

PERCEPTIONS OF STUDENTS AND INSTRUCTORS
ABOUT USING REMOTE ACCESS TECHNOLOGY
IN PROGRAMMING LANGUAGE COURSES: A CASE STUDY

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ABSTRACT

**PERCEPTIONS OF STUDENTS AND INSTRUCTORS
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M.S., Department of Computer Education and Instructional Technology

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This study investigated the perceptions of students, the instructor and the laboratory assistant about the use of remote access technology in group projects of programming language courses. Their perceptions are investigated in terms of three aspects: effects of the use of this technology on their motivation, the perceived usefulness and the perceived ease of use of this technology. A central shared project server was installed for group project studies of students. To access to the central project server, Microsoft Remote Desktop Connection, which is a remote access technology, was used.

The data were collected from 2nd grade university students by using a computer attitude scale and a questionnaire developed by the researcher. Also, interviews were conducted with the course instructor and the laboratory assistant. Descriptive statistics, frequency distributions and descriptive analysis methods were used to analyze the results.

In results, the high percentage of indecisive students, which is between 38% and 48%, was noticeable. It was concluded that by increasing the length of usage of the system this high ratio may be decreased to reasonable levels. On the other hand, high number of the rest of the students reported positive perceptions. They expressed that remote access technology is a useful and also easy to use technology. It is concluded that students, the instructor and the laboratory assistant accepted the use of this new technology in their learning environment. Also, like instructor and the laboratory assistant, they stated that it affected their motivation towards the group projects in a positive way.

Keywords: Remote Access Technology, Remote Laboratories, Programming Language Courses, Group Projects, Technology Acceptance Model

ÖZ

PROGRAMLAMA DİLİ DERSLERİNDE
UZAKTAN ERİŞİM TEKNOLOJİSİNİN KULLANIMI İLE İLGİLİ
ÖĞRENCİ VE ÖĞRETMENLERİN ALGILARI: BİR DURUM ÇALIŞMASI

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Yüksek Lisans, Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü

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Bu çalışma, uzaktan erişim teknolojisinin programlama derslerindeki grup projelerinde kullanımı ile ilgili olarak öğrenci ve öğretmenlerin algılarını araştırmıştır. Algılar üç açıdan araştırılmıştır: Bu teknolojinin kullanımının öğrencilerin motivasyonu üzerindeki etkisi, bu teknolojinin faydalılığı ve kullanım kolaylığı üzerine algılar. Bu çalışma kapsamında öğrencilerin grup projelerinde kullanımı için merkezi bir proje sunucusu tasarlanmış ve kurulumu yapılmıştır. Merkezi sunucunun ortak çalışma alanına erişim için ise öğrenciler ve öğretmenler

tarafından Microsoft Remote Desktop Connection isimli bir uzaktan erişim yazılımı kullanılmıştır.

Veriler, programlama dersi almakta olan 37 üniversite öğrencisinden bilgisayara karşı tutum ölçeği ile araştırmacı tarafından geliştirilen anket kullanılarak toplanmıştır. Ayrıca, dersin öğretmeni ve laboratuvar asistanına da anketler uygulanmıştır. Sonuçların sunum ve analizinde ise betimsel istatistikler, frekans dağılımları ve betimsel analiz yöntemleri kullanılmıştır

Elde edilen sonuçlarda, kararsız öğrencilerin %38 ila %48 arasında değişen yüzdelik oranının yüksek olması dikkat çekmiştir. Sonuç olarak, kararsız öğrencilerin yüzdelik seviyesinin, sistemin kullanım süresinin yeterli kadar artırılarak daha kabul edilebilir bir seviyeye getirebileceği sonucuna varılmıştır. Diğer taraftan, geriye kalan öğrencilerin ezici bir çoğunluğunun algılarını olumlu olarak raporladığı görülmüştür. Bu bağlamda, öğrencilerin, öğretmenin ve lab asistanının öğrenme ortamlarında bu yeni teknolojiyi kabul ettiği sonucuna varılmıştır. Öğrencilerin, uzaktan erişim teknolojisinin faydalı ve kolay kullanılabilir bir teknoloji olduğunu ve ayrıca öğrencilerin projelerine karşı motivasyonlarını olumlu yönde etkilediğini düşündükleri görülmüştür. Ayrıca, ders öğretmeni ve laboratuvar asistanının algılarının öğrenciler ile paralel olduğu görüldü

Anahtar Kelimeler: Uzaktan Erişim Teknolojisi, Uzak Laboratuvarlar, Programlama Dili Dersleri, Grup Projeleri, Teknoloji Kabul Modeli

To my parents,
Hayati and Ayşe TURŞAK

and to my sister,
Dilek TURŞAK

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CHAPTER 1

INTRODUCTION

In this chapter, the background of the study, the statement of the problem, the purpose of the study, the significance of the study and the definitions of the terms will be presented.

1.1 Background of the Study

While computers became more common in life, they also started to be used for educational purposes. Their powerful features like visualization and interaction helped them to become a significant instructional technology tool in education. However, the major deficiency of computers was the lack of communication with each other. After the development of Internet, their significance was multiplied in educational environments. Internet is a major technological advancement reshaping not only our society but also our universities. In a short period of time, Internet became most important channel for distance learning.

The use of Internet as an instructional channel forced educators rethink their ways of instructions offered and administered (Longe, 2005). Thus, many educators are

looking for approaches in which they take advantage of flexibility and convenience provided by Internet-based learning. By this effort, some traditional barriers can be overcome such as time and place.

World Wide Web (WWW) was firstly a text-based platform. In a short time, images, sounds, animations, interactions and lots of various multimedia channels have been added to this powerful platform. It has been used as a communication channel with emerging of different technologies such as e-mail, IRC, ICQ and other instant messaging tools. During this development period, all of these technologies have also integrated in e-learning environments.

As in other areas, online education becomes more important for higher education. Turkish Higher Education Council (YÖK) states that web-based education can play an important role for Post Secondary Vocational High Schools in creating capacity in following years and it is said that the number of current online programs of Post Secondary Vocational High Schools will be increased in the near future (Turkish Higher Education Council, 2005).

At the same time distance education is growing in terms of institutional participation and student enrollments, there are some factors preventing growth in distance education. According to Rigby and Dark (2006), one of the most frequently cited preventive factor is lack of fit with institutional mission.

“The preventive factors are especially important when the courses/programs to be offered are technical in nature. This is due to the increased reliance on

equipment in technical courses/programs and the difficulty in designing hands-on laboratory experiences at a distance that are as effective as the on campus laboratory. Despite these obstacles, solutions are being found to offer remote labs in technical education” (Rigby and Dark, 2006).

The use of online laboratories provides a cost effective way of opening laboratories for students 24 hours in a day and as a result it provides an opportunity to share physical laboratory (Jeppson, et. al., 2004).

Online Laboratories are a relatively new concept but their numbers are exponentially increasing in different disciplines due to recent technological developments and the increase of the availability of tools for their design. For example, in physics there are significant amount of remote laboratories.

“Online laboratories certainly represent the best alternative to working in a real laboratory because if properly designed they can offer students:

- a tele-presence in the laboratory
- to perform experiments on real equipment
- to collaborate
- to learn by trial and error
- to perform analysis on real experimental data but also
- a flexibility in choosing time and place for performing experiments ”
(Nedic, Machotka, & Nafalski, 2003, p. T3E-2)

Such kinds of technologies are created to be used. Although, they provide a lot of advantages for their users, computer systems cannot improve users’ performance if

they are not used (Davis, Bagozzi, & Warshaw, 1989). “The Technology Acceptance Model (TAM) suggests that the perceived usefulness and the perceived ease of use of an information system are major determinants of its use. Previous researches showed the validity of this model across a wide variety of information system types (Gefen & Keil, 1998, p. 34). People tend to use or not to use an application to the extent they believe it will help them perform their job better.

As a result, it is not enough to integrate such kind of new systems into education. Their usefulness, ease of use and effects on students’ motivation should be also investigated carefully.

1.2 Statement of the Problem

Nowadays, as in other parts of the world, online education gain importance as an opportunity and actually as a requirement. In Turkey, Universities and Post Secondary Vocational High schools open alternative online programs to be able to meet the demands of Turkish education system. In the report of The Current Status of Turkish Higher Education, Turkish Higher Education Council (2005) states that although there are significant amount of students to engage in Vocational and Technical education, quota of these schools cannot be increased because of student capacity inadequacy. In the same report, online education is suggested as a solution for this problem and it is stated that the number of online programs will be increased in the following years. This fast move from traditional face to face learning to online

learning platforms will require several problems to be solved by using different technologies.

Group project work is the one of the important component of the traditional face to face learning strategies is group project work. Group project work has established itself as a widespread form of student-centered learning (Wyvill & Lejk, 2001). Two leading researchers in the area of group processes, Johnson and Johnson (1989, s. 32), believe that “learning to work effectively in a group may be one of the most important interpersonal skills a person can develop since this will influence one’s employability, productivity and career success”. Thus, there are excellent reasons for trying to get students to learn how to work effectively in a group. At that point, the responsibility of course instructors is to provide a convenient environment to help students to be able to contribute equally. However it is not easy for every online course to provide such kind of convenient environment.

One group of courses which has problems about group project works in online platforms was programming language courses. These courses mostly require students to develop at least one group project to accomplish the course objectives. To be able to develop such kind of group projects, students of online or web supported courses should be provided a shared working environment.

The software or the system which is provided to students to help their group projects should be easy to use software and students should really get benefit from it. The use of such kind of software can increase their individual and performance and even their motivations towards the course and towards their group projects.

The solution designed and used in this study was a kind of remote laboratory. It consists of two main parts: a remote access technology called Microsoft Remote Access Technology and a central project server having an appropriate operating system to be accessed by this client software. Remote Access Technology provides an opportunity for students to connect and use the desktop of a remote computer from anywhere and anytime by using Internet. It allows users to share hardware and software of the central server computer. Also, with the support of the operating system used on the server, every user can have an individual account, individual desktop and individual working session on the server. By these features, it allows users to work on the remote computer just as sitting in front of it. Another important feature of this technology is that it allows users to disconnect from the server by leaving their desktop as it is and to continue their study after a while from any other client computer without losing any data. Furthermore, since this client/server architecture just requires an ActiveX supported web-browser and very low hardware configuration on client side, it provides a significant cost effective solution for hardware and software share. All these major features of this technology provide high ubiquity in user platform.

However, it is not enough to integrate this technology. Also, users' acceptance level of this technology should be investigated because computer systems cannot improve users' performance if they are not used (Davis, 1989). Moreover, effects of the use of this new technology on students' motivation can be investigated to learn about the usefulness of this technology in group projects of programming language courses.

1.3 Purpose of the Study

This study aims to investigate the effects of the integration of Remote access technology as a new technology in web-supported learning environments. After a deep literature review, it was concluded that there is no significant study about the use of this technology in programming language courses or similar technology training courses according to the results of the literature review conducted during this study. This study will possibly be the one of the first researches in this topic.

The main purpose of this study is to investigate instructors' and students' perceptions about the use of the remote access technology in group projects of programming language courses in terms of its *perceived effects on students' motivation, perceived usefulness* and *perceived ease of use*. Also, it is aimed to get the list of advantages, disadvantages and the suggestions of instructors about the use of this technology. Liu, Moore, Graham and Lee (2003) stressed the importance of student perceptions about the new tools as "because students are the consumers of the new educational tools, their perceptions and evaluations are essential to ensure quality instruction." (p. 263).

The ease of use and usefulness of the remote access technology in terms of students' and the instructor' and the laboratory assistant' perceptions was investigated in this study. Also, the effect of the use of this technology was investigated in terms of both students' and instructor's perceptions. Lastly, the advantages, disadvantages and suggestions about the use of this technology obtained from instructors' point of view.

This study tries to answer following questions:

1. How do the students, the instructor and the laboratory assistant perceive the use of remote access technology in group projects in terms of *its effects on students' motivation towards the course's group project?*
2. How do the students, the instructor and the laboratory assistant perceive *the usefulness* of the remote access technology?
3. How do the students, the instructor and the laboratory assistant perceive *the ease of use* of the remote access technology?
4. What are *the advantages and disadvantages* of the remote access technology in programming language courses from the instructor's and the laboratory assistant's point of view?
5. What are *the suggestions* of the instructor and the laboratory assistant about the use of this technology?

1.4 Significance of the Study

Today, almost every university performs studies on online education to get benefit from its advantages. Also, in the report of The Current Status of Turkish Higher Education, Turkish Higher Education Council (2005) reported that the number of existing online programs in Post Secondary Vocational High schools will be increased in following years. With the shift of the education to the online environments, some courses face problems as a result of their nature. One of the problematic courses when it comes to online platforms is programming language courses. The problem which this study was focused is the online group project studies in programming language courses. When the potential number of fully or partially online programming courses which will be offered in different departments of universities and Post Secondary Vocational High schools in the near future, the significance of such kind of studies are obvious.

In this study, an improved group working environment was designed by using remote desktop technology especially as a solution for group projects conducted in programming language courses.

1.5 Definitions of Concepts and Terms

World Wide Web (WWW): “It is a hypertext system of cross-linked data sources, which permits easy access to or publication of complex data types, including text, graphics, sound and animation, across Internet. WWW is initially developed at

CERN (the European Center for Nuclear Research) in Geneva, Switzerland”
(Association of Research Libraries, 1998)

E-Learning: “It is a word for describing the learning facilitated and supported through the use of information and communications technology. E-learning can cover a spectrum of activities from supported learning, to blended learning (the combination of traditional and e-learning practices), to learning that is entirely online. Whatever the technology, however, learning is the vital element. E-Learning is no longer simply associated with distance or remote learning, but forms part of a conscious choice of the best and most appropriate ways of promoting effective learning” (University of Bath, 2004).

Distance Education: “The acquisition of knowledge and skills through mediated information and instruction, encompassing all technologies and other forms of learning at a distance” (United States Distance Learning Associations, 2005).

Server: “In general, a server is a computer program that provides services to other computer programs in the same or other computers” (Pacific Internet, 2005).

Client: “A client is the requesting program or user in a client/server relationship. For example, the user of a Web browser is effectively making client requests for pages

from servers all over the Web. The browser itself is a client in its relationship with the computer that is getting and returning the requested HTML file. The computer handling the request and sending back the HTML file is a server” (Pacific Internet, 2005).

Remote Access Technology (RAT): This technology provides users to connect to a remote server system by using web browser and allow using the desktop of this remote server.

Microsoft Remote Desktop Client: It is remote access software which allows users to remotely access and use the hardware and software of a remote computer via Internet. This software installed with the standard installation of Microsoft Windows XP and new versions of Microsoft Windows operation systems.

Web Labs or Remotely Accessed Laboratories: “Laboratories (institutions) those make available resources for didactic experiments accessed and controlled remotely by means of a computer network” (Prazeres, F. S. Santos, Capobianco, & Teixeira, 2005).

Perception: In this study, perception is used as a seeing, understanding of the software used and processing, acquiring and organizing the information got by this experience.

Assistant: In this study, assistant refers to the laboratory assistant of the CEIT 211 course.

CHAPTER 2

REVIEW OF LITERATURE

In this chapter, the review of the literature about online education, remote laboratories, group projects programming language courses and group projects, technology acceptance model, related research and the summary of the literature will be presented.

2.1 Online Education

Online education has generated tremendous excitement both inside and outside higher education. For some people, it offers the potential to provide learning to new audiences; for others, it offers the opportunity fundamentally to transform learning delivery and the competitive landscape (Poehlein, 1996). The rapid expansion of the Web as a powerful course delivery platform, combined with the increasing interest in lifelong learning, has created a significant motivation for universities to develop online programs. As the technology is now available and relatively user-friendly, those universities which do not embrace it will be left behind in the globalization and technological development.

Internet and World Wide Web (WWW) offers educators an opportunity to provide learners with innovative new virtual environments that can enhance the learning process. Mioduser, Nachmias, Lahav, & Oren (2000) identify web technologies as being relevant to the educational process as a result of:

- "Support for sophisticated manipulation of information, which is at the heart of education transactions."
- "Communication facilities such as email, chat rooms and group discussion lists that enable communication between different actors in the educational process, and allow for collaborative work, regardless of time and place constraints."
- "User-friendly tools that support student creativity and initiative."
- "The ability for the Web to serve as an instructional delivery medium."

Also, in medium richness theory (Daft & Lengel, 1986), a rich medium is one that allows for both synchronous and asynchronous communication and supports a variety of didactical elements (text, graphics, audio and video messages). Today, web technologies support all those elements and it is obvious that the web is the richest medium for online education. Not only these web technologies seem ideal for the distance-learning context, but also they may benefit traditional classroom-based learning environments by providing a complementary channel for communicating, collaborating and sharing information (McClelland, 2001).

2.2 Remote Laboratories

Traditional laboratory halls limit the users in terms of utilization time and place. However, in the new trend which gains more popularity and power with the parallel of the development of online education, education environments get become time and place independent. The new slogan of the online education is anywhere, anytime. As parallel to this trend, it is required to replace traditional laboratories with a new environment which do not constrain the usage of laboratory environments in terms of neither time nor place.

“Work in a real laboratory imposes time and physical boundaries both for students and academic staff. It requires significant scheduling effort and financial investments. Lately, universities are strongly supporting the introduction of modern technology and online delivery of courses both for internal and external students. Universities not following this trend, are less likely to attract students and obviously cannot compete for distance education students” (Nedic, Machotka, & Nafalski, 2003).

The solution is remote laboratories which allow users to access and use the physical resources of the real laboratories from anywhere and anytime. Since the invention of Internet, many academicians, educators, and researches have been searching for remote laboratories in different disciplines. However, nature of real laboratory environments challenges the researchers in different technical problems. The integration of remote laboratories into e-learning environments usually is not taken with the relevance it deserves (Prazeres, F. S. Santos, Capobianco, & Teixeira,

2005). Today, with the incremental integration of e-learning systems into the learning environments and with the increase in the ubiquity of the students in such kinds of environments, it becomes inevitable to provide online alternatives for physical laboratories.

Web lab provides cost effective way of opening up laboratory resources for students 24 hours a day and provides an opportunity to share physical laboratory (Jeppson, Lundgren, Alamo, Hardison, & Zych, 2004). In other words, in contrast to local laboratories, remote laboratories allow students to learn independent from time and place. This flexibility increases the usefulness and effectiveness of the existing computer laboratories.

The results of the pilot assessment study conducted by Corter, Nickerson, Esche and Chassapis (2004) were encouraging. It is reported that “more than 90% of the student respondents rated the effectiveness and impact of the remote labs to be comparable (or better) than the hands-on labs” (p. F1G-20). This results also supported by analyses of scores on exam questions involving specific lab content.

The research of Wagner & Tuttas (2001) which shows the positive effects of the remote labs on students’ motivation reports their findings as following;

“Almost all students do accept online lab experimenting and understand that net-based forms of learning have several advantages in comparison to presence teaching. As with most new ways of teaching and learning students

motivation is increased at first. This has been measured by asking the students to grade the whole experiment. It is plainly visible the online teams have been more satisfied than the local teams” (p. T1F-22).

2.3 Group Projects

Group project work is a widespread form of student-centered learning today. As an educational instructional strategy, “group projects increases motivation, aids students to learn new material and to internalize material they have been taught, and can help develop communication and group-working skills” (Newman, Daniels, & Faulkner, 2002, p. 3) . Also, one of the goals of group projects for students should be to work as a team and for and for each member to contribute equally as far as possible (Wyvill & Lejk, 2001). While group projects are not always favored by students, they have great value in many classrooms, including those on Internet.

Butcher, Stefan, & Tario (1995) argue that group work can provide a more interesting, effective and, hence, preferred learning context compared to traditional lectures and help to facilitate learning and teaching in very large classes. Other benefits of group work include the co-construction of knowledge. This corresponds to Vygotsky’s (1981) claim that interactions produce new understandings for the participants. “Group work also promotes learning through encouraging discussions and debate which encourage the justification of ideas, resolution of disagreements and understanding of new perspectives” (Webb, 1995, p. 244).

Group projects can provide a number of additional benefits to students when compared to working on a project individually (Chapman, 2001). It is believed that by participating in a group project, students develop a better understanding of the complexities, challenges, and advantages of working effectively in a group. “To some degree, group projects simulate real-world experiences since many students will find themselves placed on a team once they become part of an organization” (Chapman, 2001, p. 118). In fact, in a job interview, it is common for a recruiter to ask students to discuss how they have handled problems related to working in a group. By working in a group, students can learn how to communicate better and function more effectively in the group-oriented business environment. They can learn to work well with others; understand the importance of the division of labor in completing a large project; and, in general, become more competent at managing group projects. Overall, it is hoped that by placing students in teams they will learn to pay more attention to, and refine their ability to use, Katzenbach’s (1997) “four C’s” of effective teamwork: communication, collaboration, cooperation, and compromise.

