in Helic's et al. (2002) study, %80 of the students saw tremendous advantages using a discussion forum and they like to exchange their views and ideas with other students and teachers in web based discussion forum rather than traditional course.

The results of Statement 39 (*Discussion forum improved my motivation to course*) show that number of agree, disagree and neutral students are similar about the contributions of mobile discussion forum to their motivation. Wu and Hiltz (2004) found similar results in their web based discussion forum study. %5.2 of the students strongly agree, %39.7 of the students agree, %34.5 of the students neutral about the statement “Motivation to learn more”.

Again, the number of agree, disagree and neutral students are similar about Statement 40 (*I learned many things from messages being sent by other students*). Lim and Lee (2002) found better results in their study. They say that “In the survey that was conducted at the end of the course, %65 of the students agreed that WAP technology has helped to build a learning community. They believed that the WAP-based forum has formed a closely-knit group, and everyone was able to participate and learn from each other.” (p.7).

Wu and Hitz (2004) also found better results in their web based discussion forum. %11.2 of the students strongly agree, %45.7 of the students agree and %30.2 of the students neutral about the statement “Learn great deal from peers”.

The results of Statement 41 (*I generally lost my navigation path and turned back to home page in deep subjects*) show that students found difficult to use the structure of the discussion forum. The tree like structure of the discussion forum was designed according to semantic model offered by Helic et. al. (2002). Taxonomy type of semantic modeling which includes a hierarchy of concepts and sub-concepts was used. This model allows users to create sub-subjects under subjects if there are not any messages under subjects. This model allows finding the desired information by looking the logical relations between subjects and sub-subjects. However this model allows deep page structures and it can take a long time to find desired information by searching logically. Also, searching through mobile devices is increasing the difficulty level. The level of the hierarchy should not be deep to take the average of this type of modeling.

Most of the students are neutral about Statement 42 (*It was useful to search for a word within subjects and messages*). Searching with keywords technique was used to find information especially subjects with deep hierarchy. Students generally did not use the searching pages and this causes the neutral result. Logical search and keyword search can increase the usability of discussion forums with mobile devices.

Most of the students are also neutral about Statement 43 (*Sending e-mails to subject members allowed discussion forum to be active continuously*). Hill (2002) gives two important constraints related to web based discussion forums:

1. Discussion forums are accessible only via personal computers
2. Participants have to check the site for new activity

This study tried to address these two constraints. Using mobile devices can be the solution for first constraint. But the second constraint still continues for mobile devices. Using e-mail messages and SMS messages to alert user about new activities can be the solution for the second constraint. Hill (2002) again says that e-mail messages can not completely solve this problem because users also have to check their email messages.

Number of agree, disagree and neutral students are similar about Statement 44 (*Irrelevant messages wasted lots of my time*). Irrelevant messages increase the load of the discussion forums especially in mobile discussion forums. They increase the scroll time and loading time of the pages. The voting system was developed to solve this problem partially. Users can see the average vote in 1-to-10 rating system for subjects and messages. They can pass the subjects that have low scores and read the messages in the subjects that have high score. Every student can vote any message to inform other users.

Students gave high importance to instructors' messages in Statement 45 (*Teachers' messages are very important for discussion forum to be active*). Wu and Hiltz (2004) found similar results for the statement "Instructor plays a critical role to motivate effective online discussion". %14.8 of the students strongly agrees and %53.4 of the students agrees with this statement.

Most of the students are agree with the Statement 46 (*I prefer to read messages that have high score*). Maurer et. al. (1999) agrees that such a grading system is a powerful functionality for discussion forums. They also offer that collecting interesting contributions in a private workspace may increase the functionality of discussion forums.

Helic et. al. (2002) says that "Further, assigning and voting for contributions represented a practical test of how well they understood topics from the subject matter and how able they were to relate ideas presented in contributions to concepts from the taxonomy." (p.9)

## CHAPTER 6

### 6 CONCLUSION & RECOMMENDATIONS

#### 6.1 Conclusion

We can conclude from the results of this study that mobile devices can help to acquire meaningful learning if in- or outside class activities are fully integrated with the course. First of all, instructors must use these devices effectively and manage the course around the mobile devices. Using mobile devices can increase the motivation of the students towards courses but again individual and collaborative activities must be organized. These activities also can help to increase the communication between students.

Mobile devices can give students the opportunity to gain access to educational information from anytime and anywhere and instructors can use these devices to give feedback and to inform students quickly. This can also increase the student-instructor communication.

Mobile discussion forums can give small but meaningful information to students. Reading small amounts information by using mobile devices does not increase the working time of the students. The study time of the students can be increased by putting the whole course content to the mobile format. However, putting the whole course content to the mobile format needs different design techniques. The course content should be put in the mobile format by applying appropriate mobile usability principals.

The results of this study show that students can easily use mobile communication tools for accessing course information. Furthermore, students like to use mobile communication tools for educational purposes and they also want to use mobile communication tools in all their courses. Most of the students want to access information about the course from anywhere and anytime and

they want to access the entire course content by using mobile communication tools.

Most of the students give a great deal of importance to the cost of using mobile communication tools whereas they do not give high importance to data security. Students also give a great deal of importance to data communication speed. Using mobile communication tools takes a long time because of the small screen sizes and limited keypads. Additionally the navigation between pages increases the usage of time. These constraints mostly affect the perceptions of students.

Small screen sizes and limited keypads of the mobile devices may affect the students' performance. However, small keypads may not a big problem for more experienced users. Regardless of their experience level, students want to use mobile devices that have big screens.

There are some properties of mobile devices that make it easy to read, write and navigate. One of these properties is the support for different image types. Mobile usability guidelines generally do not offer to use images because of the communication speed and small screen sizes. Increasing network technology has just removed the speed constraint. Furthermore, students think that even though they are small, images and icons can give important information. It is not mandatory to use big images or animated images. Another property that makes it easy to use mobile devices is the "Joystick". The joystick can help for navigation between pages and lines. Regardless of the joystick, students also found easy to navigate in mobile applications. However, the joystick especially can decrease the time for finding information because results show that it takes some time to find the desired pages in mobile applications.