Two important researchers in the area of group processes, Johnson and Johnson (1989, p. 32), believe that learning to work effectively in a group may be one of the most important interpersonal skills a person can develop since this will influence one’s employability, productivity, and career success. Thus, there are excellent reasons for trying to get students to learn how to work effectively in a group.

Although a number of advantages for group work listed, it is not without its drawbacks. Working in a group also has potential drawbacks for each individual student (Chapman, 2001). Webb (1995, p. 245) stated one of the disadvantage of group work as “social loading” or “free riding”, which takes place when a member of a group contributes little or nothing to the work of the group. The results of this be demotivating other group members who hate doing all the work and so the efforts of the entire group turn downwards. Webb (1995, pp. 246) also notes that the division of labor, which may take place within the group, may not be beneficial in terms of individual learning because students only become involved in part(s) of the group work and so might be denied a sense of completeness. Students have expressed fear that their individual grades will be compromised or that the work will not be distributed fairly among members of the group (Comer, 1995). Another concern students have is that working in a group is too time-consuming due to inefficiencies in coordinating efforts as well as in meetings. Furthermore, working with others on a task can be stressful and lead to conflict within groups, leading to a negative attitude that could then be directed toward the individual’s overall assessment of the group experience, not to mention the instructor (Lerner, 1995).

Thus, as most of the instructional method, group projects have both advantages and disadvantages. The decision about the use of group projects as a part of instructional activities should be made according to the direct and indirect goals of the instruction. As Johnson and Johnson (1989, p. 32) stated, “learning to work effectively in a group may be one of the most important interpersonal skills a person can develop since this will influence one’s employability, productivity, and career success”.

2.4 Group Projects in Programming Language Courses

Programming language courses are offered in the curriculum of different schools and grade levels. In Turkish Education System, there are various programming language courses offered in various disciplines and different grade levels from high schools up to universities. Some of the university departments which offer mandatory or elective programming language courses in their curriculums are Computer Engineering, Computer Education and Instructional Technologies, Electrics and Electronics Engineering, Mathematics, Applied Mathematics, Physics, Chemistry. Moreover, there are some programs in Post Secondary Vocational High Schools in which different programming language courses are offered, such as Computer Technologies and Programming. Even, programming language courses are offered in the curriculums of various high schools, such as Computer Hardware, Computer Software and Auto Command Systems braches of Vocational High Schools and Post Secondary Vocational High Schools.

There is a significant amount of literature about the different ways and subject areas in which group project studies has been used (Wyvill & Lejk, 2001). Also, group working is quite relevant in Computer Science because theory and practice are primary educational concerns and both knowledge and vocational skills are expected by employers. Group working also can be used “to motivate students to help them understand systems analysis, software development lifecycles, specific software

design support tools, database design, web site design, or web server programming” (Newman, Daniels, & Faulkner, 2002, p. 3).

In addition to supporting knowledge acquisition, group projects can be used to help the students gain and improve vocational and interpersonal skills. “Well designed group projects can ensure that the students must consider the problems of communication with manager and client and can help improve both report writing and presentation skills” (Newman, Daniels, & Faulkner, 2002, p. 3). Group projects can also help in getting students to analyze problems and synthesize solutions while examining, and trying to decrease the risks of things going wrong as a result of the labor division: all valuable skills for the software engineering project managers of the future (Ford & Gibbs, 1996).

Today, also the nature of software development in real world highly requires efficient team working. To be better prepared for the group-oriented business culture where labor division and group decision making is becoming commonplace, students need to experience the challenges of working in groups (Chapman, 2001). In near future, many of computer science students will possibly be working for multinational companies and therefore they will probably work in a virtual project teams which have team members from different geographical locations. Preparing students for working in virtual project teams is crucial for computer science programs because nowadays companies expands into new markets by buying existing companies or establishing branch offices in different locations.

To conclude, today group projects are indispensable parts of effective programming language courses and the skills and experiences gained from group projects gets more crucial every day for computer science graduates.

2.5 Motivation in Education

Motivation is concerned with the factors that arouse or reduce the desire to engage in a behavior. The origin of the word tells us that motivation refers to *getting someone moving*. When we motivate ourselves or someone else, we develop incentives - we set up conditions that start or stop behavior (Vockell, 2004).

Motivation is a special study area in educational psychology because it has critical effects in learning process. Motivation influences learners in various ways. For example, in a single situation there may be greater number of factors motivating learners to engage in a behavior and an even numerous factors motivating them to avoid that behavior. In deep understanding of the principles of motivation will enable us to get students to want to participate and do their share in the instructional process.

Motivation in education can have several effects on how students learn and their behavior towards subject matter (Ormond, 2003). It can:

1. Direct behavior toward particular goals

2. Lead to increased effort and energy
3. Increase initiation of, and persistence in, activities
4. Enhance cognitive processing
5. Determine what consequences are reinforcing
6. Lead to improved performance.

(Ormond, 2003)

Since, students not always internally motivated, sometimes it is required to motivate them externally. This results that there is no single motivation. In literature, there are two kinds of motivation:

Intrinsic motivation occurs when people are internally motivated to do something because it either get them pleasure, they think it is important, or they feel that what they are learning is morally significant. Malone and Lepper (2003) have defined intrinsic motivation more simply in terms of *what people will do without external inducement*.

Extrinsic motivation occurs when a student is compelled to do something or act a certain way because of factors external to him or her (like money or good grades).

It is accepted by most motivational theories that motivation is the strongest factor in engaging in a behavior arises from within the learner rather than from outside pressures. Bruner (1966) has describes the relationship between motivation and learning in the following way:

“The will to learn is an intrinsic motive, one that finds both its source and its reward in its own exercise. The will to learn becomes a "problem" only under specialized circumstances like those of a school, where a curriculum is set, students are confined, and a path fixed. The problems exist not so much in learning itself, but in the fact that what the school imposes often fails to enlist the natural energies that sustain spontaneous learning” (Bruner, 1966, p. 127).

2.5.1 *Motivational Theories*

Main motivational theories mostly used in educational sciences are *self-efficacy theory*, *self-determination theory*, *goal-setting theory* and *attribution theory*.

Self-Efficacy Theory

Albert Bandura's (1989) theory of self-efficacy has important implications with regard to motivation. Bandura's basic principle is that “*people are likely to engage in activities to the extent that they perceive themselves to be competent at those activities*” (Bandura, 1989). In education, this means that learners will be more likely to attempt, to persist and to be successful at tasks at which they have a sense of efficacy

Self-Determination Theory

Self-determination theory, developed by Edward Deci and Richard Ryan (1991), focuses on the importance of intrinsic motivation in driving human behavior. Like Maslow's hierarchical theory and others that built on it, SDT posits a natural tendency toward growth and development. Unlike these other theories, however, SDT does not include any sort of "autopilot" for achievement, but instead requires active encouragement from the environment. The primary factors that encourage motivation and development are autonomy, competence feedback, and relatedness.

Goal-Setting Theory

Goal-Setting Theory examines the relationship between goal difficulty and performance. Locke and Latham have stated that a positive, linear relationship exists between goal difficulty and performance, meaning that the most difficult goals resulted in the highest levels of performance. This being said, however, there is a limit to the difficulty of goals that will result in a related performance. For example, if a person sets a goal that is impossible to achieve, their performance will not correlate (Locke & Latham, 2002). An ideal goal should present a situation where the time between the initiation of behavior and the end state is close in time. A goal should be moderate, not too hard or too easy to complete. In both cases, most people are not optimally motivated, as many want a challenge. In summary, Goal-Setting Theory argues that there is a positive relationship between goal difficulty and the performance (Locke & Latham, 2002).

Attribution Theory

There are four factors related to attribution theory that influence motivation in education: *ability, task difficulty, effort, and luck* (Vockell, 2004). These four factors can be analyzed in the following way:

- **Ability** is a relatively *internal* and *stable* factor over which the learner *does not exercise much direct control*.
- **Task difficulty** is an *external* and *stable* factor that is *largely beyond the learner's control*.
- **Effort** is an *internal* and *unstable* factor over which the learner *can exercise a great deal of control*.
- **Luck** is an *external* and *unstable* factor over which the learner *exercises very little control*.

(Vockell, 2004).

The basic principle of attribution theory is that “a person's own perceptions or attributions for success or failure determine the amount of effort the person will expend on that activity in the future” (Vockell, 2004).

2.6 Technology Acceptance Model

Information systems are created to be used. Unfortunately, “many information systems development projects either totally fail or they produce systems that are underutilized” (Davis, 1989). It is not possible to improve users’ performance for any computer systems if it is not used. Students’ acceptance and the use of technologies utilized in learning environments is important factor for the success of the instruction. This factor has even greater importance in a developing countries, where students entering University for the first time, may have had limited prior experience about the computer and Internet technologies. Understanding why people accept or reject computers is one of the most challenging issues in information systems research (Swanson, 1988).

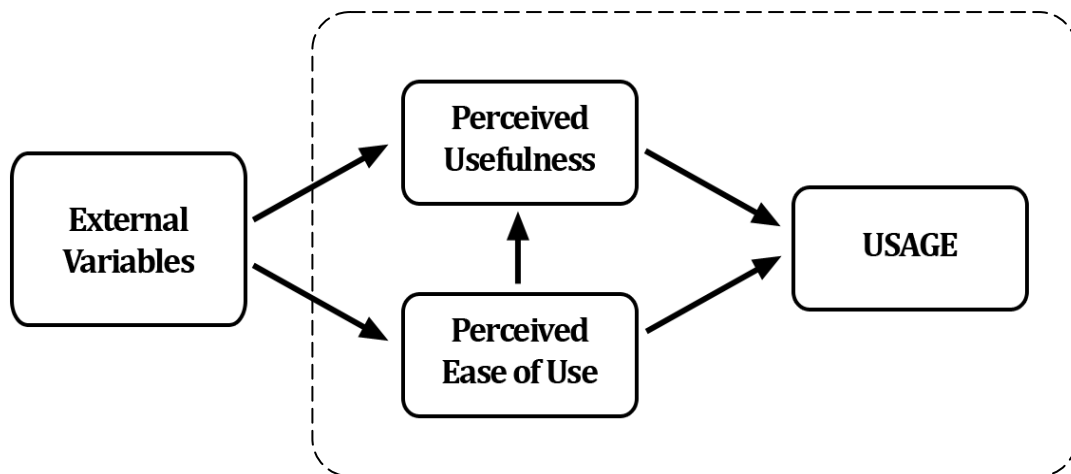


Figure 2.1- Technology Acceptance Model (Brown, 2002)

Technology Acceptance Model (TAM) was introduced by Davis (1989). It is actually the adaptation of theory of reasoned action (TRA) introduced by Fishbein and Ajzen (1975). TAM argues that perceived usefulness and perceived ease of use are important factors in determining information system use. Perceived usefulness is "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320) while perceived ease of use is "the degree to which a person believes that using a particular system would be free of effort." (Davis, 1989, p. 320). Davis (1989) performed his studies on an e-mail system, a file editor, and two graphics packages. His studies showed that perceived usefulness has very significant effect on use and intention to use. On the other hand, although perceived ease of use showing mostly significant correlations with use or with intention to use, it showed mostly insignificant effects in linear regression analyzes that examined the combined effects of perceived usefulness and perceived ease of use on system use or on the intention to use of it.

The Technology Acceptance Model (TAM) is widely used by researchers and practitioners to predict and explain user acceptance of information technologies. TAM models system usage intentions and behavior as a function of perceived usefulness and perceived ease of use. The original scales for measuring the TAM constructs have been confirmed to be reliable and valid in several replications in a variety disciplines and across a wide range of technologies (Gefen & Keil, 1998). Some of these technologies are: e-mail and gopher (Venkatesh & Davis, 1994), spreadsheets (Mathieson, 1991; Adams, Nelson, and Todd, 1992), DBMSs (Szajna,

1994), microcomputer usage (Igarria, Parasuraman, & Baroudi, 1996; Igarria, Zinatelli, Cragg, & Cavaye, 1996), FAX (Straub, 1994), group support systems (Chin & Gopal, 1995) , and expert systems (Keil, Beranek, & Konsynski, 1995).

2.7 Summary

The use of computers and Internet in education affects the quality of the learning environments positively. With the incremental improvements in Internet technologies, especially online education provides an opportunity to provide learners with innovative new virtual environments that can enhance the learning process. Universities which do not make investments on online education will probably left behind in the race of globalization and technological developments in education.

Researcher studied to create effective remote laboratories in different disciplines and they have got significant results related with both efficiency and effectiveness of them. Remote laboratories are efficient because they provide time and place independent working environment for instructors and students. Also, remote laboratories eliminate the requirements of scheduling efforts for the use of limited physical and this allows more students to share limited physical resources. As a result, the use of remote laboratories decreases the investments about the laboratories. Remote laboratories are also effective because they affect students' motivation positively according to the results of the researches. Moreover, provide instructors and students an opportunity to work on the lab resources time and place

independently and this allows users to access to the laboratory resources from anywhere and anyplace.

Group working is an important part of the most of the courses. Especially for programming language course students, it is very significant to learn working effectively in a group because it is one of the most important interpersonal skills a person can develop since this will influence one's employability, productivity, and career success. With globalization of the real companies, working in virtual teams of which group members are in different geographical regions also gets importance for employability and the career success of those students. Also, the gradual increase of the online education programs force the educators to move group working and group project studies to the online environment. Although, the online environment and Internet technologies provide various advantages for group projects, there are also some limitations faced as a result of the nature of the group work requirements.

Remote laboratories are one of the important requirements for group working in online education especially for programming languages because group members are far away from each other and they mostly require developing group projects collaboratively in a virtual team. Remote laboratories provide a shared working environment by allowing users to share the physical resources of the remote server. This made significant improvement for group working environments especially for programming language courses.

Technologies are developed to be used by students to get benefit from them however, most of them are not used enough and as a result they fail to provide advantage to their users. Technology Acceptance Model (TAM) models system usage intentions and behavior as a function of perceived usefulness and perceived ease of use. The reliability of this model is widely confirmed by various researches. Technologies aimed to be used in learning environments should be investigated in terms of two constructor of TAM: perceived usefulness and perceived ease of use.

CHAPTER 3

METHODOLOGY

In this chapter, the methodology utilized in this study will be provided in detail. First overall design and rationale of the study, participants and the context of the study, then instruments, data collection and data analysis procedures are described. Finally, assumptions and the limitations of the study are presented

3.1 Overall Design and Rationale

This research study was designed to investigate perceptions of the students, the instructor and the laboratory assistant of a programming language course about the use of a remote access technology in group projects of students.

This study is based upon non-experimental design and a follow-up case-based qualitative study. During the data collection both qualitative and quantitative methods were used. This study utilizes components of descriptive study, case study and qualitative research. The aim of the use the mix of these methodologies is to gain rich understanding of the perceptions of the students, the instructor and the laboratory assistant participated in the study.

Three main purposes of a descriptive research are to *describe, explain* and *validate* findings. These studies primarily concerned with finding out “what is” both qualitatively and quantitatively (Nelson-Knupfer & McLellan, 1996). Descriptive research holds a valuable place within education because in contrast to laboratory experiments, the human nature of educational research is critical to the result.

For that reason, descriptive research methodologies were conducted in this study. The student perception questionnaire was used in this study as one of the main source of data. Responses of students to this questionnaire were examined at the end of the study to investigate the perceptions of students about the use of Remote Access Technology in terms of *its effects on their motivation, its usefulness* and *its ease of use*.

A case study is defined as “a research strategy which focuses on understanding the dynamics present within single settings” (Eisenhardt, 1989). It is also defined as “an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and the context are not clearly evident” (Yin, 2003). Case studies provide useful clues in understanding particular experiences or incidents which may have wider applicability in the region.

Since the research questions aimed to explore the perceptions of participants in this study, a case study was conducted as the most appropriate method of investigation to

enclose explorative nature of this study stated in research questions. This case study provides initial and meaningful data for the use of this technology in online education because the use of Remote Access Technology in online education is a relatively new phenomenon.

Quantitative methods were used to gather and analyze students' attitudes towards computers, computer competencies, e-learning experiences and perceptions about the use of the remote access technology in their group projects. For the triangulation of the data, qualitative methods were used to gather and analyze both instructors' perceptions.

Qualitative methods were engaged because the main purpose of this study is to investigate and gain deep understanding of the perceptions of participants. Informal structured interviews were conducted with the instructor and the laboratory assistant to obtain their perception about the use of Remote Access Technology in terms of its effects on students' motivations towards the course, its usefulness and its ease of use. Also, its advantages, disadvantages and suggestions of the instructor and the laboratory assistant were investigated by using these interviews.

3.2 Research Questions

The aim of this study is to gain an insight on how the programming languages course students and instructors perceive the use of a remote access technology in their course's group projects.

Two research questions with sub-questions were asked in this study to achieve the purpose of the study.

1. How do the students of a programming language course perceive the use of the remote access technology in their course's group projects?
 - 1.1. How do the students of a programming language course perceive the remote access technology in their course's group projects *in terms of its effects on their motivation towards the course's group project?*
 - 1.2. How do the students of a programming language course perceive the *usefulness* of the remote access technology?
 - 1.3. How do the students of a programming language course perceive *the ease of use* of the remote access technology?

2. How do the instructor and the laboratory assistant of a programming language course perceive the use of the remote access technology in course's group projects?
 - 2.1. How do the instructor and the laboratory assistant of a programming language course perceive the remote access technology in course's group projects in terms of *its effects on students' motivation towards the course's group project?*
 - 2.2. How do the instructor and the laboratory assistant of a programming language course perceive *the usefulness* of the remote access technology?

- 2.3. How do the instructor and the laboratory assistant of a programming language course perceive *the ease of use* of the remote access technology?
- 2.4. What are *the advantages and disadvantages of the use of remote access technology in programming language courses* from the instructor's and the laboratory assistant's point of view?
- 2.5. What are *the suggestions of the instructor and the laboratory assistant* about the use of this technology?

3.3 Sample Selection and Participants

In this study purposive sampling strategies were used. Especially, convenience and criterion sampling techniques were utilized to select the participants.

Vaughn *et al.* (1996) defines purposive sampling as “a procedure by which researchers select a subject or subjects based on predetermined criteria about the extent to which the selected subjects could contribute to the research study”. Purposive sampling is “best used with small numbers of individuals/groups which may well be sufficient for understanding human perceptions, problems, needs, behaviors and contexts, which are the main justification for a qualitative audience research” (Commonwealth Education Media Centre for Asia). Purposive sampling is also popular in qualitative research. Purposive sampling strategies that can be used in qualitative studies are extreme case sampling, *maximum variation sampling*, *homogeneous sampling*, *typical case sampling*, *critical case sampling*, *snowball or chain sampling* and *criterion sampling* (Commonwealth Education Media Centre for Asia).

Criterion sampling is a commonly used sampling technique in qualitative researches. It reviews and studies cases that meet some pre-set criterion of importance (Patton, 1990).

Convenience sampling is a sampling technique which is mostly used when the participants are selected based on the accessibility and availability for the researcher.

Participants of this study were selected by using convenience and criterion sampling strategies. The main concept investigated in the study was the perceptions of participants about the use of Remote Access Technology and to investigate their perceptions, participants should be ones who can use this technology in their courses. Participants selected for this study were most convenient candidates for the researcher in terms of accessibility and availability. For these reasons, convenience and criterion sampling techniques were utilized in this study.

A web-supported programming language course “CEIT211: Programming Languages II” offered in Computer Education and Instructional Technologies Department at Middle East Technical University was found to meet the purpose of this study. The participants of the study were the students, the instructor and the laboratory assistant of this course during 2006/2007 Spring term. The students were 2nd year CEIT students taking the course as a must course. There were 52 students involved in the course but only 37 of them responded Students’ Perceptions about the

Remote Access Technology Questionnaire (SPRAT-Q). As seen in Table 3.1, 25(67.6%) of them were male and 12(32.4%) of them were female.

Table 3.1– Genders of Students

TOTAL	Male		Female	
	N	%	N	%
37	25	67.6	12	32.4

Also, interviews were conducted with the instructor and the assistant of the course in order get their perceptions about the tool. As seen in table 3.2, the instructor has been working at METU for 6 years and allso offering this course for 6 years. The laboratory assistant has been at METU for 1,5 years and he is the laboratory assistant of this course for 1 years. Both the instructor and the laboratory assistant is male. Both of them had previous experience with Remote Access Technology but none of them use it for educational purposes before this study.

Table 3.2–Characteristics of Instructor and the Assistant

Questions	Instructor	Assistant
How long have you been working as an instructor in METU?	for 6 years	for 1.5 years
How long have you been giving CEIT 211 course?	for 6 years	for 1 year
Have you ever used any Remote Access Technology until now?	Yes	Yes
Have you ever used any Remote Access Technology in any course previously as an instructor?	No	No
Have you ever made your students use any Remote Access Technology in your CEIT 211 course previously?	No	No

3.4 Context

The study was conducted in actual field settings. In this section, learning environment will be described in detail.

3.4.1 Information about CEIT211 Course

The descriptive feature of case studies let the researcher to write the detailed documentation of the case in the research report (Merriam, 1998). This section will describe the CEIT211 course in details.

Course Description and General Objectives

“CEIT 211: Programming Languages II” is offered to 2nd year Computer Education and Instructional Technologies (CEIT) students as a must course. It is an introductory programming languages course in visual environments. It also includes the design and implementation of underlying concepts and principles of visual environments in Microsoft Visual Basic which is a visual programming language. Moreover, the course content covers general structure of Visual Basic Language, data types, variables, built-in functions, subprograms, selection statements, loops, text files, user defined data types, dynamic data structures, database programming and Internet application development using Visual Basic (Ersoy, 2003).

Main goals of the course were;

- to identify and to define the basic features of Visual Basic
- to write both user and programmer friendly Visual Basic applications
- to create applications for windows environments
- to manage database facilities of Visual Basic
- to develop Internet applications by Visual Basic

(Ersoy, 2003).

Course Format

The course has mainly two parts: 4 lecture hours offered by the instructor, Halil Ersoy, and 2 laboratory hours offered by two laboratory assistants, Neşet Mutlu and

İsmail Yıldız. Laboratory hours are divided into two student groups and offered by two laboratory assistant. Students develop two projects in the scope of the course during the semester: 1 individual project and 1 group project. This study was conducted during the group project study period of the course.

3.4.2 *The Central Project Server*

A central project server installed to be used in course's group projects (Hardware and software were reported in Appendix A). Microsoft Remote Desktop was used to allow users to access and work on the server. For each student and instructor, a personal account was created on the server. When a user connected to the server by using his/her personal account, a new Windows session was created and the user allowed to use the server sources from his/her local machine. Also, this technology allowed users to disconnect from the server anytime, reconnect and continue to use the same Windows session anytime and anywhere without losing any data or without any change on their desktop.

Server Environment

Firstly, personal user directories were created for each student to store their project files and documents. Moreover, each group had its own shared directories to which only group members can access. There were also shared directories open to whole class for sharing documents by all course members. Instructors had access to all directories so that they could follow personal and group works during the whole

development period. This structured directory and permission hierarchy was designed to provide both private and shared storage areas to the users.

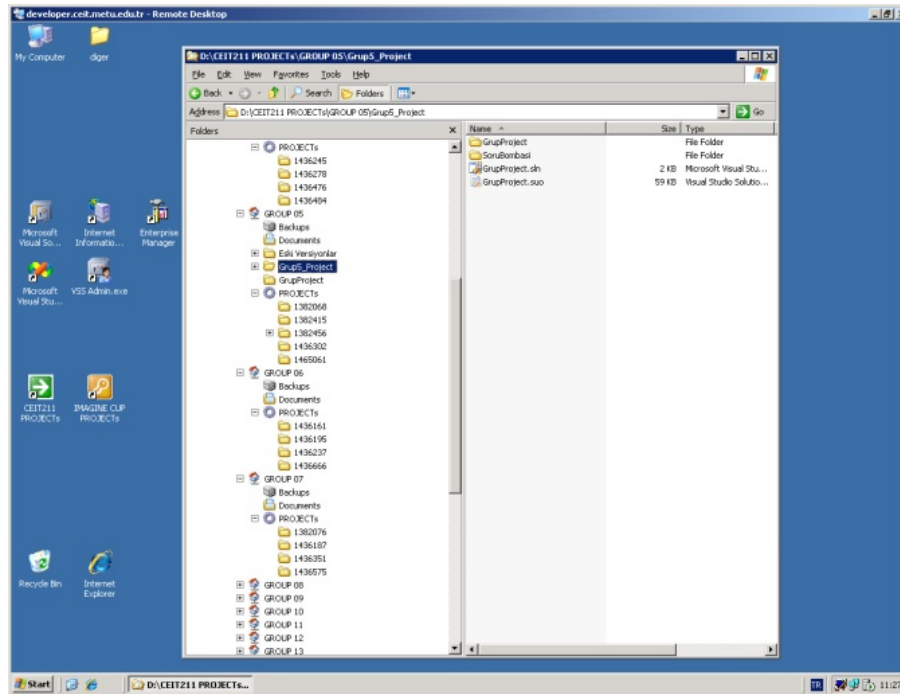


Figure 3.1 - Group and User Directory Structures on the Server

Secondly, a set of course related software was installed on the server for students.

These software were;

- Microsoft Visual Studio 2005
- Microsoft SQL Server 2000
- Microsoft Internet Information Server

Also, “Microsoft Visual Source Safe” was installed to improve the group project study environment. This software allows group members to work on the same source

synchronously or asynchronously. Additionally, group members can follow each others' changes on the source code.

Thirdly, there were a set of administrative tools for instructors to manage the server environment. These software were;

- Microsoft Active Directory
- Security Administrator

By using these tools, the instructor and the laboratory assistant could manage user accounts or set access permissions such as reading, writing or execution on file system and programs installed.

Finally, since users actually work on the same computer that is the project server, they can see each others' login status by using "Windows Task Manager" window. They were also able to send messages to each other by using this window.

3.4.3 *Information about Microsoft Remote Desktop Client*

Microsoft Remote Desktop Client is software that displays the screen of another computer (via Internet or network) on your own screen. The program allows you to use your mouse and keyboard to control the other computer remotely. It means that you can work on a remote computer, as if you were sitting in front of it. You can also share your local disks with the remote computer to perform file transfers.

To enable multiple remote desktop connections to the server, it is required to install Microsoft Terminal Services on the server. Microsoft Terminal Services is a service software installed on the Windows 2003 Server that “provides the ability to host multiple, simultaneous client sessions on Windows Server 2003” (Microsoft , 2003).

Terminal Services were installed on the server to allow users to be able to connect to the server by using Microsoft Remote Desktop Client which is a built-in software comes with the standard Windows XP installation. Also, the web-based version of this client software is integrated into the course website to allow users easily access to their remote desktops from the course website without requiring any other software. This provided active website users with an opportunity to easily connect to their remote desktop just in the course website.

Course Website and Integration of Remote Access Technology

The original course website of the course was adopted by the course instructor Halil Ersoy from the web-based learning environment of the CEIT 333 course, namely Application of Authoring Languages in Internet Environment constructed by Prof. Dr. M. Yaşar ÖZDEN. It was developed by using Active Server Pages (ASP) technology which is a web scripting language (Ersoy, (2003); Özden, (2002); Özden, (2004)).

In the scope of this study, first of all the existing website accounts of the students and instructors were integrated with Microsoft Active Directory. Since students' remote access accounts are also on Microsoft Active Directory, each user got a single shared personal account for both website and server remote access. Moreover, by the integration of Microsoft Remote Desktop Web Client, a remote desktop access button is added to the course website. Thus, after students logged in to the website, they could access to their remote desktop by one button click. To access to the remote desktop, it was enough to have a standard web browser with ActiveX support. As a result, students got a chance to connect to their personal desktops on the server by using both the website and the standard Microsoft Remote Desktop Connection client.

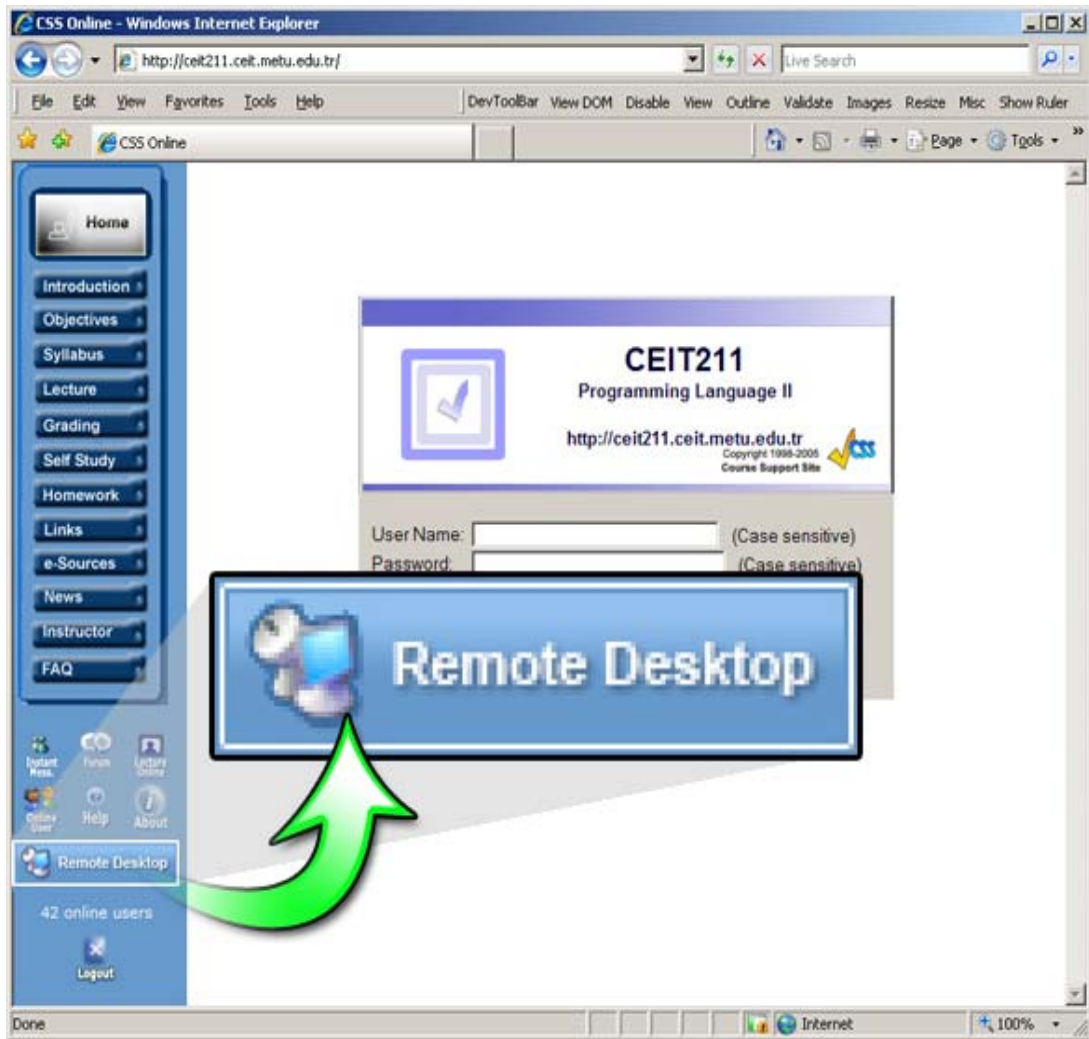


Figure 3.2 - Remote Desktop Button in Course Website

As it is seen in Figure 3.2, a Remote Desktop button is added to the menu of the course website. Students, the instructor and the laboratory assistant can access to their own desktop by using this button after they logged in to the website by using their own personal account.

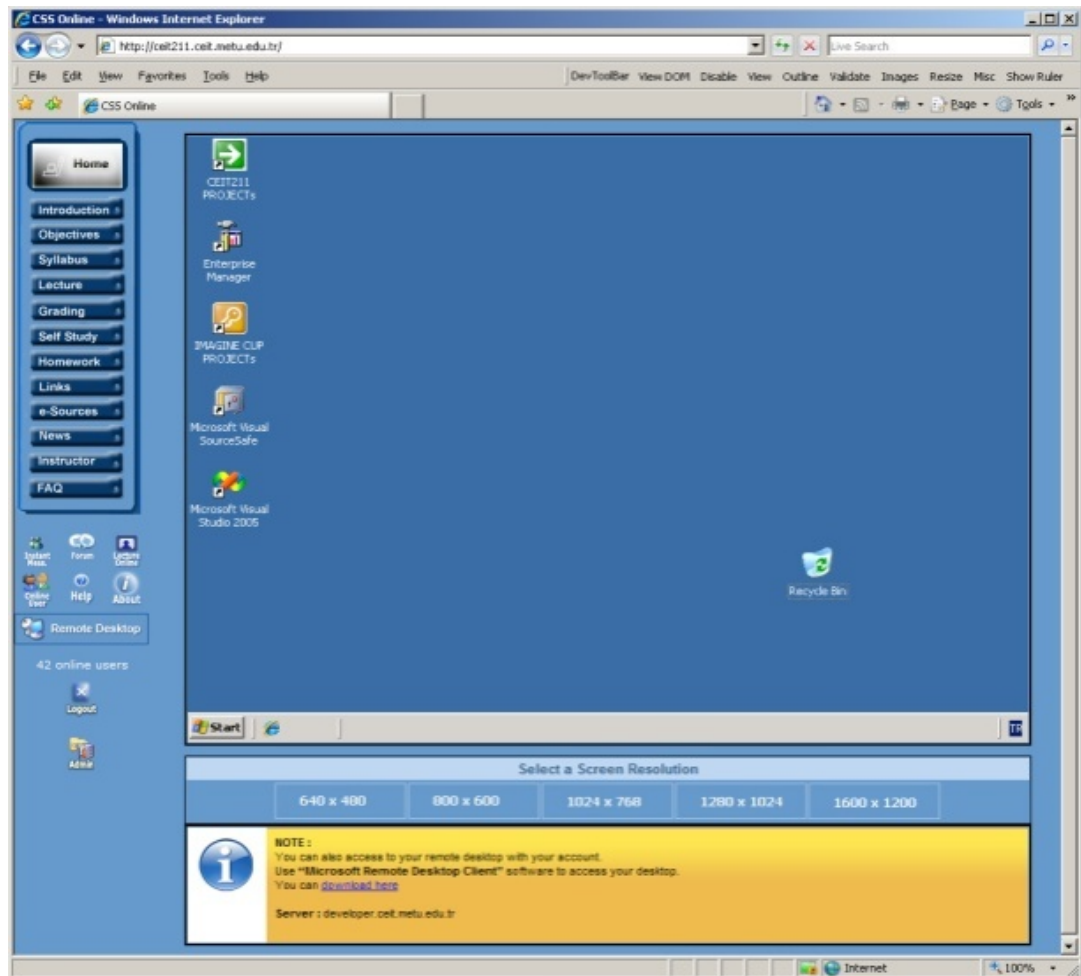


Figure 3.3- Remote Access Technology Web Page in Course Website

Figure 3.3 shows the remote desktop integration of the website. Students, the instructor and the laboratory assistant access to their own desktop by using newly integrated remote desktop page. This page recognizes the active user of the website and logs that user automatically to the desktop of this user on remote server.

3.5 Variables

The independent variable for the first and second research problems is the use of Remote Access Technology.

Dependent variables for the first problem are;

Perceptions of students about the use of Remote Access Technology in terms of;

- *its effects on their motivation towards course's group project*
- *its usefulness*
- *its ease of use*

and for the second problem;

Perceptions of the instructor and the laboratory assistant about the use of Remote Access Technology in terms of;

- *its effects on students' motivation towards course's group project*
- *its usefulness*
- *its ease of use*

Also, in the scope of the second problem the *advantages, disadvantages* and *suggestions* about the use of this technology from the point of the instructor and the laboratory assistant were investigated in this study.

3.6 Instruments

During this study, three instruments were used to collect data. In order to obtain students' attitudes towards the computers, *Computer Attitude Scale (CAS)* was used. Also, to obtain students' perceptions about the Remote Access Technology, *Students' Perceptions about the Remote Access Technology Questionnaire (SPRAT-Q)* was utilized. Finally, to obtain instructor' and laboratory assistant' perceptions about the Remote Desktop Connection, *The Instructor' and the Laboratory Assistant' Perception about Remote Access Technology Interview Guide (ILAPRAT-IG)* were used. In Table 3.3, research questions and corresponding instrument were listed.

Table 3.3 - Research Questions and Their Data Collection Tools

RESEARCH PROBLEMS	DATA COLLECTION
<p>Question 1: How do the <i>students</i> perceive the use of the remote access technology in their course's group projects?</p>	
<p>Question 1.1: How do the students perceive the remote access technology in their course's group projects "<i>in terms of its effects on their motivation towards the course's group project</i>"?</p>	<p>Students' Perceptions about the Remote Access Technology Questionnaire (SPRAT-Q)</p>
<p>Question 1.2: How do the students perceive "<i>the usefulness</i> of the remote access technology"?</p>	
<p>Question 1.3: How do the students perceive "<i>the ease of use</i> of the remote access technology"?</p>	
<p>Question 2: How do the <i>instructor</i> and the laboratory assistant perceive the use of the remote access technology in course's group projects?</p>	
<p>Question 2.1: How do the instructor and the laboratory assistant perceive the remote access technology in course's group projects in terms of "<i>its effects on students' motivation towards the course's group project</i>"?</p>	<p>The Instructor' and the Laboratory Assistant' Perception about Remote Access Technology Interview Guide (ILAPRAT-IG)</p>
<p>Question 2.2: How do the instructor and the laboratory assistant perceive "<i>the usefulness</i> of the remote access technology"?</p>	
<p>Question 2.3: How do the instructor and the laboratory assistant perceive "<i>the ease of use</i> of the remote access technology"?</p>	
<p>Question 2.4: What are "<i>the advantages and disadvantages</i> of the remote access technology in programming courses" from the instructor's and the laboratory assistant's point of view?</p>	
<p>Question 2.5: What are "<i>the suggestions</i> of the instructor and the laboratory assistant" about the use of this technology?</p>	

3.6.1 *Computer Attitude Scale (CAS)*

Before students started to use the Microsoft Remote Desktop Client Software, they were given the CAS (Appendix C). The aim of the use of this instrument is to get and report the computer attitude characteristics of students. This scale originally consists of 40 questions and developed by Loyd and Gressard (1984) as a Likert-type instrument. It has four subscales: a) anxiety, b) liking, c) usefulness, d) confidence (Knezek & Christensen, 2000). It is translated into Turkish by Berberoğlu and Çalikoğlu (1992). Questionnaire items are 4 point-scale Likert-type and item scale represented as in the Table 3.4.

Table 3.4 - Computer Attitude Scale (CAS) Item scale

1	Strongly Disagree
2	Agree
3	Disagree
4	Strongly Agree

In this study, 3 of questions were removed from the original questionnaire after the suggestion of the Faculty Ethics Commission (see Appendix C)

Thus, the version of the questionnaire used in this study had 37 questions. Berberoğlu and Çalikoğlu (1992) found the reliability coefficient alpha value equals to 0.900 in their study. According to the results of CAS conducted in this study, the

reliability coefficient alpha value found as 0.933. Number of questions and Cronbach's Alpha values for each construct are listed in Table 3.5.

Table 3.5 - Cronbach's Alpha Values for Constructs of CAS

Subscale	Cronbach's Alpha	Number of Items
Anxiety	.755	10
Liking	.774	10
Usefulness	.781	8
Confidence	.860	9
Overall	.933	37

3.6.2 *Students' Perceptions about the Remote Access Technology Questionnaire (SPRAT-Q)*

This questionnaire is the main instrument to obtain the students perceptions about the use of remote access technology (Appendix B). It was developed in English because formal language of the university and there are foreign students' in courses and this course also offered in English. It was developed by the researcher in the scope of this study specifically for this research.

3.6.2.1 *Questionnaire Development Process*

Development process of the questionnaire can be divided into two phases. In each phase, questionnaire was examined by several test experts and subject area experts to assure the questionnaire's accuracy, clarity and validity.