There are some specific properties of mobile software. One of these properties is small labels due to small screen sizes. According to results of this study students can understand the meaning of small labels in mobile applications. This situation is similar to the small labels of data input items.

Another specific property is small text-based error messages. Small text error messages do not give the sufficient information to students. Instead of writing 'Try again later', the reason of the error and the time for revisiting should be written. The another specific property is small help pages. Small help pages that include a few sentences can give sufficient information to students.

Shortcut links are very important properties of mobile applications and they should be put in all pages. They decrease the time to find desired information and they are also the main way for recovering from the unknown path.

Designing small mobile applications requires different techniques from normal web applications. It is hard to design consistent page structures and aesthetic pages in mobile applications. The results of this study show that even with small mobile applications, consistent and aesthetic pages can be designed.

Generally it is not so hard to use small mobile applications for students in this study. They can easily perform the required operations for mobile discussion forums and course information systems.

Mobile discussion forums which include small information are not enough to respond to all questions of students although mobile discussion forums are useful for learning others' ideas. Mobile discussion forums should be managed carefully by instructors or course assistants to cover all aspects of the course. After that, mobile discussion forums can affect the motivation of the students and allow them to learn from others.

The taxonomy type of semantic modeling in mobile discussion forums can render it hard to obtain information particularly on deep subjects. This type of discussion forums may produce better results for normal web applications because they are generally used with big screens, keyboards and mouse. Searching for keywords can make some improvements for this type of discussion forums.

There are some important characteristics for mobile discussion forums. Sending emails is one of these properties; however it does not guarantee the activity in mobile discussion forums. Irrelevant messages can waste the valuable time of the students. Students want to see the instructors' messages in discussion forums. Grading or voting messages is a meaningful technique for mobile discussion forums.

## **6.2 Recommendations and Further Research**

This thesis was developed within two years. Some different studies were developed before this thesis. A WAP usability study and a research proposal about mobile learning were developed to make improvements to this thesis.

The main difficulty in the design process was to select an educational application. Mobile learning does not have appropriate characteristics for all type applications. Some types of applications also require high budgets to implement in real environment. Budgeting should be calculated carefully before developing the project.

The main difficulty in development process was to search a support for SMS based messaging. Hill (2002) offers alerting users with SMS type messages whenever a new contribution comes to forum. Support for SMS messaging could not be found and excluded from the project. SMS messaging capabilities of mobile devices should be used for further projects.

Another difficulty in development process was developing the discussion forum as a tree like structure. This structure hindered some coding processes. The deepest of the subjects should be limited for both making easy to coding and also for using the forum. Users generally confused with unlimited menu deepest.

The main difficulty in implementation process was to integrate the discussion forum into course activities. The researcher in this study was not an



instructor or research assistant. Generally, instructors in the courses were voluntarily participated to this study. However, if the researcher was an instructor in a course the motivation of the students could be higher than students in this study.

The trend for mobile applications goes towards context-aware or location-aware and individualized applications. Bull et. al. (2003) offers four this type of applications. Wang (2004) says about context awareness that “The awareness of learning context is important. A learning system that examines the learning context shall adapt learning process with respect to context change. Although it is not a new idea, context awareness is increasingly vital in mobile learning because learning context is more dynamic and complex.” (p.1)

Voice based mobile applications are also increasing their popularity in the mobile world. Microsoft has announced Microsoft Speech Application SDK for creating applications that recognize spoken commands and depending on the mode, communicate a spoken or a visual response to the user. Voice based applications can solve the limited keypad problem for data input. Also controlling the applications by voice commands can make easy to navigate between pages.

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## APPENDIX A

### ***BöteMobile* Mobile Learning Portal User Information Form**

#### **Kişisel Bilgiler**

1. Adınız / Soyadınız ?
2. Yaş Grubunuz ?  
 18 – 22       23 – 27       28 – 32       33 - 37       38 – ve daha fazla
3. Cinsiyetiniz ?       Bay       Bayan
4. Eğitim durumunuz nedir ?  
 Lisans Öğrencisi       Yüksek Lisans Öğrencisi       Doktora Öğrencisi
5. Mesleğiniz nedir ? (**Yüksek Lisans ya da Doktora öğrencisiyseniz doldurunuz!**)  
\_\_\_\_\_

#### **İnternet Kullanım Bilgileri**

6. Kaç yıldır İnternet kullanıyorsunuz ?  
 Kullanmıyorum       1 yıldan az       1 – 3 yıl       3 – 5 yıl       6 ve daha fazla
7. Günde ne kadar süre ile İnternet kullanıyorsunuz ?  
 Kullanmıyorum       1 saate yakın       1- 2 saat       2 – 3 saat  
 3 – 4 saat       4 – 5 saat       5 saatten fazla
8. İnternete nereden bağlanıyorsunuz ? ( **Birden fazla seçim yapabilirsiniz!** )  
 Evden       İşten       Okuldan       Yurttan       Diğer (Lütfen yazınız!) \_\_\_\_\_
9. İnternette en çok hangi aktiviteleri kullanıyorsunuz ? (**Birden fazla seçim yapabilirsiniz!**)  
 E-posta       Haberler       Arama       Sohbet(Chat)       E-Öğrenme  
 Alışveriş       Oyun       Hava Durmu       Bankacılık       İndirme (müzik,video,dosya vb.)  
 Diğer (Lütfen Yazınız!) \_\_\_\_\_

#### **Mobil Telefon Kullanım Bilgileri**

10. Mobil bir cihazınız var mı ? ( **Birden fazla seçim yapabilirsiniz!** )  
 Cep Telefonu       Pocket PC       Palm       Smartphone       Diğer (Lütfen yazınız!) \_\_\_\_\_

11. Cep telefonunuzun markası ve modeli nedir? (Cep telefonunuz varsa doldurunuz!)

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12. Cep telefonunuzun grafik ekranı var mı? (Cep telefonunuz varsa doldurunuz!)