In the first phase, 1 test expert and 9 subject area experts examined the questionnaire. First feedback was related with the motivation factor questions. It was said that the number of the questions were not enough therefore it should be increased. After a literature review, the number of the motivation related questions increased by using the indicators reported in the literature. Another feedback was about the computer competency section. It was said that the direction and the questions were not compatible. This incompatibility corrected according to the expert feedbacks. The third comment was about the repeating phrases in perception questions. Suggestion was to group such kind of questions into one section and to write a shared phrase at the top of the section and questions should make a complete sentence by following this phrase. This solution was applied for the problem. Final feedback was that all the perception questions were coded in a positive question format and there should be some negatively coded questions. According to this feedback, some questions were changed.

Second phase started after all the required revisions were made according to feedbacks taken in first phase. In this phase, the questionnaire was examined by 1 test expert and 4 subject area experts. First feedback was about “frequency” question in self-reported usage section (section 5). Choices in this question were “never”, “sometimes”, “average”, “often”, “very often”. It was proposed that those kinds of choices were highly subjective and it is better to replace them with specific time periods. They were replaced by “never”, “once in a week”, “three times in a week”,

“everyday”, “more than one in a day”. Second suggestion was to add open ended question to allow students to write their reason for low and high usage. This suggestion was applied for the last two questions starting with “how many times...” and “how much time...” phrases in self-reported usage section. After all revisions, an English grammar check performed at METU Academic Writing Center and the questionnaire was finalized.

3.6.2.2 *Validity*

To ensure the validity of the questionnaire, its subscales and questions are revised or adapted from other questionnaires used in previous researches. These literature supports will be reported under “Questionnaire Subscales” title in this section. Also, to increase the validity, it was developed with the help of experts. During the development period, they directed the structure and the content by their feedbacks.

3.6.2.3 *Reliability*

The entire instrument development process was executed with the help of expert feedbacks to increase the reliability of the study. Also, a pilot study has been conducted with the students of “CEIT439: Object Oriented Web & Mobile Programming” course which is also another programming languages course and students has group projects. Also, the course content is very similar to CEIT 211 course which is the course that the actual study was conducted on. Total number of students participated in pilot study was 13.

In pilot study, the system has been introduced to the course instructor by the researcher. Then, an introductory lecture was given to the students by supporting presentation and other tutorial documents. Also these documents were uploaded to the course website and the shared folder on the central project server utilized by this study. After students used the system for 3 weeks, online student perception questionnaire was conducted as online. After data collection and analyze, the reliability coefficient alpha value was calculated as 0.966. This value is high enough for reliability. Number of questions and Cronbach's Alpha values for each construct are listed in the Table 3.6 for both pilot study and actual study.

Table 3.6 - Cronbach's Alpha Values for Constructs of SPRAT-Q

	Number of Items	Pilot Study	Actual Study
		Cronbach's Alpha	Cronbach's Alpha
Self-Reported Computer Competency	7	.643	.786
Self-Reported E-learning Experience	4	.413	.327
Perceived Effects on Students Motivation Towards the Group Projects	9	.902	.916
Perceived Usefulness	10	.935	.935
Perceived Ease of Use	8	.935	.909
Overall for Perception Constructs	27	.966	.946

3.6.2.4 Questionnaire Subscales

The questionnaire consists of 5 sections and there are 6 subscales namely *self-reported computer competency*, *self-reported e-learning experience*, *perceived*

effects on students' motivation towards their group projects, perceived usefulness, perceived ease of use, self-reported usage. Subscales, sections and their number of questions are listed in Table 3.7. First 2 subscales contain questions about participants' background information which are *self-reported computer competency, self-reported e-learning experience.* Following 2 subscales are aimed to get students' perceptions about the Microsoft Remote Desktop Software and the last section contains questions about *self-reported usage.*

Table 3.7 –Sections and Number of Questions for Each Constructs of SPRAT-Q

Subscale(s)	Section	Number of Questions
Self-Reported Computer Competency	Section 1	7
Self-Reported E-learning Experience	Section 2	4
Perceived effects on Students' Motivation towards their Group Projects	Section 3	9
Perceived Usefulness	Section 3	10
Perceived Ease of Use	Section 4	8
Self-Reported Usage	Section 5	3
TOTAL		41

Self-Reported Computer Competency

This subscale had 7 questions querying the participants' competencies about different technologies including remote access technologies. It was included to obtain data

about participants' current competency level. The aim was again to use its results to explain the possible extreme values which might be obtained as the result of the perception related constructs.

Self-Reported E-Learning Experience

This subscale had 4 questions querying the participants' online or web-based course experiences. It was included to obtain data about participants' background experiences. The aim was to use its results to explain the possible extreme values which might be got as the result of the perception related constructs.

Perceived Effects on Students' Motivation towards Their Group Projects

This construct was added to get students perceptions about how positively or negatively the use of this technology affected their motivation towards the course's group projects. *Interest / Enjoyment* and *Perceived Competence* variables used in the development of this construct were introduced in Intrinsic Motivation Inventory (IMI) developed by Edward L. Deci and Richard M. Ryan (2006). Also, willingness and participation variables were added to this scale. McAuley, Duncan, and Tammen (1989) did a study to examine the validity of the IMI and found strong support for its validity. Tsigilis and Theodosiou (2003) also found a Greek version of the scale to be reliable. All questions and sub-variables of motivation construct used in questionnaire are listed in Table 3.9.

Table 3.8 - Perceived Effects on Students' Motivation towards Their Group Projects Related Questions and Variables

Question	Variable
S3.04 ... increased my interest on our project	
S3.06 ... made our project enjoyable	Interest / Enjoyment
S3.19 ... made our project boring	
S3.16 ... increased my satisfaction about our group project	Perceived Competence
S3.07 ... decreased my willingness to work on our group project	
S3.11 ... increased my motivation towards our group project	Willingness
S3.18 ... increased my willingness to work on our group project	
S3.03 ... increased my participation to our group project	
S3.12 ... increased my study time on our group project	Participation

Perceived usefulness and *perceived ease of use* constructs were developed based on the Technology Acceptance Model (TAM) introduced by Davis (1989).

“A key purpose of TAM is to provide a basis for tracing the impact of external factors on internal beliefs, attitudes and intentions. TAM posits that two particular beliefs, *perceived usefulness* and *perceived ease of use* are of primary relevance for computer acceptance behavior.” (Davis, 1989)

Perceived Usefulness

Perceived usefulness is defined as “the prospective user’s subjective probability that using a specific application system will increase his or her job performance within an organizational context” (Davis, Bagozzi, & Warshaw, 1989) . David’s measurement scale has 6 variables for perceived usefulness;

- Work more quickly
- Job performance
- Increase productivity
- Effectiveness
- Makes job easier
- Useful

In this questionnaire, items of this subscale were developed based on these variables. There were 10 Likert-type questions for perceived usefulness. All questions and sub-variables are listed in Table 3.9.

Table 3.9 - Perceived Usefulness Questions and Corresponding TAM Variables

Question	Variable
S3.01 ... enabled me to accomplish our group project more quickly	Work more quickly
S3.15 ... decreased my speed in our group project	
S3.02 ... improved my performance in our group project	Job performance
S3.14 ... has decreased my performance in our group project	
S3.05 ... increased my productivity in our group project	Increase productivity
S3.08 ... enhanced my effectiveness in our group project	Effectiveness
S3.09 ... made it easier to develop our group project	Makes job easier
S3.10 ... was beneficial to access to the server	
S3.13 ... improved our opportunity to work on our group project	Useful
S3.17 ... was useful in our group project.	

Perceived Ease of Use

Perceived ease of use refers to “the degree to which the prospective user expects the target system to be free of effort” (Davis, Bagozzi, & Warshaw, 1989). David’s measurement scale has 6 variables for perceived usefulness;

- Easy to learn
- Clear & Understandable
- Easy to become skillful
- Easy to use
- Controllable
- Flexible

Items of this subscale were developed based on first 4 of those variables reported by David within Technology Acceptance Model. Since the tool used in this study were not multi-function and multi-aimed software, controllability and the flexibility variables omitted. There were 8 Likert-type questions for perceived ease of use. All questions and corresponding TAM variables are listed in table 3.10.

Table 3.10 - Perceived Ease of Use Questions and Corresponding TAM Variables

Question	Variable
S4.01 Learning to use “Remote Access Technology” was easy for me Desktop Client”	Easy to learn
S4.05 I was difficult to learn to use “Remote Access Technology”	
S4.02 It was easy to become skillful at using “Remote Access Technology”	Easy to become skillful
S4.03 User interfaces and messages of “Remote Access Technology” were clear and understandable	Clear & Understandable
S4.04 User interfaces and messages of “Remote Access Technology” were user friendly	
S4.06 User interfaces and messages of “Remote Access Technology” were using terms familiar to me	
S4.07 It was hard to understand the user interface of “Remote Access Technology”	Overall Easy to use
S4.08 I found “Remote Access Technology” easy to use	

Self-Reported Usage

This construct was included to examine the possible correlation of the perceptions with the use of the technology. To obtain self-reported usage data, 3 questions were developed. First one was in an ordinal choice format which aims to get periodical usage frequency. Next two questions were in a number input format to get students total usage data in terms of usage times and total usage hours. Also, these last two questions had open ended answer areas for high and low usage reasons.

3.6.3 *The Instructor' and the Laboratory Assistant' Perception about Remote Access Technology Interview Guide (ILAPRAT-IG)*

This is a structured interview and the interview guide is developed by the researcher. Development process consists of two phases. In each phase, expert feedbacks and directions were solicited and interview guide was revised by those feedbacks.

In phase 1, first feedback was that it would be better to have a warming up questions instead of starting with questions directly related the study. According to this feedback, a warming up section was added at the beginning of the interview guide. Second feedback was to include in-depth questions. It was said that existing questions were too general and it was suggested to add in-depth follow-up questions to get more valuable answers. In-depth follow-up questions were added by considering this suggestion. Thirdly, it was suggested to add an introduction page to contain information about the research. It was said that this could increase the independency of the interview guide from the researcher. Then an informative

introduction page was added to the interview guide. Finally, it was suggested to add ending questions at the end of the guide and two ending questions were added according to this suggestion.

In phase 2, the revised version of the interview guide was re-examined by subject area experts. In this phase only feedback related with the format was a suggestion to make an addition to the introduction section regarding voice recording. This suggestion was applied by adding information section which also contains a question asking for permission to use voice recording. Other feedbacks were generally about grammatical corrections. At the end of this phase, an English grammar check was performed at METU Academic Writing Center. Then the interview guide was finalized.

3.7 Data Collection Procedures

The data was collected by both qualitative and quantitative methods. Questionnaires were used to obtain quantitative data from students and interviews conducted with the instructor and the laboratory assistant of the course as data collection instruments.

CAS was conducted before students started to use the Microsoft Remote Access Technology and SPRAT-Q was conducted at the end of the system usage period. Both questionnaires were conducted online.

ILAPRAT-IG was conducted with the instructor and one of the lab assistants of the course after the system usage period ended. After having interviewees' permissions,

all speeches were recorded by a digital sound digital device during the interviews. Then these records were scripted carefully.

3.8 Data Analysis Procedures

Since both quantitative and qualitative data collection tools were used in the study, data analysis methods also contain both quantitative and qualitative data analysis methods. All stages of data analysis procedures are listed in Table 3.11.

Table 3.11 - Data Analysis Procedures

Method of Analysis	Stages	Description of the process used
Quantitative	Coding	Data from the SPRAT-Q were coded with the help of Data Coding Guide (see Appendix B).
	Descriptive statistics	Descriptive analysis of mean, frequency, percentage, and standard deviations for each question were calculated by using SPSS 13.0 for Windows software program.
	Display	Charts and tables were created from the data using SPSS and Microsoft Excel features.
	Conclusion Drawing	Interpretations were made on the tables and charts developed and then conclusions were drawn.
Qualitative	Coding	Interview audio records were scripted carefully. Files were developed in Microsoft Word for subsequent analysis.
	Ordering and Displaying	A conceptual framework was developed according to main research questions and their sub-questions. Then, interview scripts were organized by using this conceptual framework.
	Conclusion Drawing	Decisions about the meaning of data were made, conclusions were drawn and they were included in the dissertation.
	Verifying	Conclusions were verified by reviewing with reference to the original data.

3.8.1 *Questionnaires (CAS and SPRAT-Q)*

Questionnaires were online and their data were automatically recorded into a database. All data were transferred into and SPSS 13 (Statistical Package for Social Sciences) data file for the analysis. Frequencies, percentages, means and standard deviations were calculated. Different graphical charts such as histograms, bar charts, pie charts and etc were also prepared to visualize the data.

The reliability of all measurement scales was comfortably above the recommended minimum level of .70 for social science research (Hatcher, 1994), and the accepted “desirable” level of .80 for social science research.

3.8.2 *The Instructor’ and the Laboratory Assistant’ Perception about Remote Access Technology Interview Guide (ILAPRAT-IG)*

Descriptive analysis method was used to analyze the interview data. According to this approach, the data obtained was summarized and interpreted by using pre-defined theme. Descriptive analysis method consists of four steps (Yıldırım & Şimşek, 2006);

- Creating a framework for descriptive analysis
- Processing data according to thematic framework
- Defining findings
- Interpreting findings

Instructor’s and assistant’s perception about the Remote Access Technology was interpreted by using descriptive analysis.

3.9 Assumptions

For this study, the following assumptions are made:

1. All participants responded accurately to all the instruments used in this study.
2. Data were collected, recorded and analyzed accurately.
3. Reliability and validity of all the measures used in this study were accurate enough to permit accurate assumptions.

3.10 Limitations

The following limitations are relevant to the present study:

1. This study is limited to 37 students who enrolled in “CEIT211: Programming Languages II” course on the Spring semester of 2006-2007 academic year.
2. Validity of this study is limited to the validity of the instruments which were used in this study.
3. Reliability of this study is limited to the honesty of the subjects’ responses to the instruments used in this study.
4. This study is limited to the group projects of “CEIT211: Programming Languages II” course offered in the 2007 Spring semester at METU.
5. This study is limited to students, the instructor and the laboratory assistant of “CEIT211: Programming Languages II” course offered in the 2007 Spring semester at METU.

CHAPTER 4

RESULTS

In this chapter, the results of quantitative and qualitative analyses are presented related with students', the instructor' and the laboratory assistant' perceptions about the use of Microsoft Access Technology in the programming course group projects. The results are presented with reference to the research questions. This chapter includes the following sections: Characteristics of the participants, results of the questionnaire responses and results of interviews with the instructors.

4.1 Characteristics of Participants

4.1.1 *Characteristics of Students*

4.1.1.1 *Students' General Characteristics*

There were 25 (67.6%) male and 12 (32.4%) female students participated to the study. The percentage of students stating that they were working with computers longer than one year is 89.2. Also, 62.2% of students stated that they have got at least one computer related course or training.

Table 4.1 - Characteristics of Participants

	GENDER				TOTAL	
	Male		Female		N	%
	N	%	N	%		
Participated in the study	25	67.6	12	32.4	37	100.0
Attended private computer training program	17	45.9	6	16.2	23	62.2
Worked with computers more than one year	23	62.2	10	27.0	33	89.2
No work experience with computers	0	0.0	2	5.4	2	5.4

4.1.1.2 *Students' Computer Education Background*

Data about students' computer education background were collected using CAS-Q. As seen in the Table 4.2, the number of students answered the question asking the institution where they got computer education was 23, 19 (82.6%) of them reported that they have taken computer education in *High School*. Also, 2 (8.7%) of them reported that they have taken education at a *Post Secondary Vocational School* while 2 (8.7%) of them reported that they got education at a *Private Institution*.

Table 4.2 - Institutions in which Students Has Taken Computer Education

Institution Type	GENDER				TOTAL	
	Male		Female		N	%
	N	%	N	%		
Highschool	14	73.7	5	26.3	19	82.6
Post Secondary Vocational Schools	2	100.0	0	0.0	2	8.7
Private Institutions	1	50.0	1	50.0	2	8.7

4.1.1.3 *Students' Computer Competency Levels*

According to students' self reported data about their computer competencies as shown in Table 4.3, 79.38% of students stated them self as expert in several software included in the questionnaire such as web browsers, e-mails search engines etc.. The percentage of students reported their competency level for these software as intermediate was 18.75 and that of students reporting their competency level as beginner was 1.88%.

For the competency on Remote Access Applications, more than half of the students reported their competencies as intermediate. According to participants' answers, the number of intermediate students was 18 (56.3%), the number of expert students was 12 (37.5%) and the number of beginner students was 2 (6.2%). These numbers show that participants are mostly familiar with the remote access technologies.

Table 4.3 - Statistics of Students' Self-Reported Computer Competencies

		Not Used	Beginner	Intermediate	Expert
Web browsers		0	0	0	18
Search Engines		0	0	0	17
E-mail		0	0	0	17
Online Forums & Blogs		0	0	8	19
Online Chat Applications		0	1	4	22
Microsoft Office Applications		0	0	0	22
Remote Access Applications		0	2	18	12
TOTAL	N	0	3	30	127
	%	0	1.88	18.75	79.38

4.1.1.4 *Self-Reported E-learning Background*

According to the results of SPRAT-Q which are shown in Table 4.4, all of the participants used Internet in their courses. 81.1% of them taken at least one online or web-supported course before this study. The percentage of participants taken at least one web-supported programming language course before study was 46%. Also, the percentage of the participants who used any remote access technology in their courses before this study was 43.2%.

Table 4.4 - Statistics of Students' Self-Reported Experiences

	Yes		No	
	N	%	N	%
Have you ever taken any <u>web-supported</u> or <u>online course</u> before this semester?	30	81.1	7	18.9
Have you ever taken any <u>web-supported programming language courses</u> before this semester?	17	46.0	20	54.0
Have you ever used Internet <u>for your course studies</u> before this semester?	37	100.0	0	0.0
Have you have ever used any <u>remote access technology individually in your courses</u> before this semester?	16	43.2	21	56.8

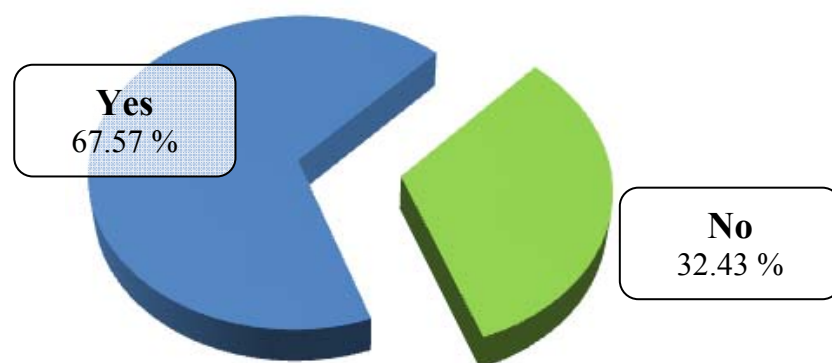


Figure-4.4 - Distribution of Remote Access Applications Competencies

4.1.1.5 *Students' Attitudes towards Computers*

The computer attitude scale (CAS) was administered to the students to obtain information about their attitudes towards computers. The scale items were 4-point Likert-type scale. The subscale items of this questionnaire were *Anxiety*, *Liking*, *Usefulness* and *Confidence*. Each subscale was analyzed and reported individually. The overall computer attitude score calculated was 3.24.

Table 4.5 - Percentages for the Sum of “Agree” and “Strongly Agree” Answers

	Total	N	%
Anxiety	37	35	94.6
Liking	37	35	94.6
Usefulness	37	36	97.3
Confidence	37	34	91.9
Overall	37	36	97.3

Not: Anxiety scores are reversed to make all the score presenting the positive attitude about the constructs

It is clearly seen in Table 4.5, that most of the students have positive attitudes towards computers. Most of the students like the computers and do not have anxiety towards computers. Also, most of them stated computers as useful tools and they feel confident them-self on the use of computers.

Table 4.6 - Descriptive Statistics of CAS Results

	Minimum	Maximum	Mean	Std. Deviation
Anxiety	2.40	4.00	3.2432	.41603
Liking	2.00	3.90	3.0676	.41704
Usefulness	2.38	4.00	3.3615	.42059
Confidence	2.33	4.00	3.2733	.46965
Overall	2.38	3.98	3.2364	.38469

Moreover, it is seen in Table 4.6 that the mean score of each sub-scale is greater than 3.0 out of 4.0 which means average attitude score of students for every subscale is between “agree” and “strongly agree”. 36 (%94.6) of 37 participants reports their positive attitudes towards computers. This information also supports that most of the students have a positive attitude towards computers.

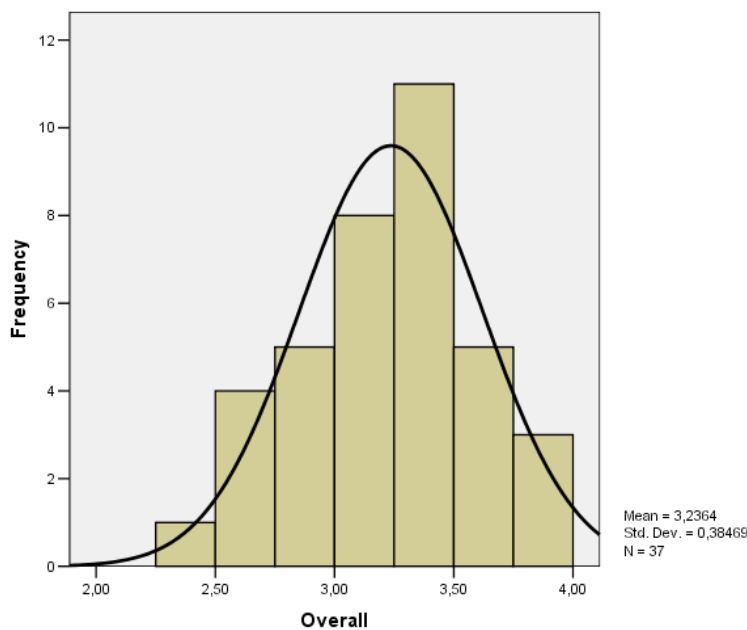


Figure 4.5 - Distribution of CAS Overall Computer Attitude Scores

4.1.1.6 *Students' Self Reported Usage*

As it is seen in Table 4.7, 43.2% of the students reported their usage as once in a week. The percentages of participants reporting their usage as three times in a week was 29.7%. Also, 40.5% of students used the system three times or more in a week.

Table 4.7 - Descriptive Statistics of the Question “How *frequently* did you use Remote Access Technology in your group project?”

	N	%
Never	6	16.2
once in a week	16	43.2
three times in a week	11	29.7
Everyday	4	10.8
Total	37	100.0

According to the results of the question “How many times did you use Remote Access Technology?”, 67.5% of students reported that they have used the system at least 5 times in their group projects.

Table 4.8 - Descriptive Statistics of the Question “How many *times* did you use Remote Access Technology in your group project?”

Usage Times	N	%
0	2	5.4
2	3	8.1
3	4	10.8
4	3	8.1
5	4	10.8
6	2	5.4
8	3	8.1

10	4	10.8
12	2	5.4
14	1	2.7
15	3	8.1
20	1	2.7
22	1	2.7
23	1	2.7
25	1	2.7
50	1	2.7
80	1	2.7
Total	37	100.0

As it is seen in Table 4.9, 59.4% of the participants reported between 5 and 20 hours of use in their group projects.

Table 4.9 - Descriptive Statistics of the Question “How many *hours* did you use Remote Access Technology in your group project?”

Usage Hours	N	%
0	2	5.4
1	1	2.7
2	3	8.1
3	1	2.7
4	2	5.4
5	4	10.8
8	1	2.7
9	1	2.7
10	6	16.2
13	1	2.7
15	6	16.2
20	3	8.1
24	2	5.4
25	1	2.7
40	1	2.7
75	1	2.7
100	1	2.7
Total	37	100.0

4.1.2 *Characteristics of the Instructor and the Assistant*

Table 4.10 –Characteristics of Instructor and the Assistant

Questions	Instructor	Assistant
How long have you been working as an instructor in METU?	for 6 years	for 1.5 years
How long have you been offering CEIT 211 course?	for 6 years	for 1 year
Have you ever used any Remote Access Technology until now?	Yes	Yes
Have you ever used any Remote Access Technology in any course previously as an instructor?	No	No
Have you ever made your students use any Remote Access Technology in your CEIT 211 course previously?	No	No

As it is seen in Table 4.10, the course instructor is working in METU (Middle East Technical University) for 6 years and also he has been offering CEIT 211 course. Also, the laboratory assistant has been working for 1.5 years in METU and he is the assistant of this course for 1 year. Although both of them have been used at least one Remote Access Technology before this study, they have not used it as an educational technology in their courses.

4.2 **Students' Perceptions about Remote Access Technology**

SPRAT-Q was conducted to obtain students' perceptions about using Remote Access Technology. Their perceptions were investigated in terms of three aspects: *Effects of the use of this technology in students' motivation towards their course group projects, perceived usefulness and perceived ease of use.*

Table 4.11 - Abbreviations Used for Student Perception Questions

Abbr.	Description
SD	Strongly Disagree
D	Disagree
N	Neutral
A	Agree
SA	Strongly Agree

The scale of the questionnaire was Likert-type and its scales and abbreviations used in this results section was listed in Table 4.11.

Table 4.12 - Descriptive Statistics of Perception Constructs

	SD	D	N	A	SA	Mean	Std. Dev.
Perceived Effects on Motivation	0,8 %	5,7 %	47,7 %	36,8 %	8,9 %	3,450	0,5989
Perceived Usefulness	0,0 %	4,1 %	42,5 %	41,0 %	12,5 %	3,649	0,5900
Perceived Ease of Use	1,5 %	3,7 %	33,1 %	49,7 %	12,0 %	3,642	0,6348
Overall	0,8 %	4,5 %	41,1 %	42,5 %	11,1 %	3,580	0,6079

Note: Total number of participants (N) = 37

As it is seen in the Table 4.12, 45.7% of students stated positive perception and only 6.5% of them stated negative perception for Perceived Effects on Motivation. Similarly, 61.7% of students stated positive perception for Perceived Ease of Use and only 5.2% of them stated negative perception. Also, 53.5% of students reported positive perception about Perceived Usefulness while only 4.1% of them reporting negative perception. As a result, the mean of the questionnaire data is 3.580 with

standard deviation equals to 0.6079 and 53.6% of students that is more than a half of them reported positive perception while just 5.3% of them reporting negative perception about the use of Remote Access Technology in overall.

4.2.1 *Students' Perceptions about the Effects of the Use of Remote Access Technology on their Motivation towards Course Group Projects*

Students' perceptions about the effects of the use of Remote Access Technology on their motivation towards course group projects were investigated by the use of 9 questions grouped in 4 indicator variables. Indicator variables were *Interest / Enjoyment, Perceived Competence, Willingness* and *Participation*.

Table 4.13 - Descriptive Statistics of Sub-variables of Motivation Factor

	SD	D	N	A	SA	Mean	Std. Dev.
Interest / Enjoyment	1,8 %	9,0 %	45,0 %	34,2 %	9,9 %	3,414	0,7634
Perceived Competence	0,0 %	2,7 %	43,2 %	43,2 %	10,8 %	3,622	0,7208
Willingness	0,0 %	1,8 %	54,1 %	38,7 %	5,4 %	3,477	0,5960
Participation	1,4 %	9,5 %	48,6 %	31,1 %	9,5 %	3,378	0,7491
Overall	0,8 %	5,7 %	47,7 %	36,8 %	8,9 %	3,450	0,5989

Note: Total number of participants (N) = 37

As it is seen in the Table 4.13, for *Interest / Enjoyment* questions 44.1% of students stated positive perception while 45.0% of them were indecisive and 10.8% of them stating negative. Also, 54.1% of students stated their positive perceptions about *Perceived Competence* questions while only 2.7% of them stated their negative perceptions. Similarly, 44.1% of students reported positive perception while just

1.8% of them reporting negative perception for *Willingness* questions. Lastly, while 40.6% of students reported positive perception, 10.9% of them reported negative perception for *Participation* variable.

Although, negative answers of *Interest / Enjoyment* and *Participation* variables reaches to 10.8 %, the total ratio of positive answers in overall is 45.7% and the overall mean score is 3.450 with standard deviation equals to 0.5989.

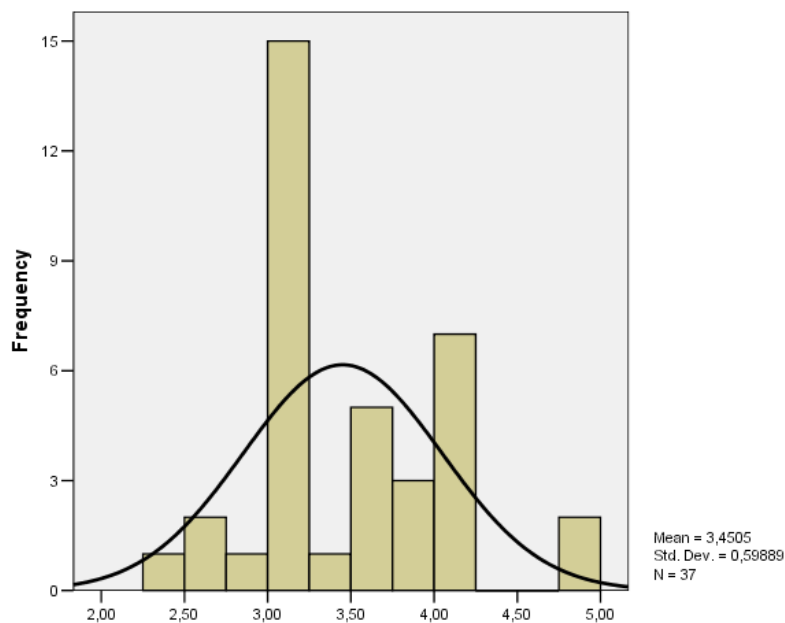


Figure 4.6 - Mean Score Distribution of Students' Perceptions about the Effects of the use of Remote Access Technology on their Motivation towards Course Group Projects

It is seen in Figure 4.6, most of the scores were located between 3.0 and 4.0. This means that the average perceptions of the students were between “neutral” and “agree”. The high number of indecisive students also should be noticed.

4.2.1.1 “Interest / Enjoyment” Variable of Motivation

Three questions were used to investigate this indicator. Question S3.04 (question 4 in section 1 of the questionnaire) were about to investigate perceptions of the students about the effects of the use of this technology on their interests towards course group projects. As can be seen in Table 4.14, 40.5% of them stated positive answer while only 5.4% stating negative one for this question. Questions S3.06 and S3.19 were used to obtain the perceptions of the students about the effects of the use of this technology on their enjoyment in course group projects. These questions were pair questions. 45.9% of students reported positive perceptions while 13.5% of them reporting negative perception. Also 40.5% of them were indecisive. The overall positive perception ratio for this variable is 44.1% with mean equals to 3.414 and standard deviation equals to 0.7634.

Table 4.14 - Descriptive Statistics of “Interest / Enjoyment” Variable of Motivation

	SD		D		N		A		SA		Mean	Std. Dev.
	N	%	N	%	N	%	N	%	N	%		
S3.04... increased my interest on our project	0	0,0	2	5,4	20	54,1	12	32,4	3	8,1	3,432	0,7280
S3.06... made our project enjoyable	1	2,7	4	10,8	15	40,5	13	35,1	4	10,8	3,405	0,9267
S3.19... made our project boring	1	2,7	4	10,8	15	40,5	13	35,1	4	10,8	3,405	0,9267
Overall	0,7	1,8	3,3	9,0	16,7	45,0	12,7	34,2	3,7	9,9	3,414	0,7634

Note: S03.19 is reversely coded

4.2.1.2 “Perceived Competence” Variable of Motivation

To investigate this indicator, only Question S3.16 was asked to students. Table 4.15 shows that more than half of the participants (54.0% of them) stated positive answer

while only 2.7% of them answering negatively to this question. Also 43.2% of them were indecisive. The mean score for *Perceived Competence* variable was 3.622 with standard deviation 0.7208.

Table 4.15 - Descriptive Statistics of “Perceived Competence” of Motivation

	SD		D		N		A		SA		Mean	Std. Dev.
	N	%	N	%	N	%	N	%	N	%		
S3.16... increased my satisfaction about our group project	0	0,0	1	2,7	16	43,2	16	43,2	4	10,8	3,622	0,7208
Overall	0,0	0,0	1,0	2,7	16,0	43,2	16,0	43,2	4,0	10,8	3,622	0,7208

4.2.1.3 “Willingness” Variable of Motivation

3 questions were asked to investigate this variable. Question S3.07 and Question 3.18 were pair questions and aimed to obtain students’ perceptions about the effects of this technology on their willingness. As seen in Table 4.16, for both questions the percentage of positive answers was 43.2% while the one for negative ones was 2.7%. Question S3.11 was directly asking their perceptions about the effects of this tool on their motivations towards group projects. For this question, 45.9% of participants reported positive perceptions for that question while no one of them reports a negative perception. In total, the mean score for this variable was 3.477 with standard deviation 0.5960. While 44.1% of them reported positive perceptions, only 1.8% of them reported negative perceptions.

Table 4.16 - Descriptive Statistics of “Willingness” Variable of Motivation

	SD		D		N		A		SA		Mean	Std. Dev.
	N	%	N	%	N	%	N	%	N	%		
S3.07... decreased my willingness to work on our group project	0	0,0	1	2,7	20	54,1	14	37,8	2	5,4	3,459	0,6496
S3.11... increased my motivation towards our group project	0	0,0	0	0,0	20	54,1	15	40,5	2	5,4	3,514	0,6065
S3.18... increased my willingness to work on our group project	0	0,0	1	2,7	20	54,1	14	37,8	2	5,4	3,459	0,6496
Overall	0,0	0,0	0,7	1,8	20,0	54,1	14,3	38,7	2,0	5,4	3,477	0,5960

Note: S03.07 is reversely coded

4.2.1.4 “Participation” Variable of Motivation

Two questions were asked to investigate this variable. Question S3.03 was about the effects of this tool on their participation to their group projects. As can be seen in Table 4.17, this question was answered by 43.2% of participants positively while negatively only by 8.1% of them. Question 3.12 was about the effects on the use of this tool on their study time in their group projects. The percentage of positive answers was 37.8% while that of negative answers was 13.5%. In overall, 40.6% of participants answered positively and 10.9% of them answered negatively for the questions of *Participation* variable. The overall mean score for this variable was 3.378 with standard deviation equals to 0.7491.

Table 4.17 - Descriptive Statistics of “Participation” Variable of Motivation

	SD		D		N		A		SA		Mean	Std. Dev.
	N	%	N	%	N	%	N	%	N	%		
S3.03... increased my participation to our group project	0	0,0	3	8,1	18	48,6	12	32,4	4	10,8	3,459	0,8026
S3.12... increased my study time on our group project	1	2,7	4	10,8	18	48,6	11	29,7	3	8,1	3,297	0,8777
Overall	0,5	1,4	3,5	9,5	18,0	48,6	11,5	31,1	3,5	9,5	3,378	0,7491

4.2.2 *Students' Perceptions about Usefulness*

Students' perceptions about the usefulness of the remote access technology used in this study were investigated by 6 variables reported in Perceived Usefulness construct of Technology Acceptance Model developed by Davis. (1989) Descriptive statistics for those variables obtained from the results of SPRAT-Q were reported in the table below.

Table 4.18 - Descriptive Statistics of Sub-variables of Perceived Usefulness

	SD	D	N	A	SA	Mean	Std. Dev.
Work more quickly	0,0 %	0,0 %	35,1 %	51,4 %	13,5 %	3,784	0,6723
Job performance	0,0 %	5,4 %	54,1 %	29,7 %	10,8 %	3,459	0,7672
Increase productivity	0,0 %	8,1 %	48,6 %	32,4 %	10,8 %	3,459	0,8026
Effectiveness	0,0 %	5,4 %	45,9 %	37,8 %	10,8 %	3,541	0,7672
Makes job easier	0,0 %	2,7 %	37,8 %	45,9 %	13,5 %	3,703	0,7403
Useful	0,0 %	2,7 %	33,3 %	48,6 %	15,3 %	3,766	0,6567
Overall	0,0 %	4,1 %	42,5 %	41,0 %	12,5 %	3,649	0,5900

Note: Total number of participants (N) = 37

As it is seen in the Table 4.18, in average more than half of the participants had positive perceptions about the usefulness of the Remote Access Technology. It is seen that *Work more quickly* and *Useful* were variables that got most positive answers with percentages more than 63.0%. Then *Makes Job Easier* follows them with percentage value of positive answers equals to 59.4%. And the percentages of following variables ordered with their percentages of positive answers were: *Effectiveness* with 48.6%, *Increase Productivity* with 43.2% and *Job Performance* with 40.5% positive perceptions. However percentages of indecisive students were

high especially for *Job performance* (54.1%), for *Increase productivity* (48.6%) and for *Effectiveness* (45.9). Mean scores of almost all variables were greater than 3.450 and the overall mean score for usefulness was 3.649 with standard deviation value equals to 0.5900.

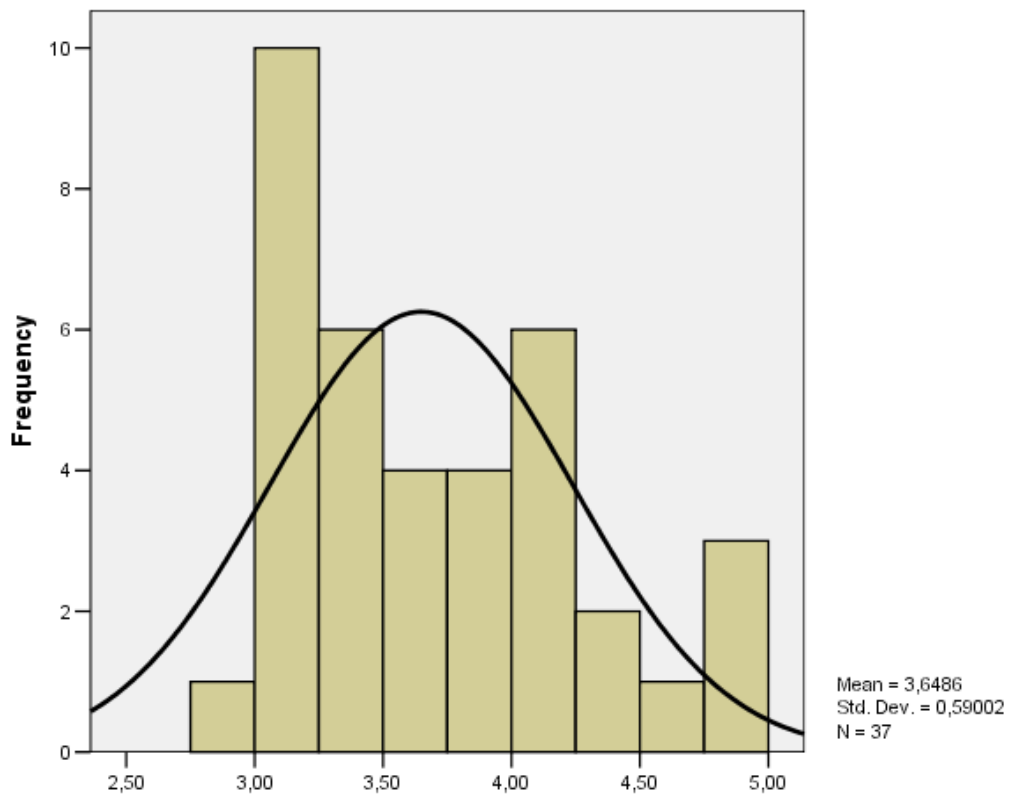


Figure 4.7 - Case Mean Score Distribution for Students' Perceived Usefulness

It is seen in the Figure 4.7 that most of the scores for perceived usefulness were located between 3.0 and 4.0. This means that the average perceptions of the students were between “neutral” and “agree” however also there is a noticeable accumulation near neutral.

4.2.2.1 “Work more quickly” Variable of Perceived Usefulness

Two questions were asked to investigate this variable and they were pair question for each other. As can be seen in Table 4.19, those questions were Question S3.01 and S3.15. Both questions were answered by 64.9% of participants positively while there were no participants answering those questions negatively. In overall, as Table 4.19 shows, the mean score for this variable was 3.784 with standard deviation 0.6723.

Table 4.19 - Descriptive Statistics of “Work More Quickly” Variable of Perceived Usefulness

	SD		D		N		A		SA		Mean	Std. Dev.
	N	%	N	%	N	%	N	%	N	%		
S3.01... enabled me to accomplish our group project more quickly	0	0,0	0	0,0	13	35,1	19	51,4	5	13,5	3,784	0,6723
S3.15... decreased my speed in our group project	0	0,0	0	0,0	13	35,1	19	51,4	5	13,5	3,784	0,6723
Overall	0,0	0,0	0,0	0,0	13,0	35,1	19,0	51,4	5,0	13,5	3,784	0,6723

Note: S03.15 is reversely coded

4.2.2.2 “Job performance” Variable of Perceived Usefulness

Two questions were asked to investigate this variable and they were pair question for each other. Those questions were Question S3.02 and S3.14. Table 4.20 shows that both questions were answered by 40.5% of participants positively while they were answered negatively only by 5.4% of them. In overall, the mean score for this variable was 3.459 with standard deviation 0.7672.