- Var       Yok       Bilmiyorum

13. Cep telefonunuzun WAP desteği var mı? (Cep telefonunuz varsa doldurunuz!)

- Var       Yok       Bilmiyorum

14. Cep telefonunuzun GPRS desteği var mı? (Cep telefonunuz varsa doldurunuz!)

- Var       Yok       Bilmiyorum

15. Cep telefonunuzda Joystick (ya da denetim kolu) var mı? (Cep telefonunuz varsa doldurunuz!)

- Var       Yok       Bilmiyorum

16. Hangi GSM operatörünün SIM kartını kullanıyorsunuz? (Birden fazla seçim yapabilirsiniz!)

- AVEA       TURKCELL       TELSİM

17. Kaç yıldır cep telefonu kullanıyorsunuz?

- Cep telefonum yok       6 aydan az       6 ay – 1 yıl  
 1 - 2 yıl       2 – 3 yıl       3 – 4 yıl  
 4 – 5 yıl       5 yıldan fazla

18. Kaç yıldır mobil cihaz kullanıyorsunuz? (Cep telefonu dışında mobil bir cihazınız varsa doldurunuz)

- Mobil cihazım yok       6 aydan az       6 ay – 1 yıl  
 1 - 2 yıl       2 – 3 yıl       3 – 4 yıl  
 4 – 5 yıl       5 yıldan fazla

19. Cep telefonunuzu günde kaç defa biriyle konuşmak için kullanıyorsunuz? (Cep telefonunuz varsa doldurunuz!)

- 1 – 2 defa       3 – 4 defa       5 – 6 defa       7 – 8 defa  
 9 – 10 defa       10 dan fazla       Diğer (Lütfen yazınız!) \_\_\_\_\_

20. Günde ortalama kaç SMS yolluyorsunuz? (Cep telefonunuz varsa doldurunuz!)

- 1 – 2 defa       3 – 4 defa       5 – 6 defa       7 – 8 defa  
 9 – 10 defa       10 dan fazla       Diğer (Lütfen yazınız!) \_\_\_\_\_

21. Daha önce hiç İnternete bağlanmak için mobil bir cihaz kullandınız mı?

- Evet       Hayır

22. İnternete bağlanma desteğine sahip olan mobil bir cihaz (cep telefonu ya da diğer mobil cihazlar) almak ister misiniz? (**Eğer böyle bir cihazınız yoksa doldurunuz!**)

- İsterim                       Kararsızım                       İstemem

23. Daha önce hiç İnternete bağlanmak için mobil bir cihaz kullandınız mı?

- Evet                       Hayır

24. İnternete bağlanma desteğine sahip olan mobil bir cihaz (cep telefonu ya da diğer mobil cihazlar) almak ister misiniz? (**Eğer böyle bir cihazınız yoksa doldurunuz!**)

- İsterim                       Kararsızım                       İstemem

## APPENDIX B

### ***BöteMobile* Mobile Learning Portal User Evaluation Form**

Merhaba,

Bu dökümanda yer alan ifadeler, mobile cihazlarla gerçekleştirdiğiniz etkinlikler sonucunda sizin, kişisel bilgileriniz ile mobil eğitim, mobil teknolojiler ve mobil tartışma listeleri hakkındaki duygu ve düşüncelerinizi öğrenebilmek için hazırlanmıştır. Sizin duygu ve düşüncelerinizin ürünü olan bu bilgiler bir yüksek lisans tezi için veri oluşturacaktır. Kişisel bilgileriniz ve ifadeler için belirttiğiniz duygu ve düşünceleriniz kesinlikle bireysel olarak yayınlanmayacak, sadece toplu rakamlar açıklanacaktır. Bu çalışmaya katıldığınız ve destek olduğunuz için hepinize teşekkür ederim.

Bilgin Avenoğlu

ODTÜ - BÖTE

## ***BöteMobile* Mobil Öğrenme Portalı Değerlendirme İfadeleri**

### **Genel Değerlendirme İfadeleri**

- 1. *BöteMobile* sistemini en çok hangi tür cihaz/cihazlar ile kullandınız? (Birden fazla seçim yapabilirsiniz)**
  - a) Simülator
  - b) Cep Telefonu
  - c) Cep Bilgisayarı
  - d) Taşınabilir Bilgisayar (Laptop)
  - e) Kişisel Bilgisayar (Desktop PC)
- 2. *BöteMobile* sistemine bağlanmak için kullandığınız mobil cihazın markası ve modeli nedir?**

**\*\*\* Dikkat \*\*\***

- Simülator ile bağlananlar sadece “Simülator” yazabilirler.
- Birden fazla cihaz yazabilirsiniz

---

### **Mobil Eğitim ile ilgili Değerlendirme İfadeleri**

- 3. Mobil cihazları kullanmak dersle ilgili bilgilerimi artırmama yardımcı oldu.**
  - a) Kesinlikle Katılmıyorum
  - b) Katılmıyorum
  - c) Kararsızım
  - d) Katılıyorum
  - e) Kesinlikle Katılıyorum
- 4. Mobil cihazları kullanmak derse karşı motivasyonumu artırdı.**
  - a) Kesinlikle Katılmıyorum
  - b) Katılmıyorum
  - c) Kararsızım
  - d) Katılıyorum
  - e) Kesinlikle Katılıyorum
- 5. Mobil cihazları kullanmak, diğer öğrenciler ile aramdaki iletişimi artırdı.**
  - a) Kesinlikle Katılmıyorum
  - b) Katılmıyorum
  - c) Kararsızım
  - d) Katılıyorum
  - e) Kesinlikle Katılıyorum