Table 4.20 - Descriptive Statistics of “Job Performance” Variable of Perceived Usefulness

	SD		D		N		A		SA		Mean	Std. Dev.
	N	%	N	%	N	%	N	%	N	%		
S3.02... improved my performance in our group project	0	0,0	2	5,4	20	54,1	11	29,7	4	10,8	3,459	0,7672
S3.14... has decreased my performance in our group project	0	0,0	2	5,4	20	54,1	11	29,7	4	10,8	3,459	0,7672
Overall	0,0	0,0	2,0	5,4	20,0	54,1	11,0	29,7	4,0	10,8	3,459	0,7672

Note: S03.14 is reversely coded

4.2.2.3 “Increase Productivity” Variable of Perceived Usefulness

The only question used to investigate this variable was S3.05. Table 4.21 shows that 43.2% of participants reported their positive perceptions while only 8.1% reporting negative perceptions. The mean score for this variable was 3.459 with standard deviation value equals to 0.8026.

Table 4.21 - Descriptive Statistics of “Increase productivity” Variable of Perceived Usefulness

	SD		D		N		A		SA		Mean	Std. Dev.
	N	%	N	%	N	%	N	%	N	%		
S3.05... increased my productivity in our group project	0	0,0	3	8,1	18	48,6	12	32,4	4	10,8	3,459	0,8026
Overall	0,0	0,0	3,0	8,1	18,0	48,6	12,0	32,4	4,0	10,8	3,459	0,8026

4.2.2.4 “Effectiveness” Variable of Perceived Usefulness

S3.08 was the only question used to investigate the variable *Effectiveness*. As seen in Table 4.22, 48.6% of participants answered positively to that question while only

5.4% of them reporting answered negatively. The mean score for this variable was 3.541 with standard deviation value equals to 0.7672.

Table 4.22 - Descriptive Statistics of “Effectiveness” Variable of Perceived Usefulness

	SD		D		N		A		SA		Mean	Std. Dev.
	N	%	N	%	N	%	N	%	N	%		
S3.08... enhanced my effectiveness in our group project	0	0,0	2	5,4	17	45,9	14	37,8	4	10,8	3,541	0,7672
Overall	0,0	0,0	2,0	5,4	17,0	45,9	14,0	37,8	4,0	10,8	3,541	0,7672

4.2.2.5 “Makes job easier” Variable of Perceived Usefulness

The only question used to investigate the variable *Effectiveness* was S3.09. As can be seen in Table 4.23, the percentage of positively answered participants for that question was 59.4% while that of negatively answered was only 2.7%. The mean score for this variable was 3.703 with standard deviation value equals to 0.7403.

Table 4.23 - Descriptive Statistics of “Makes Job Easier” Variable of Perceived Usefulness

	SD		D		N		A		SA		Mean	Std. Dev.
	N	%	N	%	N	%	N	%	N	%		
S3.09... made it easier to develop our group project	0	0,0	1	2,7	14	37,8	17	45,9	5	13,5	3,703	0,7403
Overall	0,0	0,0	1,0	2,7	14,0	37,8	17,0	45,9	5,0	13,5	3,703	0,7403

4.2.2.6 “Useful” Variable of Perceived Usefulness

There were 3 questions were asked to investigate this variable. The first question was S3.10 and it was asked to obtain perceptions of students about its usefulness related

with accessing to the server. The percentages of students answered those question positively was the highest percentages among all the perception questions of the questionnaire. As seen in Table 4.24, while the percentage of positive answers was 70.3%, that of negative answers was only 2.7%. The second question was S3.13. The percentage of positive answers for that question was 59.4% while that of negative answers was only 2.7%. The last question was S3.17 and its' percentage of positive answers was also one of the top percentages among all the questions of the questionnaire. It was 62.1% and the percentage of negatively answered questions was only 2.7%. In overall, the percentage of positive answers for this variable was 63.9% and the mean score was 3.766 with standard deviation equals to 0.7672.

Table 4.24 - Descriptive Statistics of “Useful” Variable of Perceived Usefulness

	SD		D		N		A		SA		Mean	Std. Dev.
	N	%	N	%	N	%	N	%	N	%		
S3.10... was beneficial to access to the server	0	0,0	1	2,7	10	27,0	21	56,8	5	13,5	3,811	0,7007
S3.13... improved our opportunity to work on our group project	0	0,0	1	2,7	14	37,8	16	43,2	6	16,2	3,730	0,7691
S3.17... was useful in our group project	0	0,0	1	2,7	13	35,1	17	45,9	6	16,2	3,757	0,7603
Overall	0,0	0,0	1,0	2,7	12,3	33,3	18,0	48,6	5,7	15,3	3,766	0,6567

4.2.3 *Students’ Perceptions about Ease of Use*

Students’ perceptions about the ease of use of the remote access technology were investigated by 6 variables reported in Perceived Usefulness construct of Technology Acceptance Model developed by Davis. Descriptive statistics for those variables obtained from the results of SPRAT-Q were reported in Table 4.26.

Table 4.25 - Descriptive Statistics of Sub-variables of Perceived Ease of Use

	SD	D	N	A	SA	Mean	Std. Dev.
Easy to Learn	5,4 %	5,4 %	21,6 %	51,4 %	16,2 %	3,676	1,0015
Easy to Use	0,0 %	0,0 %	35,1 %	51,4 %	13,5 %	3,784	0,6723
Easy to Become Skillful	0,0 %	2,7 %	43,2 %	43,2 %	10,8 %	3,622	0,7208
Clear & Understandable	0,7 %	6,8 %	32,4 %	52,7 %	7,4 %	3,595	0,6597
Overall	1,5 %	3,7 %	33,1 %	49,7 %	12,0 %	3,642	0,6348

Note: Total number of participants (N) = 37

As it is seen in Table 4.25, most of the participants reported positive perceptions about the ease of use of Remote Access Technology. It is seen that “*Easy to learn*” and “*Easy to use*” variables had most positive answers. Then “*Clear & Understandable*” and “*Easy to become skillful*” follows them with percentage values greater than 50.0%. The overall mean score for this construct was 3.642 with standard deviation value equals to 0.6348.

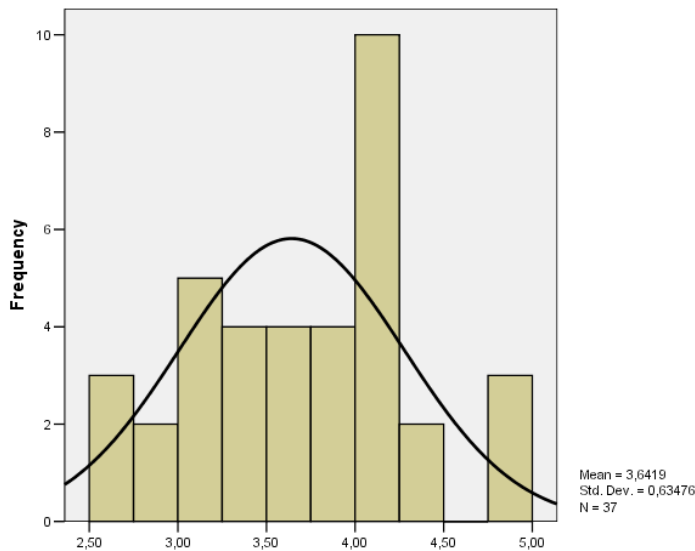


Figure 4.8 - Students’ Perceived Ease of Use for Mean Score Distribution

It is seen in Figure 4.8, most of the scores for perceived ease of use were located between 3.0 and 4.0. This means that the average perceptions of the students about the ease of use of this technology were between “neutral” and “agree”. This shows that students mostly reported their positive perceptions about Ease of Use of this technology.

4.2.3.1 “Easy to Learn” Variable of Perceived Ease of Use

There were two questions to investigate this variable and they were pair questions. Table 4.27 shows that with the percentage of 67.6% for the positive answers, these questions were in the top questions having highest percentages for their positive answers. Table 4.26 shows that the percentage of negative answers was only 10.8%. In overall, the mean score for the variable “Easy to learn” was 3.676 with the standard deviation value equals to 1.0015.

Table 4.26 - Descriptive Statistics of “Easy to learn” Variable of Perceived Ease of Use

	SD		D		N		A		SA		Mean	Std. Dev.
	N	%	N	%	N	%	N	%	N	%		
S4.01. Learning to use “Remote Access Technology” was easy for me”	2	5,4	2	5,4	8	21,6	19	51,4	6	16,2	3,676	1,0015
S4.05. I was difficult to learn to use “Remote Access Technology”	2	5,4	2	5,4	8	21,6	19	51,4	6	16,2	3,676	1,0015
Overall	2,0	5,4	2,0	5,4	8,0	21,6	19,0	51,4	6,0	16,2	3,676	1,0015

Note: S04.05 is reversely coded

4.2.3.2 “Easy to Use” Variable of Perceived Ease of Use

The only question used to investigate this variable was S4.08. As can be seen in Table 4.27, while the percentage of positive answers equals to 64.9%, there were no negative answer for this question. The mean score was 3.784 with the standard deviation value equals to 0.6723.

Table 4.27 - Descriptive Statistics of “Easy to use” Variable of Perceived Ease of Use

	SD		D		N		A		SA		Mean	Std. Dev.
	N	%	N	%	N	%	N	%	N	%		
S4.08. I found “Remote Access Technology” easy to use	0	0,0	0	0,0	13	35,1	19	51,4	5	13,5	3,784	0,6723
Overall	0,0	0,0	0,0	0,0	13,0	35,1	19,0	51,4	5,0	13,5	3,784	0,6723

4.2.3.3 “Easy to Become Skillful” Variable of Perceived Ease of Use

Question S4.02 was the only question used to investigate this variable. Table 4.28 shows that while the percentage of positive answers was 64.9%, that of negative answers was just 2.7%. The mean score for this variable was 3.622 with the standard deviation value equals to 0.7208.

Table 4.28 - Descriptive Statistics of “Easy to Become Skillful” Variable of Perceived Ease of Use

	SD		D		N		A		SA		Mean	Std. Dev.
	N	%	N	%	N	%	N	%	N	%		
S4.02. It was easy to become skillful at using “Remote Access Technology”	0	0,0	1	2,7	16	43,2	16	43,2	4	10,8	3,622	0,7208
Overall	0,0	0,0	1,0	2,7	16,0	43,2	16,0	43,2	4,0	10,8	3,622	0,7208

4.2.3.4 “Clear & Understandable” Variable of Perceived Ease of Use

There were 4 questions used to investigate this variable. As can be seen in Table 4.29, first one was S4.03 and its percentage of positive answers was 62.2% and that of negative answers was only 5.4%. S4.04 was second one and its percentage of positive answers was 56.7% while that of negative answers was only 5.4%. The third question was S4.06 with 59.5% positive answers and 13.5% negative answers. The final question was S4.07 and its percentage of positive answers was 62.2% while that of negative answers was only 5.4%. In total, the percentage of positive answers was 60.1% while that of negative ones was only 7.5%. The overall mean for this variable was 3.595 with standard deviation value equals to 0.6597.

Table 4.29 - Descriptive Statistics of “Clear & Understandable” Variable of Perceived Ease of Use

	SD		D		N		A		SA		Mean	Std. Dev.
	N	%	N	%	N	%	N	%	N	%		
S4.03. User interfaces and messages of “Remote Access Technology” were clear and understandable	0,0	0,0	2,0	5,4	12,0	32,4	20,0	54,1	3,0	8,1	3,649	0,7156
S4.04. User interfaces and messages of “Remote Access Technology” were user friendly	0,0	0,0	2,0	5,4	14,0	37,8	18,0	48,6	3,0	8,1	3,595	0,7249
S4.06. User interfaces and messages of “Remote Access Technology” were using terms familiar to me	1,0	2,7	4,0	10,8	10,0	27,0	20,0	54,1	2,0	5,4	3,486	0,8699
S4.07. It was hard to understand the user interface of “Remote Access Technology”	0,0	0,0	2,0	5,4	12,0	32,4	20,0	54,1	3,0	8,1	3,649	0,7156
Overall	0,3	0,7	2,5	6,8	12,0	32,4	19,5	52,7	2,8	7,4	3,595	0,6597

Note: S04.07 is reversely coded

4.3 The Instructor' and the Laboratory Assistant' Perceptions

The instructor' and the laboratory assistant' perceptions about the use of Remote Access Technology were investigated by the use of interviews. Two interviews were conducted: one with the course instructor and one with the course laboratory assistant. Interview data were analyzed by using descriptive analysis approach described by Yıldırım and Şimşek (2006). According to this approach, a conceptual framework was created. Following table shows the conceptual framework used in this study for descriptive analysis of interview data.

Table 4.30 - Conceptual Framework for Interview Data Analysis

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1. Effects of the use of Remote Access Technology on Students' Motivation towards Course Group Projects
 - a. Interest / Enjoyment
 - b. Perceived Competence
 - c. Willingness
 - d. Participation
 2. Perceived Usefulness
 - a. Work more quickly
 - b. Job performance
 - c. Increase productivity
 - d. Effectiveness
 - e. Make job easier
 - f. Overall Useful
 3. Perceived Ease of Use
 - a. Easy to Learn
 - b. Easy to become skillfull
 - c. Clear & Understandable Interfaces
 - d. Overall Easy to Use
 4. Advantages and Disadvantages
 5. Suggestions
-

4.3.1 *The Instructor' and the Laboratory Assistant' Perceptions about the Effects of the Use of Remote Access Technology on Students' Motivation towards Group Projects*

To investigate the effects of the use of this technology on students' motivation towards course group projects, firstly instructors were asked that "How did the use of this technology effect the motivation of the students towards their group projects? Positively, negatively or not effected?" Answers of both instructors were positive. To get detailed indicators of their observations, they were asked to explain the indicators which they observed to support their positive opinions. They stated following observations as indicators;

The instructor:

"First of all, since all the students got access to the server, they could use final versions of the software without needing to install on their own computers. Some of my students do not have their own computers thus they could use this system from their dormitories. I have observed positive effects of the integration of this system to the course on their motivation. Moreover, we have installed additional software to help them in their group works and they could access and use that software by using remote access technology. This was also effective on their motivation. Also, I have observed that some of the groups started their project studies just after the introduction of this tool. This was mostly unusual when we compare with previous semesters. I think, this is also an indicator for the increase of their motivation because of this tool."

The laboratory assistant:

“First of all, I have observed that they have voluntarily used this software in their group projects and they stated their positive feelings and willingness to use the technology in their projects. Also, in previous years we could not get much feedback about their project processes but this semester we got much more feedbacks and questions about their projects and this shows that students engaged and got much willingness than previous semesters.”

Moreover, although the instructor and the laboratory assistant stated that they could not get enough chances to observe students to answer some questions, they mostly reported their positive observations about the effects of the use of this technology on their motivation.

Interest / Enjoyment

The first predefined indicator for motivation was “Interest / Enjoyment”. To investigate the instructor’ and the laboratory assistant’ perceptions about this variable, they were asked two questions: one for student’s interests and one for their enjoyment by using Remote Access Technology.

Firstly, it was asked that “Have you observed that the use of the technology has increased students’ *interest* to their group project studies?”. Both the instructor and lab assistant stated that they got not enough observations to answer this question clearly. They stated the following observations;

The instructor:

“Most of the groups were submitted their projects on time and 10 of 15 groups developed their projects on the server actively. However, I don’t have

an observation that shows whether or not the use of this technology positively affected their interests on group projects.”

The laboratory assistant:

“They were asking about their projects but since I don’t know their previous interests about the course and projects, I could not state an opinion about the effects of this technology on their interests.”

Secondly, it was asked that "Have you observed that the use of the technology has increased students’ *enjoyment* in their group project studies?”. While the instructor stated that he got not enough observations to answer this question, the laboratory assistant reported his positive observations about the effects of this technology on students’ enjoyment. They stated the following observations;

The instructor:

“Students stated positive feedbacks. They mostly stated that they learned a lot from projects. They were finishing their first group projects in a programming language course and they enjoyed it but I don’t know how much of this enjoyment is related with the use of the remote desktop technology.”

The laboratory assistant:

“Yes I think, some advantages of this technology affected their enjoyment positively. For example, this technology provided a shared working environment for all group members and it provided students’ to work in a collaborative working opportunity. In previous semesters, it was difficult to work as a group because they got problems in determining an appropriate meeting time for all group members. Also, they were facing with problems in assembling project parts developed by different group members. By the use

of this technology, they mostly have got rid of such kind of problems and this increased their enjoyment and excitements towards their group projects.”

As it is seen, although both of them stated that they got no chance to observe the effects on students’ interests, for enjoyment the lab assistant observed that the use of this technology increased their enjoyment towards the course group projects by solving their most of the problems by providing a convenient collaborative working environment for group members.

Perceived Competence

The second predefined indicator for motivation was “Perceived Competence”. To investigate the instructor’ and the laboratory assistant’ perceptions about this variable, they were asked that ““Have you observed that the use of the technology has increased students’ *satisfaction* about their group project studies?”. While the lab assistant stating not enough observation they could do about that, the course instructor stated a positive observation. They stated the following observations;

The instructor:

“First of all, no problem was reported about the use of this technology. Also, since all required programs and additions were installed on this server such as Developer version of Visual Studio and Crystal Reports, they could solve their problems easily and this made them happy and increased their satisfaction. Also, in previous projects group members faced some problems because of developing different parts of the projects in different places. For example, they faced problems resulted by language differences or platform differences. However, this semester students did not face such kind of problems because they developed their projects on a same server with a

shared environment. I can say that this affected student's satisfaction positively.”

The laboratory assistant:

“Since, students’ mostly asked their questions to the course instructors about their group projects thus I could not get a chance to observe effects on their satisfaction.”

Although, the laboratory assistant could not observe the effects on students’ satisfaction, the instructor observed that the use of this technology effected students’ satisfaction feeling towards group projects positively. This can be also evidence of positive effects on their perceived competence.

Willingness

The third predefined indicator for motivation was “Willingness”. To investigate the instructor’ and the laboratory assistant’ perceptions about this variable, they were asked that ““Have you observed that the use of the technology has increased students’ *willingness* about their group project studies?”. While the course instructor stating that he could not observed a difference, the lab assistant stated positive observations. They stated the following observations;

The instructor:

“I could observe an indicator for that.”

The laboratory assistant:

“I have observed some indicators for that. First of all, after the introduction and integration of this tool, I observed that the questions of the students

related with their group projects and project topics and problems they were faced in their project development were increased. This shows that they have started their projects just after the introduction of this tool. Also, in previous semesters, there were not so much feedbacks and questions related with their projects but this semester they were much more active in their projects. In my opinion, advantages of this technology from which students got benefit were reasons for that. For example, in previous semesters students faced problems in assembling project different parts and as a results they wasted too much time and their work got slow down. However, this semester they got rid of those problems and they could arrange more time on the projects. Also, they could access to their projects anywhere and anytime. I think, all those advantages increased their willingness to work on their projects.”

Although, the instructor could not observe the effects on students’ willingness, the laboratory assistant observed that the use of this technology effected students’ willingness about group projects positively.

Participation

The final predefined indicator for motivation was “Participation”. To investigate the instructor’ and the laboratory assistant’ perceptions about this variable, they were asked two questions: One was about the change on student’s participation and the other was about the change on their study time on course group projects.

Firstly, it was asked that “Have you observed that the use of the technology has increased students’ *participation* to their group project studies?”. Both the instructor and the laboratory assistant stated that they got not enough observations to answer this question clearly. They stated the following observations;

The instructor:

“I did not have a chance to observe their individual participation to their course group projects because of the project development format. In our course, student’s starts mostly after course lectures finished. Thus, we could not observe their individual participations in project development process.”

The laboratory assistant:

“Since students and groups were alone in their study, I could not observe their individual participations in groups.”

Secondly, it was asked that “Have you observed that the use of the technology has increased students’ *study time* in their group project studies?”. Again, both the instructor and the laboratory assistant stated that they could not make enough observation to answer this question clearly. They stated the following observations;

The instructor:

“I could not observe that.”

The laboratory assistant:

“Since during the most of the development period students were working in their homes or dormitories, we could not observe their individual study time. However, in last two laboratory sessions conducted just after this technology introduced and group project topics determined, I observed active participation of most of the students in this period.”

Both the instructors and the laboratory assistant stated that they could not observe their individual participation and study time. Only, the laboratory assistant reported that he observed an active participation in last two laboratory sessions conducted just at the beginning of the course group projects.

4.3.2 *The Instructor' and the Laboratory Assistant' Perceptions about Usefulness of this Technology*

To investigate perceptions of the instructor and the laboratory assistant about the usefulness of Remote Access Technology, firstly instructors were asked that “What do you think about the usefulness of this technology in students’ group project studies? Was it useful or not?” Answers of both the instructor and the laboratory assistant were positive. To get detailed indicators of their observations, they were asked to explain the indicators which they observed to support their positive opinion. They stated following observations as indicators;

The instructor:

“First of all, it was very useful for me as an instructor. It helped me to observe their group progresses in development period because they have developed projects on a shared environment and I also had access to that environment during their project development period. Also, it was very useful for me in sharing documents with my students.

Secondly, I have seen another useful side on an electricity cut. Since all students worked on the same server and the server was attached to a power supply, their sessions were protected even when their local computers shut down on an electricity cut. This prevented their works to be lost.

Finally, it was also useful to integrate web version into the course website. Both for me and my students, it was good to easily access to our windows desktops on server just by clicking a button. Users did not require installing any special software to access their project desktop.”

The laboratory assistant:

“It was useful because it increased students’ interests and motivations towards the course and their projects. Group projects usually relatively long term projects and it requires coordination between group members. This causes some problems such as defining meeting dates. However, this technology helps them to minimize such kind of problems by providing a convenient collaborative working environment for their group projects. Also, it provides place and time independent access to the project environment.

Also, it speeded up their group works by providing to access from anywhere and anytime. To work on the same project environment decrease the problems they faced. Before this tool, they could get meet once in a week or once in two weeks. By the use of this tool, they could make decisions and apply them faster.”

Both the instructor and the lab assistants stated the Remote Access Technology as useful tool for their courses in terms of different advantages they have observed. Questions asked to get their perceptions specifically were organized in 5 indicators. Statements of the instructor and the lab assistant related with each indicator were reported in following sections.

Work more quickly

The first indicator for perceived usefulness was “Work more quickly”. To investigate the instructor’ and the laboratory assistant’ perceptions about this variable, they were asked that “Have you observed that the use of the technology has increased students’ work speed in their group project studies?”.

The instructor:

“I could not observe a difference. As previous semesters, this semester also there were projects submitted in last hours of the submission period.”

The laboratory assistant:

“Yes it increased their work speed as I stated before. Meetings and careful planning were critical in previous semesters because they were developing in different places and different parts. But using this technology, they have developed on the same machine and on the same source code thus they got rid of losing time with deep planning, regular meetings and problems occurred in assembling the different parts. All this advantages helped them to increase their work speed as group.”

Although, the instructor state that he could not observe a difference in students’ work speed, the laboratory assistant stated its positive effects.

Job performance

The second indicator for perceived usefulness was “Job performance”. To investigate the instructor’ and the laboratory assistant’ perceptions about this variable, they were asked that “Have you observed that the use of the technology has increased students’ performance in their group project studies?”

The instructor:

“Since students were alone in code development period, I could not observe them. However, I know from their feedbacks that they used this tool to communicate with each other.”

The laboratory assistant:

“I observed. This tool provided a collaborative environment for students. Also, it allowed them to work on the same source code simultaneously. Those advantages helped them to increase their performance.”

Although, the instructor state that he could not observe a difference in students’ job performance, the laboratory assistant stated its positive effects.

Increase productivity

The third indicator for perceived usefulness was “Increase productivity”. To investigate the instructor’ and the laboratory assistant’ perceptions about this variable, they were asked that “Have you observed that the use of the technology has increased students’ productivity in their group project studies?”

The instructor:

“I cannot say something about that because I could not observe them in working period.”

The laboratory assistant:

“I could not get chance to observe them during coding or development.”

Both the instructor the laboratory assistant stated that they could not have a chance to observe students in their group project studies.

Effectiveness

The fourth indicator for perceived usefulness was “Increase Effectiveness”. To investigate the instructor’ and the laboratory assistant’ perceptions about this

variable, they were asked that “Have you observed that the use of the technology has increased students’ effectiveness in their group project studies?”

The instructor:

“I did not get a chance to observe them to talk about changes in their effectiveness.”

The laboratory assistant:

“I could not get chance to observe.”

Both the instructor the laboratory assistant stated that they could not have a chance to observe changes in students’ effectiveness.

Make job easier

The fifth predefined indicator for perceived usefulness was “Make job easier”. To investigate the instructor’ and the laboratory assistant’ perceptions about this variable, they were asked two questions.

Firstly, it was asked that “Have you observed that the use of the technology made it easy for students to access to the project server?” The instructor state that he could not observe that whether this tool made their work easier or not. On the other hand, the laboratory assistant stated that this tool made their work easier.

The instructor:

“By the use of this tool, they could access and work on their shared project environment, they could communicate and also they could share their files. Microsoft Remote Access Client provided all this features by allowing them to connect and use the server resources remotely.”

The laboratory assistant:

“It was useful to access to the server and their project files. Since, this tool allows uploading and downloading of files, this was very beneficial for students.”

Secondly, it was asked that “Have you observed that the use of the technology made the development of group projects for students easy?” The instructor state that he could not observe that whether this tool made their work easier or not. On the other hand, the laboratory assistant stated that this tool made their work easier.

The instructor:

“I cannot say something about that because I could not observe them in work period.”

The laboratory assistant:

“Yes it was beneficial to make the development easy for students because of some reasons. For example, it increased their communication and sharing. Also, it allows them to follow changes made by other group members and it was easy to work on the same project simultaneously. Last advantage that makes their work easy was that they could not face problems to merge different parts of the projects by different members.”

Overall Usefulness

The final predefined indicator for perceived usefulness was “Overall Usefulness”. To investigate the instructor’ and the laboratory assistant’ perceptions about this variable, they were asked three questions.

Firstly, it was asked that “Have you observed that the use of the technology increased students’ contribution in their group project studies?”. While the laboratory assistant stating that he could not observe that, the instructor stated his positive observations related with students’ contributions;

The instructor:

“In previous semesters, there were some groups in which one or two members with more experience and who developed most of the project as in previous semesters. Although, same situations occurred in some groups, this semester group members could follow and test the developed portions of the projects within the development period. This was nearly impossible in previous semester. These increased their participation by allowing all members to access and examine the latest version of the project immediately.”

The laboratory assistant:

“Since this tool could allow them to work on the same project at the same time, they could see and make corrections or adaptations on all parts of the projects. In previous years, this was not possible because they could meet much more rarely. This increased their contribution because this tool allowed them to follow the source code synchronously.”

Secondly, it was asked that “Have you observed that the use of the technology improved students’ opportunity to work on group projects?”. While the laboratory assistant stating that he could not observe that, the instructor stated his positive observations related with students’ contributions;

The instructor:

“As I said before, this semester they could follow additions and corrections of each member and to test the current version of the project. Even members with less technical abilities could made contributions by testing of the project.

Also, active developers could get opportunity to check others code and to see adaptation requirements between part which they developed and others. All those advantages increased students' opportunities to work on the project make more contribution.”

The laboratory assistant:

“In previous semesters, job division and assignment was a great problem so projects were mostly developed by more experienced members. However, since they worked on the computer and the same source code, they could make work assignment easier than previous years and this is because of the increase of their opportunity to work on group projects.”

Finally, it was asked that “Have you observed that the use of the technology useful in overall?” Both the instructor and the laboratory assistant stated their positive observations about that;

The instructor:

“I think this tool was very beneficial for both me and my students in their development period. I want to use this tool in next semesters of this course if I can.”

The laboratory assistant:

“This was very useful because of reasons which I mentioned previously.”

4.3.3 *The Instructor' and the Laboratory Assistant' Perceptions about Ease of Use of this Technology*

To investigate the instructor's and the laboratory assistant's perceptions about the ease of use of Remote Desktop Technology, they were asked questions grouped in four indicators according to Perceived Ease of Use construct of TAM. The results

and statements of the instructor and the laboratory assistant were reported in following sections.

As it is seen from the statements of both the instructor and the laboratory assistant which were reported below, they define Remote Access Technology as an easy to use tool and their perceptions are quite positive about this tool in terms of its easy to use aspect.

Easy to learn

The first indicator for perceived ease of use was “Easy to learn”. To investigate the instructor’ and the laboratory assistant’ perceptions about this variable, they were asked that “Was learning to use Remote Access Technology easy for your students?”. Both the instructor and the laboratory assistant stated their positive observations;

The instructor:

“Students learned it easily. No help request reached us about the use of this tool.”

The laboratory assistant:

“It is actually easy and simple tool. Students did not face any problem in learning to use it.”

Easy to become skillful

The second indicator for perceived ease of use was “Easy to become skillful”. To investigate the instructor’ and the laboratory assistant’ perceptions about this variable, they were asked that “Was becoming skillful at using Remote Access

Technology easy for your students?". Both the instructor and the laboratory assistant reported their positive observations and perceptions;

The instructor:

“Students learned it easily and they could use it to access to the server by using all required features easily.”

The laboratory assistant:

“Since it is easy to learn, they could get master on this tool easily.”

Clear & Understandable

The third indicator for perceived ease of use was “Clear & Understandable”. To investigate the instructor’ and the laboratory assistant’ perceptions about this variable, they were asked four questions.

Firstly, it was asked that “Were user interfaces and messages of Remote Access Technology clear for your students?”. Both of them stated positive perceptions about the clarity and understandability of the interfaces;

The instructor:

“Yes, its interfaces were clear & understandable for students.”

The laboratory assistant:

“Yes, they were.”

Secondly, it was asked that “Were user interfaces and messages of Remote Access Technology user friendly for your students?”. Perceptions of both the instructor and the laboratory assistant were positive;

The instructor:

“Yes, its messages and interfaces were easy to understand and interfaces were user friendly enough.”

The laboratory assistant:

“Yes, interfaces were quite successful. It was quite easy to use and user-friendly.”

Thirdly, it was asked that “Does user interfaces and messages of Remote Access Technology uses terms familiar for your students?”. Again, perceptions of both the instructor and the laboratory assistant were positive;

The instructor:

“Yes, absolutely. A regular windows user could easily understand and use the interfaces without any problem.”

The laboratory assistant:

“Yes, it is. Students could not face problems in understanding messages and interfaces.”

Finally, it was asked that “Was it hard to understand the user interfaces of Remote Access Technology for your students?”. Perceptions of both the instructor and the laboratory assistant were positive about the understandability of the user interface;

The instructor:

“No, it was easy to understand as I stated previously.”

The laboratory assistant:

“No, it was easy for students to understand.”

Overall Easy to use

The final indicator for perceived ease of use was “Overall easy to use”. To investigate the instructor’ and the laboratory assistant’ perceptions about this variable, they were asked that “In overall, was the use of “Remote Access Technology” easy for your students?”. Both the instructor and the laboratory assistant reported their positive observations and perceptions;

The instructor:

“Yes, absolutely.”

The laboratory assistant:

“Yes, of course.”

4.3.4 *Advantages and Disadvantages of this Technology from the Instructors' Point of View*

In the interviews, the instructor and the laboratory assistant also asked the advantages and disadvantages of this technology. They have reported several advantages and disadvantages with different importance levels. They were listed below;

Advantages

Advantages for Collaborative Group Project Studies

- It allows group members and instructors to share documents between each other
- It provides easy to access group work environment
- It helps students to get rid of platform incompatibility problems
- It allows group members to work on the same source code simultaneously
- It allows group members to communicate with each other
- It mostly helps students to get rid of problems of assembling different parts
- It helps students to follow and test other group members' additions and corrections
- It makes job divisions easier on group projects by providing to work on a shared source code.

Advantages for Instructors

- It allows teachers to observe students' work progresses during the project development period because all the project were developing on the same computer and the instructor also have an access to it.
- It makes easy to manage students' accounts since all accounts are on the same computer

Technical Advantages

- It provides time and place independent group work environment
- Since all students uses the same computer and software installed on it, once new software installed were all users gets a chance to use it.
- Students' sessions and works are protected against any technical problems occurred on the client computers for example electricity cut.
- It provides a convenient environment for regular backup service by centralizing the source codes. This protects students' project files against data lost.

Disadvantages

- Server can slow down when high number of simultaneous online users and high requirements of software used.
- To centralize all the project files on a single computer increases the risk of data lose.

- To centralize all the project files on a single computer increases the risk of unwanted access of different group members.
- All students cannot have an Internet connection to use this system.

4.3.5 *Instructors' Suggestions about the Use of this Technology*

Finally, the instructor and the laboratory assistant were asked to share their suggestions about the further usages of this technology. These suggestions were listed below.

Suggestions for Improvement

- Instant messaging software can be integrated within the server to increase communication ways for group members.
- Some improved project observation and examination tools can be integrated within the server to increase the effectiveness of group project studies.
- A regular backup unit can be attached and configured to the server.

Suggestions for Different Usage

- This tool and the system can be used in most of the courses in that students require a collaborative group project work environment.
- This tool and the system can be used in most of the courses that requires hardware and software resource sharing.
- This system can be used as a solution for schools having computers with low hardware configurations to run software required for

courses. A powerful server can be installed to be used by all students remotely and the remote access technology can allow them to access and work on this server. This provides us an opportunity to utilize idle computers because of their low configuration.

CHAPTER 5

DISCUSSION, CONCLUSION AND RECOMENDATIONS

In this chapter, according to the results presented in the previous chapter, discussion and interpretation of the results are presented. Suggestions for practice, recommendations for researchers and recommendations for further research are also presented.

5.1 Discussion

Rapid developments in computer technologies significantly affected educational systems as it did most of the other parts of our daily life. With the use of the Internet as an instructional channel, educators are forced to rethink their ways of instructions offered and administered (Longe, 2005). Internet provides new virtual environments that can enhance the learning process (Mioduser, Nachmias, Lahav, & Oren, 2000). It also improves communication, collaboration, information sharing channels (McClelland, 2001). Also, Internet allows us to overcome two of the most important traditional barriers in education: time and place. That is, it provides a time and place independent environment which highly promotes the online learning environments.

However, sometimes all those discovered opportunities are not enough to solve problems of some situations in providing some courses in online environments. One of these problem areas is group project works of programming language courses. Although, Internet provides highly efficient, effective and widely used communication tool for group working, the number of solutions which provides effective group working environment for group projects of programming language courses are limited.

The solution implemented in this study was the use of a central project server with the conjunction of Remote Access Technology. This is actually a remote laboratory application in computer education and it provides a collaborative team working environment. Also, as other applications of remote laboratories, it “provides cost effective way of opening up laboratory resources for students 24 hours a day and provides an opportunity to share physical laboratory” (Jeppson, Lundgren, Alamo, Hardison, & Zych, 2004). Also, it provides time and place independent, synchronous and asynchronous team working environment.

However, it is not enough just to integrate this relative new technology in their learning environment; the acceptance of this new technology should be checked. Information systems are created to be used. If the users do not accept them, they eventually fail (Davis, 1989).

The aim of this study is to investigate the effects of the integration of Remote Access Technology as new technology in learning environments of students. To obtain information about effects of the use of this technology, perceptions of students, the instructor and the laboratory assistant were investigated in terms of its perceived effects on students' motivation towards group projects, its usefulness and its ease of use. Also, to get list of advantages, disadvantages and suggestions of the instructor and the laboratory assistant were the following aims of this study.

5.1.1 *Perceived Effects on Students' Motivation towards Group Projects*

According to the results of the study, nearly half of the students (45.7%) stated positive perceptions about the effects of the use of Remote Desktop Technology on their motivation towards the course and the mean score was 3.450. The percentage of students stating negative that the use of this technology effected their motivation negatively was only 6.5%. However, rest of the students (47.7%) were indecisive about the effects the use of this technology on their motivation. The reason for high indecisive student percentage can be the low usage of the tool because of limited usage period. The percentages of students stating positive perception about the effect of the use of this technology on their motivation might be higher if the study period would be longer. Nonetheless, 45.7% is still high enough to say that the use of this technology has a positive effect on students' motivation.

According to the results of the literature review of the researcher, this study is a one of the initial study about the implementation of remote laboratories by using remote

access technology in programming language courses. However there are some other studies about remote laboratories in different disciplines which support the results of this study.

The results of motivation aspect of this study correspond to the results of the study conducted by Wagner & Tuttas (2001). Like the results of this study, they reported positive effects of the remote labs on students' motivation in their findings;

“Almost all students do accept online lab experimenting and understand that net-based forms of learning have several advantages in comparison to presence teaching. As with most new ways of teaching and learning students motivation is increased at first. This has been measured by asking the students to grade the whole experiment. It was plainly visible that online teams have been more satisfied than the local teams” (p. T1F-22).

Also, Miele, Potsaid and Wen (2001) reported that the use of remote laboratory increased students' motivations;

“Judging from the student responses and their performances in the course, introducing the remote laboratory was a resounding success. Each remote lab project seemed to increase their enthusiasm and motivation for learning the course topics.”

5.1.2 *Perceived Usefulness and Perceived Ease of Use*

According to TAM (Technology Acceptance Model) developed by Davis (1989), perceived usefulness and perceived ease of use of a system are the major indicators of the acceptance of this system.

When the results of the *perceived usefulness* of the system are examined, it is seen that according to the results of this study, more than half of the students (53.5%) reported that remote desktop access technology was useful for them. The percentages of students stated negative opinion was only 4.1%. However, there was significant number of indecisive students (%42.5). The mean score of *perceived usefulness* construct was 3.649. Remote access technology was also reported as a useful technology by the instructor and by the laboratory assistant of the course. The instructor focused on the technical opportunities provided by this technology such as file and document sharing, personal sessions, session protection against client side problem, such as electricity cut, and website integration. Also, he stated that he will use this tool in their future semesters because of all the benefits it provides. The laboratory assistant emphasized the advantages for collaborative studies, minimizing problems rises as a result of job division, providing time and place in depended shared work environment.

When results of the *perceived ease of use* of Remote Access Technology are examined, it is again seen that more than half of the students (61.7%) stated that the use of Remote Access Technology was easy. The mean score for perceptions

questions related with *ease of use* of the tool was 3.642. The percentage of indecisive students for this aspect was lowest (33.1%) among other aspects investigated in this study. It can be said that the usage period to perceive and report the ease of use of the tool was enough unlike other aspects. Also, both the course instructor and the laboratory instructor reported their positive opinions about the ease to use of this tool.

These results are very similar to the results of the study conducted by Liegle and Meso (2005). They have also investigated the perceived usefulness and perceived ease of use of such kind of remote access technology and they have got similar mean scores for these constructs. While the mean score perceived usefulness in this study was 3.649, that of their study was 3.750. Also, while the mean score of perceived ease of use construct for this study was 3.642, that of their study was 3.450. All scores are out of 5. As it can be seen that results of both study are very similar. Also Liegle and Meso (2005) reported that students found this technology usefull and easy to use for individual exercises and for group projects.

Also, the results of this study are also supported by results of the pilot assessment study conducted by Corter et.al (2004) in which it is reported that “more than 90% of student respondents rated the effectiveness and the impact of the remote labs to be comparable (or better) than the hands-on labs” (p. F1G-20). This result also supported by analyses of scores on exam questions involving specific lab content

(Corter et.al 2004). This shows that, remote laboratories are found useful in previous studies too.

Based on the results of this study and previous studies reported in literature, it can be said that remote access technology is accepted by students, the instructor and the laboratory assistant in the learning environment of the programming language course in which this study is conducted. Also, the high number of indecisive students can be minimized by providing longer usage period in future researches.

5.1.3 *Advantages and Disadvantages*

As a result of the interviews conducted by the course instructor and the laboratory assistant, several advantages and disadvantages were reported by them. Those advantages were organized in three main categories: advantages for collaborative group project studies, advantages for instructors and technical advantages.

5.1.3.1 *Advantages of Remote Desktop Technology*

Advantages for Collaborative Group Project Studies

- It allows group members and instructors to share documents between each other
- It provides easy to access group work environment
- It helps students to get rid of platform incompatibility problems
- It allows group members to work on the same source code simultaneously

- It allows group members to communicate with each other
- It mostly helps students to get rid of problems of assembling different parts
- It helps students to follow and test other group members' additions and corrections
- It makes job divisions easier on group projects by providing to work on a shared source code.