6. Mobil cihazları kullanarak ders ile ilgili bilgilere istediğim zaman ve yerden ulaşma olanağı buldum.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

7. Mobil cihazları kullanmak, öğretmen ile aramdaki iletişimi artırdı.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

8. Mobil cihazları kullanarak dersle ilgili bilgilere erişebilmek, o ders için daha fazla çalışmama olanak sağladı.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

9. Mobil bir cihaz kullanarak dersle ilgili bilgilere erişmek oldukça kolaydı.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

10. Mobil cihazları eğitimsel amaçlı olarak kullanmak oldukça eğlenceliydi.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

11. Diğer derslerde de mobil cihazlardan yararlanmak isterim.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

12. İstediğim her zaman ve her yerden mobil bir cihaz kullanarak dersle ilgili bilgilere erişebilmek isterim.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

13. Mobil cihazları bir dersin içeriğinin tamamına erişebilmek için de kullanmak isterim.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

14. Bir ders için mobil cihazları kullanmanızı engelleyecek nedenler aşağıdakilerden hangileri olabilir?

\*\*\* Dikkat\*\*\*

Lütfen önem derecesine göre en önemli 1, en önemsiz 7 olmak üzere numara yazarak **sıralayınız.**

- \_\_\_\_\_ Fiyatının Pahalı Olması  
\_\_\_\_\_ Veri Erişim Hızının Yavaş Olması  
\_\_\_\_\_ Mobil Cihazların Ekranlarının Küçük Olması  
\_\_\_\_\_ Sınırlı Tuş Sayısının Yazmayı Zorlaştırması  
\_\_\_\_\_ Küçük Bir Cihazla Erişilebilecek Bilginin Sınırlı Olması  
\_\_\_\_\_ Veri Erişiminin Güvenli Olmaması  
\_\_\_\_\_ Bir Bilgiye Ulaşmanın Uzun Zaman Alması

### **Mobil Teknolojiler ile İlgili Değerlendirme İfadeleri**

#### **Mobil Donanım Teknolojileri ile İlgili İfadeler**

15. Kullandığım mobil cihazın ekranının küçük olması işlemleri yapmamı zorlaştırdı.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

16. Mobil cihazımın üzerindeki tuş takımı yetersiz olduğu için konu adı, mesaj, e-posta vb. şeyleri yazmak oldukça zordu.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum



17. Mobil cihazın boyutlarının daha büyük olmasına neden olsa bile, internet erişimi için mobil cihazın ekranının daha büyük olmasını isterim.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

18. Mobil cihazımın resimleri göstermemesi işlemleri yapmamı zorlaştırdı. (Mobil cihazınız resimleri **desteklemiyorsa** bu soruyu işaretleyiniz)

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

19. Mobil cihazımın üzerinde yer alan joystick(ya da denetim kolu) sayfalar üzerinde hareket etmemi kolaylaştırdı (Mobil cihazınızda denetim kolu yoksa bu soruyu boş bırakınız).

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

### **Mobil Yazılım Teknolojileri ile İlgili İfadeler**

20. Menülerde hareket etmek ve bir seçim yapmak kolaydı.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

21. Aradığım bilgiye ulaşabilmek için girmem gereken sayfa sayısı genellikle çok fazlaydı.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

22. Girdiğim sayfalarda yer alan menü isimleri oldukça anlaşılırdı, bu yüzden hangi bilginin hangi menüde olduğunu bulmakta zorlanmadım.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

**23.** Hata mesajları kolaylıkla anlaşılabilirdi ve ne yapmam gerektiği hakkında yeterli bilgi veriyordu.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

**24.** Sayfalarda yer alan işlemlerin kullanımı hakkında yeterli yardım bilgisi vardı.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

**25.** Kullanılan resimler ve işaretlendirmeler oldukça anlaşılırdı.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

**26.** Sayfalarda yer alan kısayol bağlantıları diğer işlemlere hızlıca geçmeye olanak sağladı.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

**27.** Veri giriş alanlarının başlıkları o alana gireceğim veri ile ilgili yeterli bilgi veriyordu.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

**28.** Hatayla yaptığım bir işlemi kolaylıkla geri alabiliyordum.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

**29.** Tüm sayfalarda, sayfa düzeni açısından birbirine benzer, tutarlı bir yapı vardı.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

30. Veri giriři yaparken hatalı giriřleri önlemek için yeterli kısıtlamalar vardı.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

31. Aynı sayfalara yeniden girdiğimde, ne yapacağımı tekrar düşünmeme gerek kalmadan hızlıca işlemleri gerçekleştirebiliyordum.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

32. Sayfaların tasarımı görünüm olarak güzeldi.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

33. Sistemin kullanımı genel olarak kolaydı.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

### **Mobil İletişim Teknolojileri ile İlgili İfadeler**

34. Menülerde bir seçim yaptıktan sonra ilgili sayfaların yüklenmesi genellikle uzun sürmedi.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

35. Bir işlem (konu açma, mesaj gönderme, e-posta gönderme, oylama vs.) yaptıktan sonra işlemin tamamlanması genellikle uzun sürmedi.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

### Mobil Tartışma Listesi ile İlgili Deęerlendirme İfadeleri

36. Tartışma listesinde yer alan konu grupları dersle ilgili ihtiyaçlarıma uygundu.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

37. Aradığım soruların cevaplarını bulabilmek için tartışma listesinde yeterli kaynak vardı.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

38. Tartışma listesi, diğer öğrencilerin ve öğretmenin tartışılan konu ile ilgili görüşlerini anlamak açısından oldukça etkiliydi.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

39. Tartışma listesi derse karşı motivasyonumu artırdı.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

40. Özellikle arkadaşlarımla gönderdiğim mesajlardan dersle ilgili çok fazla şey öğrendim.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

41. İç içe grupların sayısının fazla olduğu konularda genellikle yolumu kaybederek başa dönmek zorunda kaldım.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

42. Konu ve mesajlar içerisinde kelime araması yapabilmek aradığım bilgiyi bulmamı kolaylaştırdı.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

43. Konuyla ilgilenen kişilere aynı zamanda e-posta gönderebilmek konunun sürekli aktif olmasını sağladı.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

44. Dersle ve konuyla çok ilgili olmayan mesajlar büyük ölçüde zaman kaybettirdi.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

45. Tartışma listesinin aktif olması açısından öğretmenin düzenli olarak mesaj göndermesini isterim.

- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

46. Tartışma listesinde çoğunlukla yüksek puan almış mesajları okumayı tercih ettim.

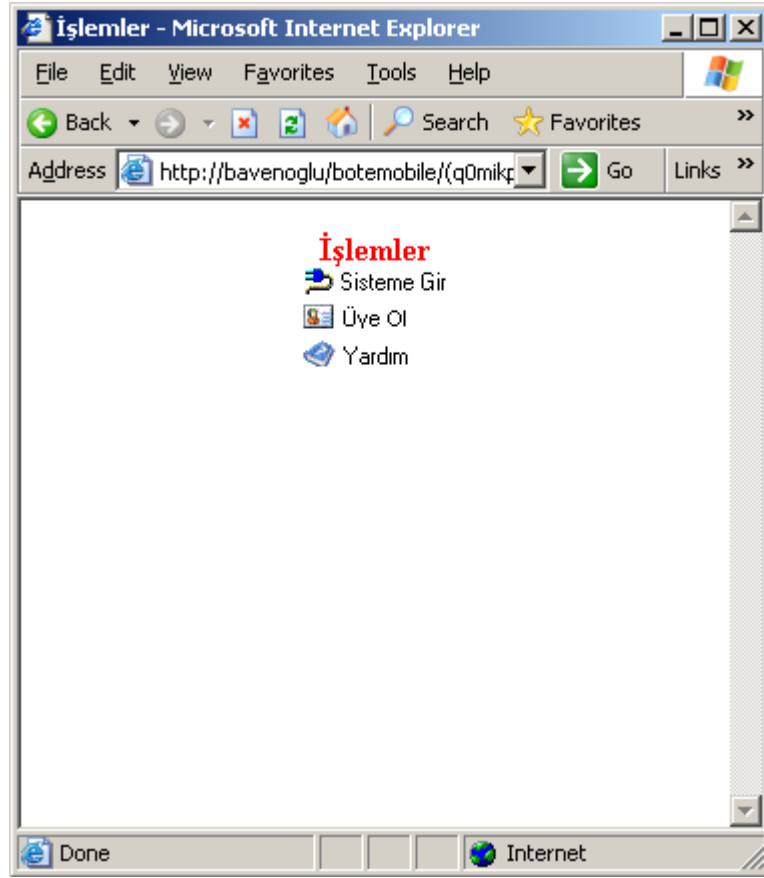
- a) Kesinlikle Katılmıyorum      b) Katılmıyorum      c) Kararsızım  
d) Katılıyorum      e) Kesinlikle Katılıyorum

## APPENDIX C

### *BöteMobile* Mobile Learning Portal Screen Shots



**Figure C.1** Home Page in Openwave Browser Simulator



**Figure C.2** Home Page in Internet Explorer



Figure C.3 Forum Page in Openwave Browser Simulator



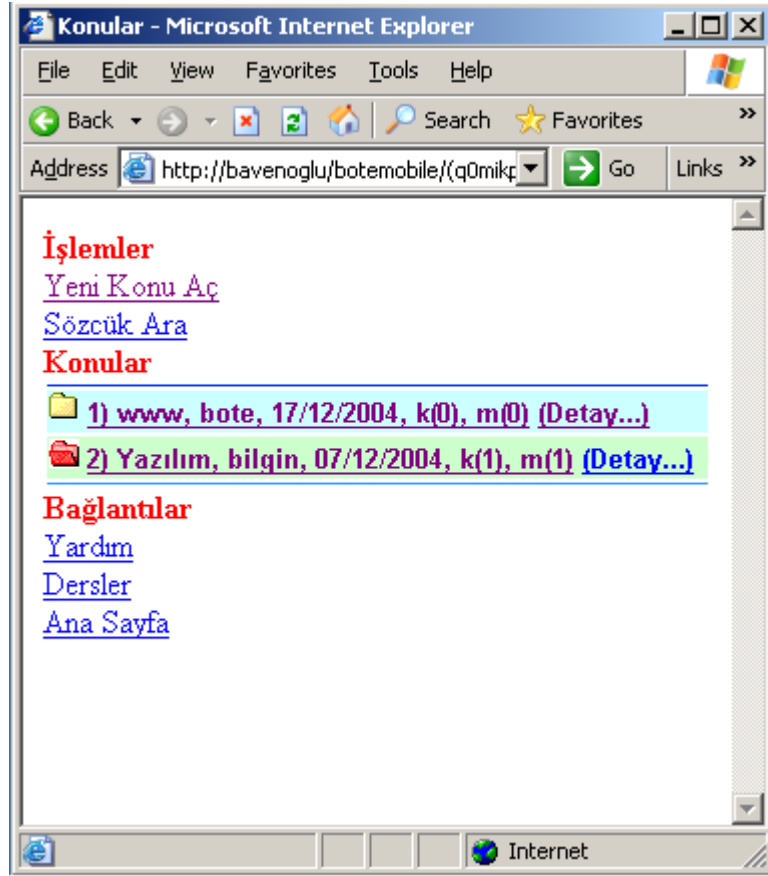
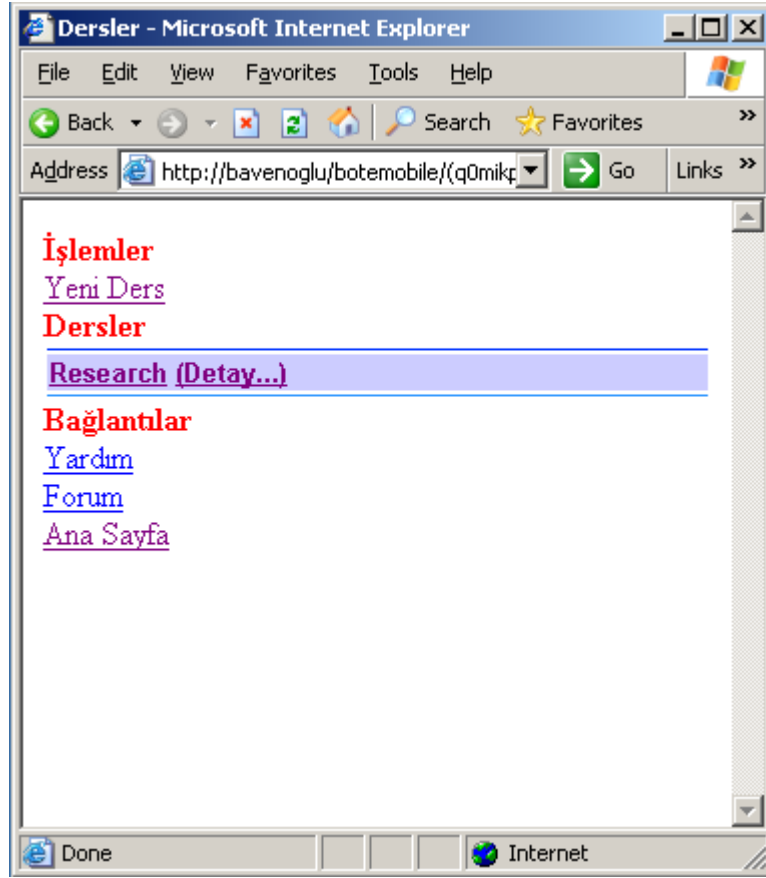


Figure C.4 Forum Page in Internet Explorer



**Figure C.5** Course Page in Openwave Browser Simulator



**Figure C.6** Course Page in Internet Explorer

## APPENDIX D

### **BöteMobile Mobile Learning Portal User Manual**

#### **BöteMobile Mobil Öğrenme Portalı**

**BöteMobile**, öğrencilerin bir dersle ilgili bilgilere her zaman ve her yerden erişebilmeleri için hazırlanmış web tabanlı bir yazılımdır. Bu yazılıma, masüstü bilgisayarlar, cep bilgisayarları ve cep telefonları ile <http://ideas.metu.edu.tr/botemobile> adresinden erişilebilir.

#### **Sisteme Üye Olma**

BoteMobile sistemine girebilmek için öncelikle üye olmalısınız. Üyelik için bir kullanıcı adı (en fazla 20 karakter) ve şifre (en fazla 8 karakter) seçiniz. E-posta bilginizin doğru girilmesi diğer e-postaları ve sınav sonuçlarını öğrenebilmeniz için önemlidir.



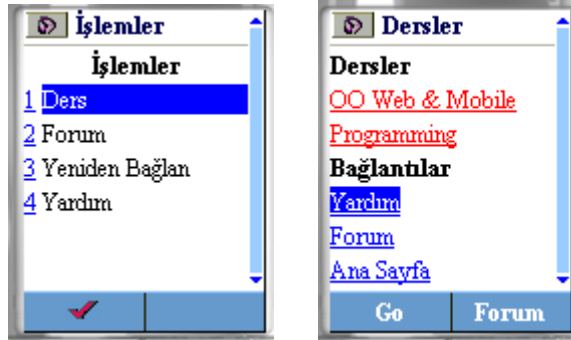
#### **Sisteme Giriş**

Üye olduktan sonra Ana Sayfa'dan "Sisteme Gir" menüsünü seçip Kullanıcı Adı ve Şifrenizi yazarak sisteme girebilirsiniz.

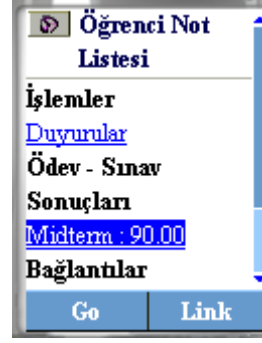


## Ders İşlemleri

Ders işlemleri altında bir ders ile ilgili ödev-sınav tarihlerine ve ödev-sınavlardan aldığınız not bilgilerine erişebilirsiniz. Ayrıca dersin öğretmenin derisle ilgili olarak bıraktığı duyurulara erişebilirsiniz.

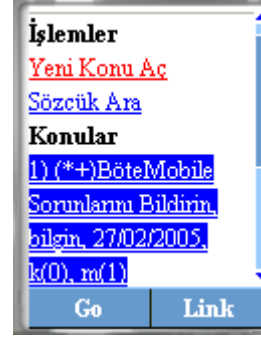
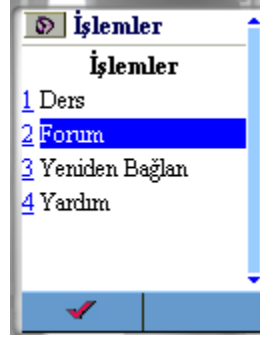


Bir derse ait ödev-sınav bilgilerini görmek için o dersin üzerine gelip seçim yaptıktan sonra "Ödev-Sınav Listele" menüsünü seçin. Karşınıza ödev-sınav sonuçları ve "Duyurular" menüsü gelecektir. Öğretmenin bıraktığı duyuruları görmek için "Duyurular" menüsünü seçin. Ödev-sınavın tarihini görmek için ilgili ödev-sınavı seçip detay bilgilerini görmelisiniz.



## Forum İşlemleri

Forum kısmı öğrencilerin dersle ilgili farklı konularda bilgi alışverişini sağlayabilmek için hazırlanmıştır.



Forum kısmı içerisinde iç-içe sınırsız sayıda konu ve alt konular açabilir, bunların altına da iç-içe mesaj ve yanıt mesajları gönderebilirsiniz. Bir konunun altına mesaj gönderildikten sonra o konu altına başka alt konu açılmaz. Konu açmak için “Yeni Konu Aç” menüsünü seçiniz. Bir konunun içindeki alt konulara ya da mesajlara erişmek için ilgili konuyu seçtikten sonra “Konuları Listele” ya da “Mesajları Listele” seçmelisiniz. Konu ve mesajlar içerisinde kelime araması yapmak için “Sözcük Ara” menüsünü seçmelisiniz. Aşağıda örnek bir konu-mesaj gruplaması gösterilmiştir.

- **Konu 1**
  - + Alt Konu 1.1
    - *Alt Konu 1.1.1*
      - Mesaj (Öğrenci 1)
      - Mesaj(Öğrenci 2)
      - .....
      - Mesaj (Öğrenci 2)
      - Mesaj (Öğretmen 1)
      - .....
    - *Alt Konu 1.1.2*
      - Mesaj (Öğrenci 3)
      - Mesaj (Öğrenci 2)
      - Mesaj (Öğrenci 1)
      - .....
      - Mesaj (Öğretmen 1)
  - .....
  - + Alt Konu 1.2
    - .....
- **Konu 2**
  - .....

Bir konuyu görebilme yetkisi olan tüm kullanıcılara E-posta göndermek için “E-posta Gönder” menüsünü seçmelisiniz. Bu konu “Herkes Açık” bir konu ise e-posta tüm forum kullanıcılarına gönderilir.

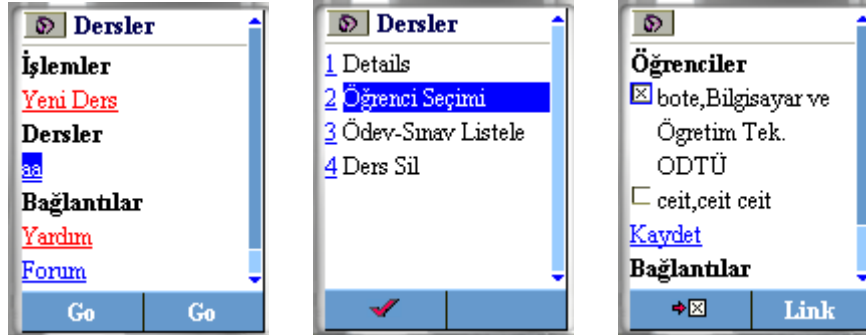


## Yeni Ders Açma

Yeni bir ders açmak için “Dersler” menüsüne girdikten sonra “Yeni Ders” menüsünü seçmelisiniz. Ders kodu ve ders adı girdikten sonra bunları kaydetmelisiniz.



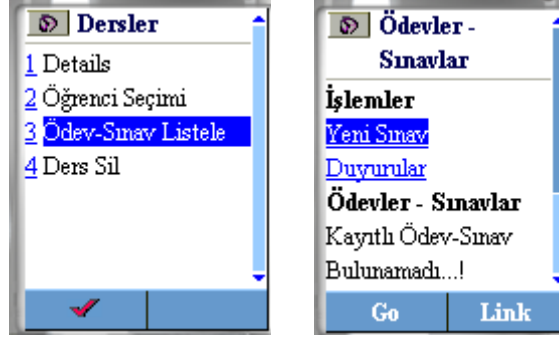
Yeni ders kaydedildikten sonra otomatik olarak “Dersler” sayfasına yönlendirilirsiniz. Burada yaptığınız kaydı görebilirsiniz. Bu kaydı seçtikten sonra “Öğrenci Seçimi” işlevi ile bu dersi görmeye yetkili olacak öğrencileri seçerek dersi kullanılabilir hale getirmelisiniz.





## Yeni Ödev-Sınav Tanımlama

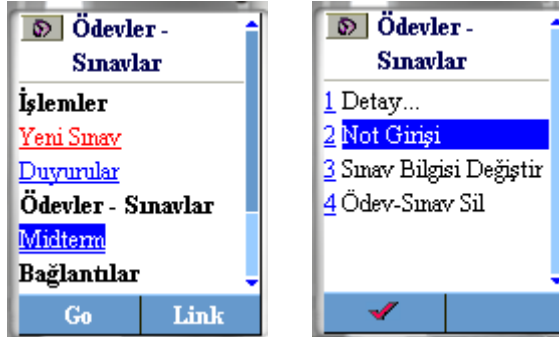
Öğrenci seçimini tamamladıktan sonra “Dersler” sayfasında, yeni açılan dersin altına ödev veya sınav tanımlamaları yapmak için “Ödev-Sınav Listele” menüsünü seçmelisiniz.



“Yeni Sınav” işlevi ile içinde bulunduğunuz ders için ödev-sınav tanımlamaları yapabilirsiniz. Öğrencilere duyurmak istediğiniz haberleri “Duyurular” sayfasına geçerek iletebilirsiniz.

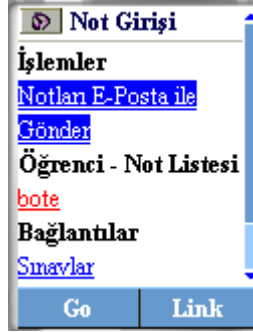
## Ödev-Sınav Notu Girişi

Bir dersin, bir ödev-sınavı için not girişi yapmak istiyorsanız “Sınavlar” sayfasında ilgili ödev-sınavı seçip “Not Girişi” işlevini seçmelisiniz.



## Sınav Sonuçlarını E-posta ile Gönderme

Bir dersin, bir ödev-sınavı için girilen notları e-posta ile tüm öğrencilere göndermek istiyorsanız “Sınavlar” sayfasında ilgili ödev-sınavı seçtikten sonra “Not Girişi” sayfasında “Notları E-Posta ile Gönder” işlevini seçmelisiniz.



## Telefon Ayarları

Cep telefonlarından **BöteMobile** sistemine erişebilmek için GPRS ayarlarınızı yapmanız gerekmektedir. GPRS ayarları için aşağıdaki seçenekleri deneyebilirsiniz:

*Seçenek 1* : İlgili operatörden SMS yolu ile gerekli ayarları alma.

AVEA için : [www.avea.com.tr](http://www.avea.com.tr) adresinde “Servisler” menüsünden “Servis Ayarları” linkine tıklayın ve karşınıza çıkan sayfada “Telefon Ayarlarını SMS ile Almak İçin Tıklayın” linkini seçin. Bu işlem için siteye üye olmanız gerekmektedir.

TURKCELL için : [www.turkcell.com.tr](http://www.turkcell.com.tr) ana sayfasından “Servisler” menüsünü seçtikten sonra sol tarafta yer alan menülerdeki “Wap Servisleri” başlığı altındaki “WAPCELL” linkine tıklayın. Burada “Wap Ayarları” linkine tıkladıktan sonra karşınıza gelen ekranda telefonunuzun marka ve modelini seçin. Daha sonra “Ayar” kısmında “WAP” seçeneğini seçin. Kısa mesaj ile ayarları almak için 2222’ye nasıl bir yazı göndermeniz gerektiği karşınıza gelen sayfada yer alacak. Örneğin: “WAP T630” yazıp 2222’ye gönderin vb. gibi.

TELSİM için : [www.telsim.com.tr](http://www.telsim.com.tr) 'de ana sayfadan üst taraftaki "Telsimce" linkine tıklayın. Karşınıza gelen sayfada yine üst taraftan "Servisler" linkini tıklayın. Karşınıza gelen ekranda "Bilgi Servisleri" menüsünde yer alan "CepWAP" linkini tıklayın. CepWAP sayfasındaki "Wap Ayarlarını Otomatik Yükleme için tıklayınız" linkine tıklayın. Bu işlem için siteye üyelik gerekiyor.

*Seçenek 2* : İlgili operatörün web sitesinden kendi telefonunuzun marka ve modeli için gerekli ayarları okuyarak, elle gerçekleştirme.

AVEA : [www.avea.com.tr](http://www.avea.com.tr) adresinde "Servisler" menüsünden "Servis Ayarları" linkine tıklayın ve karşınıza çıkan sayfada telefonunuzun markasını, modelini ve Ayar başlığı altında "GPRS üzerinden WAP" seçeneğini seçin. Karşınıza gelen penceredeki adımları telefonunuza uygulayın.

TURKCELL: [www.turkcell.com.tr](http://www.turkcell.com.tr) ana sayfasından "Servisler" menüsünü seçtikten sonra sol tarafta yer alan menülerdeki "Wap Servisleri" başlığı altındaki "WAPCELL" linkine tıklayın. Burada "Wap Ayarları" linkine tıkladıktan sonra karşınıza gelen ekranda telefonunuzun marka ve modelini seçin. Daha sonra "Ayar" kısmında "WAP" seçeneğini seçin. Gelen sayfadaki ayarları telefonunuza uygulayın.

TELSİM : [www.telsim.com.tr](http://www.telsim.com.tr) 'de ana sayfadan üst taraftaki "Telsimce" linkine tıklayın. Karşınıza gelen sayfada yine üst taraftan "Servisler" linkini tıklayın. Karşınıza gelen ekranda "Bilgi Servisleri" menüsünde yer alan "CepWAP" linkini tıklayın. CepWAP sayfasındaki "WAP telefonlarının ayarları nelerdir?" linkine tıklayarak telefonunuzun marka ve modeline göre ayarlarınızı elle gerçekleştirin.

## **Ücretlendirme**

GPRS bağlantısı için ücretlendirme KB başına yapılmaktadır.

### **AVEA için Ücretlendirme**

AveaWAP (Faturasız) : 7000 TL / KB

AveaWAP (Faturalı) : 6000 TL / KB

### **TURKCELL İin Ücretlendirme**

WAPCELL(Faturalı) : 7000 TL / KB

WAPCELL(Faturasız) : 10 KB = 1 kontör

### **TELSİM İin Ücretlendirme**

Telsim'in sitesinde CepWAP iin yazan ücretlendirme metni : "İnternete baėlı kaldıėınız ya da yurtii veri iletiminde bulunduėunuz sürece, bulunduėunuz Telsim aboneliėinin yurtii görüőme ücretleri üzerinden, % 30 özel data hattı indiriminden de yararlanırsınız."

### **Simülatörler İle Kullanım**

GPRS baėlantısını gerçek telefonlar ile saėlama olanaėı olmayanlar, masaüstü bilgisayarlarına kuracakları cep telefonu simülatörleri ile sistemi kullanabilirler.

### **Openwave Simülatörünün Kurulması**

Openwave simülatörü

[http://developer.openwave.com/dvl/tools\\_and\\_sdk/openwave\\_mobile\\_sdk/phone\\_simulator/](http://developer.openwave.com/dvl/tools_and_sdk/openwave_mobile_sdk/phone_simulator/)

adresinden üye olduktan sonra ücretsiz olarak indirilebilir (yaklaşık 6,5 MB).

### **YOURWAP.com Simülatörü**

YOURWAP.com cep telefonu simülatörünü

[http://www.yourwap.com/marketing/en/6/6\\_1/6\\_1.php](http://www.yourwap.com/marketing/en/6/6_1/6_1.php) adresinden indirebilirsiniz.