Advantages for Instructors

- It allows teachers to observe students' work progresses during the project development period because all the project were developing on the same computer and the instructor also have an access to it.
- It makes easy to manage students' accounts since all accounts are on the same computer

Technical Advantages

- It provides time and place independent group work environment
- Since all students uses the same computer and software installed on it, once new software installed were all users gets a chance to use it.
- Students' sessions and works are protected against any technical problems occurred on the client computers for example electricity cut.
- It provides a convenient environment for regular backup service by centralizing the source codes. This protects students' project files against data lost.

5.1.3.2 *Disadvantages of Remote Desktop Technology*

- *Server can slow down when high number of simultaneous online users and high requirements of software used.*

Solution: This problem can be solved by improving hardware configuration and Internet connection bandwidth of the server if it is needed and reasonable. Also, this can be solved by using more than one server and distributing users to those different servers.

- *Server can slow down when high number of simultaneous online users and high requirements of software used.*

Solution: This problem can be solved by improving hardware configuration and Internet connection bandwidth of the server if it is needed and reasonable. Also, this can be solved by using more than one server and distributing users to those different servers.

- *To centralize all the project files on a single computer increases the risk of data lose.*

Solution: This risk can be reduced by using a regular backup unit. Even this disadvantage can be turned to an advantage by using this backup unit because projects files were also under high risk when they are distributed to different computers.

- *To centralize all the project files on a single computer increases the risk of unwanted access of different group members.*

Solution: This risk can be reduced by performing careful security configuration on the server.

- *All students cannot have an Internet connection to use this system.*

Solution: This system was suggested for courses in which most of the students has an access to Internet from any place such as laboratories, dormitories, Internet cafés and homes.

5.1.4 *Suggestions*

As a result of this study, various suggestions were obtained from the instructors about the use of this technology. Some suggestions were about improvement of the system used in this study. These suggestions include improving group work environment and extra features for the server such as external backup utilities. Other suggestions were about the different usages about this technology. All suggestions were grouped in two categories and listed below;

Improvement Suggestions

- Instant messaging software can be integrated within the server to increase communication ways for group members.
- Special tools for project observation and examination can be integrated within the server to increase the effectiveness of group project studies.
- A regular backup unit can be attached and configured to the server.

Different Usage Suggestions

- This tool and the system can be used in most of the courses in that students require a collaborative group project work environment.
- This tool and the system can be used in most of the courses that requires hardware and software resource sharing.
- This system can be used as a solution for schools having computers with low hardware configurations to run software required for courses. A powerful server can be installed to be used by all students remotely and the remote access technology can allow them to access and work on this server. This provides us an opportunity to utilize idle computers because of their low configuration.

5.2 Conclusions

First of all, the remote access technology called Microsoft Remote Access Client is an ease to use software for students and instructors of programming language courses. It is easy to use and easy to learn. Also, its screens and messages are clear and easy to understand for both students and instructors.

Secondly, it is beneficial for students in their group course projects. Since this study was conducted for a relatively short period, the percentage of the indecisive student was significantly high. However, it was easy to use and beneficial for heavy percentage of the rest of the students. Especially students found this technology useful in increasing their work speed and making their job easier.

If we combine the results of first and second conclusions, it can be said that according to Technology Acceptance Model, this new technology was accepted by students', the instructor and the laboratory assistant of a programming language courses in which this study is conducted.

Thirdly, the use of this technology effects the students' motivation slight positively. Almost half of the students were reported positive perceptions while most the rest of them reporting neutral opinion. This can be the result of short usage period. Even so, it can be said that the use of this technology has a positive effect on students' motivations.

Fourthly, the use of this technology brings variety of advantages for both students and instructors. Those advantages can be grouped into three main categories: advantages for collaborative group project studies, advantages for instructors and technical advantages. Also, there are several disadvantages reported but most of them have a solution.

Finally, there are number of improvement and usage suggestions about the use of this technology reported by instructors.

5.3 Suggestions for Practice

Following suggestions may help instructors or researcher in the design and implementation of such a group project server environment in programming language courses.

- Allocate at least one hour lecture to introduce the aim and the usage of the system at the beginning of the study. Also, give brief information about the advantages about the system for group project studies.
- Get the list of software and configuration which students needs and install appropriate software and make required configurations. To start up the installation of the project server, researchers can get benefit from the “Central Project Server Installation Guide” reported in Appendix A.

- Support students about their technical problems related with the system as soon as possible, such as user account problems or file permission problems.
- Actively participate in the server as an instructor to decrease the loneliness of the students.
- Support students about their technical problems related with the system as soon as possible, such as user account problems or file permission problems.
- In server environment, install improved communication tools to increase students' and instructors' communication between each other.

5.4 Recommendations for Researchers

First of all, in order to deeply understand the results of questionnaires and interviews, it is also recommended to have interviews with the participants. Although, 54% of participants reported positive perceptions in overall about the use of Remote Desktop Technology, 41% of them reported neutral answers to the questionnaire. It would be beneficial to conduct student interviews to understand the result of so many unclear scores. Also, interviews can help to understand the reasons for positive and negative perceptions reported by the participants.

Secondly, this study can be repeated in a longer period to allow the focus group members to get a more usage chance. This will also make them more certain in their perceptions about the use of this technology and consequently this will increase the

reliability of the results of the study. Also, the use of 4-scale Likert type questionnaire, which do not have “neutral” option in it, can help to get actual tendency of students who states they are not sure.

Thirdly, also an attitude test can be used to obtain the initial attitudes towards the programming course at the beginning of the study. This could help the researcher to observe and to examine possible extremely positive or negative results.

Finally, SPRAT-Q can be improved. This was the first usage of that questionnaire after the pilot study thus it can be required to improved in terms of different aspects. For example, Computer Experience and E-learning Experience sections can be extracted from that questionnaire and they can be formed in a short questionnaire to be used at the beginning of the study because those questions sections formed to obtain data about students’ experiences before the study. This will also make the questionnaire shorter and a purely perceptions related questionnaire.

5.5 Recommendations for Future Researches

Based on the results of this research and the experiences gained by the researchers in this study, a few areas emerge to be investigated in feature researches.

First of all, this study was conducted with 2nd grade Computer Education and Instructional Technologies department students in a programming languages course. This study can be replicated in different grade levels to investigate the similar variables.

Secondly, Remote Desktop Technology which was investigated in this study can be used and investigated in different courses which require collaborative group projects environment. Also, the study can be repeated after making improvements reported in the suggestions section. For example, to improve the collaborative environment, more communication tools can be integrated with the system such as instant messaging tools and project supporting tools for team project development environment.

Thirdly, this study can be repeated to investigate the advantages of the use of this technology on schools which have significant amount of idle computers with lower hardware configuration. One of the important focus group can be the students and the instructors of *Vocational High schools* and *Post Secondary Vocational High Schools*. According to the results of interviews conducted with instructors, they suggest that the use of this technology may be a solution to be able to use that great amount of idle computers in the programming language courses actively.

Fourthly, a broader study can be conducted which investigates all the system used in this study. This study only focused on the perceived effects of the use of Remote

Access Technology on students' motivations, its usefulness and its ease of use. However, a broader study can be designed to investigate the perceptions of both students and instructors about the whole system parts: effectiveness of server file system design, effectiveness of collaboration tools etc.

Finally, this study was focused on perceptions of students' and instructors. Future experimental studies can be conducted to investigate the effects of the use of this system on students in terms of different aspect such as course achievement, individual and group motivations, and group project achievements. Even, more experimental studies can be designed and conducted to get more objective data about the effects of the integration of this technology into online education.

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APPENDIX A

Central Project Server Installation Guide

1. Used Hardware and Software

Server Hardware Configuration

- 4 x Intel(r) Xeon(TM) CPU 2.66 GHz
- 3 x 1 GB RD RAM with ECC
- 1 x 250 GB Hard disk (for System files)
- 1 x 200 GB Hard disk (for User Project files)
- 1 x Network Adapter Card
- Other Peripheral Devices
 - 1 x Standard Video Card
 - 1 x Standard Keyboard
 - 1 x Standard Mouse
 - 1 x Standard Monitor

Software Used

- **Operation System Related Software**
 - Microsoft Windows Server 2003 Enterprise Edition
 - Microsoft Active Directory
 - Microsoft Terminal Server Licensing

- **Course Related Software**
 - Microsoft Visual Studio 2005
 - Microsoft SQL 2000
 - Microsoft Visual Source Safe
 - Microsoft Internet Information Server

- **Security Related Software**
 - Symantec Enterprise Antivirus 2004
 - Security Administrator

- **Administration Related Software**
 - TURSOFT VSS User Manager
 - TURSOFT Project Directories Creator
 - ITL Active Directory User Manager

2. System Installation

- **Operation System Related Software**
 - Install “Microsoft Windows Server 2003 Enterprise Edition” (The operation system)
 - Install “Microsoft Active Directory” and create a domain
 - Install “Microsoft Terminal Server Licensing” and increase the concurrent connection limit to more than total count of the students and instructors.

- **Security Software**
 - Install “Symantec Enterprise Antivirus 2004” and perform all upgrades and enable runtime Auto-Protect feature

 - Install “Security Administrator”

- **Administration Related Software**

- Install “TURSOFT VSS User Manager “
- Install “TURSOFT Project Directories Creator”
- Install “ITL Active Directory User Manager”

- **Course Related Software**

- Install Microsoft Visual Studio 2005
- Install Microsoft SQL Server 2000
- Install Microsoft Visual Source Safe

3. System Configuration

- **Preparation**

- Create an Microsoft Excel document which is in a specific format and defines project groups and members of the groups

- **Active Directory Groups and Accounts Creation**

- Student Groups and Accounts
 - Automatically create user active directory accounts by using “ITL Active Directory User Manager”
 - Create active directory an group for each project group manually as a “Global” type
 - Assign project members to their own active directory group
 - Create a general active directory group named “STUDENTS” as a “Domain Local” type
 - Assign all project groups to this general group as a member
 - Set this each project group as member of built-in group named “Remote Desktop Users” to allow connecting by using Remote Desktop Connection Client.
- Instructors Groups and Accounts
 - Create a general active directory group named “INSTRUCTORS” as a “Global” type
 - Assign all instructors to this group

- Set this each project group as member of built-in group named “Remote Desktop Users” to allow connecting by using Remote Desktop Connection Client.
- **Visual Source Safe Accounts Creation and Permissions Setting**
 - Open “TURSOFT VSS User Manager” program.
 - Login with the Visual Source Safe “admin” account.
 - Load the user accounts excel document created before.
 - Select root directory in Visual Source Safe to be used to automatically create group project directories
 - Set other few parameters and click “Only Import User Accounts” button
 - After import is successfully completed, click “Only Import User Permissions” button
- **Group Project Directory Structure Creation**
 - Open “TURSOFT Project Directories Creator” program.
 - Load the user accounts excel document created before.
 - Set root directory, students active directory group name, instructors active directory group name
 - Click “Generate” button, it will automatically generate whole directory structure for each group and automatically set student and instructor permissions
- **SQL Server Group Project Databases Creation and Configuration**
 - Manually create project database for each project group
 - Give appropriate permissions for each active directory project groups
- **Website Integration**
 - Active Directory Integration

- Add “Active Directory” support to course website user authentication page
 - Configure website to use project server’s active directory domain and accounts
 - Store username and password in session after user authentication
 - Remote Desktop Web Client Integration
 - Customize and add “Microsoft Remote Desktop Web Client” page to the course website
 - Configure this page to make it use the user account values in session
- **Applying User Account Limitations**
 - Automatically or manually login with each user account at least one by using “Microsoft Remote Access Technology”. This will make windows to create user profiles in windows
 - Create a test account in active directory
 - Open “Security Administrator” software
 - Set appropriate limitations for this test account
 - Remove access to system drive
 - Remove access to administrative tools from control panel
 - Click on this account, select “Copy To...” menu
 - Select all student accounts and click OK to apply these limitations.

NOTE: Some limitations may need to restart system. Program notify if this happens. Then, restart the project server to make changes to be applied.
- **Setting File System Security**
 - Remove student access to system files

- Only allow to access and change the VSS data directory. Since, system directory access is removed by using security administrator; users manually cannot reach this directory and files. This is only for Visual Source Safe client and Visual Studio plug-in.

APPENDIX B

Students' Perceptions about the Remote Access Technology Questionnaire (SPRAT-Q)

Student Perception Questionnaire about Remote Access Technology

This questionnaire is prepared to explore your perceptions about the use of Remote Desktop Technology, which is called as Remote Access Technology that you have used in your group projects in the scope of CEIT 211 course.

The questionnaire is prepared to be used for the master thesis study performed in Computer Education and Instructional Technologies Department in the Middle East Technical University.

Your responses will be kept confidential and will only be used for this study.

Contact:

Muhammet TURŞAK

tursoft@tursoft.net

Academic Supervisor:

Prof. Dr. M. Yaşar ÖZDEN

Please enter following information about yourself.

Gender Male Female

SECTION 1:

In this section, 7 technologies are listed. For each of the technology, please select one of the competency levels that best describes your competency. Use your mouse pointer for selecting your choice and please select only one for each technology.

		Not Used	Beginner	Intermediate	Expert
1.1	Web browsers <i>(Examples: Internet Explorer, Firefox, Netscape, Opera)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.2	Search Engines <i>(Examples: Google, Alta vista, Yahoo, MSN, Lycos)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.3	E-mail <i>(Examples: Hotmail, Yahoo! Mail, Gmail, Outlook, etc.)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.4	Online Forums & Blogs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.5	Online Chat Applications <i>(Examples: IRC, MSN Messenger, Yahoo! Messenger etc.)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.6	Microsoft Office Applications	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.7	Remote Access Applications <i>(Examples: Microsoft Remote Desktop Client, VNC, RemoteAdmin, PCAnyWhere, etc.)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SECTION 2:

This section contains questions about your previous experiences about online and web supported learning environments. Use your mouse pointer for selecting your answer and please select only one answer for each question.

#	Question	Yes	No
2.1	Have you ever taken any <u>web-supported</u> or <u>online course</u> before this semester?	<input type="radio"/>	<input type="radio"/>
2.2	Have you ever taken any <u>web-supported programming language courses</u> before this semester?	<input type="radio"/>	<input type="radio"/>
2.3	Have you ever used <u>Internet for your course studies</u> before this semester? (Examples: Researches, homeworks, projects, etc.)	<input type="radio"/>	<input type="radio"/>
2.4	Have you have ever used any <u>remote access technology individually in your courses</u> before this semester? (Examples: Microsoft Remote Desktop Client, VNC, RemoteAdmin, PCAnyWhere etc.)	<input type="radio"/>	<input type="radio"/>

SECTION 3:

Please indicate how much you agree or disagree with following statements listed below.
Use your mouse to select your choice and please select only one for each statement.

Using “Remote Access Technology”;

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.1	... enabled us to accomplish our group project <u>more quickly</u> .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.2	... improved <u>my performance</u> in our group project.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.3	... increased <u>my participation</u> to our group project.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.4	... increased <u>my interest</u> on our project.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.5	... increased <u>my productivity</u> in our group project.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.6	... made our project <u>enjoyable</u> .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.7	... decreased <u>my willingness</u> to work on our group project.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.8	... enhanced <u>my effectiveness</u> in our group project.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3.9	... made it <u>easier to develop</u> our group project.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.10	... was <u>beneficial to access</u> the server.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.11	... increased <u>my motivation towards our group project</u> .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.12	... increased <u>my study time</u> on our group project.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.13	... improved <u>our opportunity to work on</u> our group project.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.14	... has decreased <u>my performance</u> in our group project.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.15	... decreased <u>my work speed</u> in our group project.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.16	... increased <u>my satisfaction</u> about our group project.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.17	... was <u>useful</u> in our group project.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.18	... increased my willingness to work on our group project.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.19	... made our project <u>boring</u> .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SECTION 4:

Please indicate how much you agree or disagree with each of the following statements listed below. Use your mouse pointer for selecting your choice and please select only one for each statement.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.1	<u>Learning to use</u> “Remote Access Technology” was <u>easy</u> for me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.2	It was <u>easy to become skillful</u> at using “Remote Access Technology”.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.3	User interfaces and messages of “Remote Access Technology” were <u>clear and understandable</u> .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.4	User interfaces and messages of “Remote Access Technology” were <u>user-friendly</u> .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.5	It was <u>difficult to learn to</u> use “Remote Access Technology”.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.6	User interfaces and messages of “Remote Access Technology” <u>uses terms familiar to me</u> .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.7	It was <u>hard to understand</u> the user interface of “Remote Access Technology”.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.8	I found “Remote Access Technology” <u>easy to use</u> .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SECTION 5:

#	Question
5.1	<p>Approximately, <u>how frequently</u> did you use “Remote Access Technology” in your group project? Please select one of the choices which best describes your usage.</p> <ul style="list-style-type: none"><input type="radio"/> never<input type="radio"/> once in a week<input type="radio"/> three times in a week<input type="radio"/> everyday<input type="radio"/> more than one in a day <p>Please indicate your reason:</p> <div data-bbox="411 952 1417 1055" style="border: 1px solid black; height: 46px;"></div>
5.2	<p>Approximately, <u>how many times</u> did you use “Remote Access Technology” in your group project? Please enter your answer in the following box.</p> <p><input data-bbox="427 1220 580 1267" type="text"/> times</p> <p>Please indicate your reason:</p> <div data-bbox="411 1366 1417 1469" style="border: 1px solid black; height: 46px;"></div>
5.3	<p>Approximately, <u>for how many hours</u> did you use “Remote Access Technology” in your group project? Please enter your answer in the following box.</p> <p><input data-bbox="427 1624 580 1671" type="text"/> hours</p> <p>Please indicate your reason:</p> <div data-bbox="411 1769 1417 1856" style="border: 1px solid black; height: 39px;"></div>

Pairs Questions

Positive Pair	Negative Pair
S3.02	S3.14
S3.01	S3.15
S3.18	S3.07
S3.06	S3.19
S4.01	S4.05
S4.03	S4.07

Subscale Items

Descriptive Subscales

1 Self-Reported Computer Competency

- S1.01 Web browsers
- S1.02 Search Engines
- S1.03 E-mail
- S1.04 Online Forums & Blogs
- S1.05 Online Chat Applications
- S1.06 Microsoft Office Applications
- S1.07 Remote Access Applications

2 Self-Reported E-learning Experience

- S1.01 Have you ever taken any web-supported or online course until now?
- S1.02 Have you ever taken any web-supported programming language courses until now?
- S1.03 Have you ever used Internet for your course studies until now?
- S1.04 Have you have ever used any remote access technology in your courses until now?

Perception Subscales

1 Effects of the system on students' motivation towards their group projects;

Using "Remote Access Technology";

- S3.03 ... increased my participation to our group project
- S3.04 ... increased my interest on our project
- S3.06 ... made our project enjoyable
- S3.07 ... decreased my willingness to work on our group project

- S3.11 ... increased my motivation towards our group project
- S3.12 ... increased my study time on our group project
- S3.16 ... increased my satisfaction about our group project
- S3.18 ... increased my willingness to work on our group project
- S3.19 ... made our project boring

2 Perceived Usefulness

Using “Remote Access Technology”;

- S3.01 ... enabled me to accomplish our group project more quickly
- S3.02 ... improved my performance in our group project
- S3.05 ... increased my productivity in our group project
- S3.08 ... enhanced my effectiveness in our group project
- S3.09 ... made it easier to develop our group project
- S3.10 ... was beneficial to access to the server
- S3.13 ... improved our opportunity to work on our group project
- S3.14 ... has decreased my performance in our group project
- S3.15 ... decreased my speed in our group project
- S3.17 ... was useful in our group project.

3 Perceived Ease of Use

- S4.01 Learning to use “Remote Access Technology” was easy for me
- S4.02 It was easy to become skillful at using “Remote Access Technology”
- S4.03 User interfaces and messages of “Remote Access Technology” were clear and understandable
- S4.04 User interfaces and messages of “Remote Access Technology” were user friendly
- S4.05 I was difficult to learn to use “Remote Access Technology”
- S4.06 User interfaces and messages of “Remote Access Technology” were using terms familiar to me
- S4.07 It was hard to understand the user interface of “Remote Access Technology”
- S4.08 I found “Remote Access Technology” easy to use

4 Self-reported Usage

- S5.01 Approximately, how frequently did you use “Remote Access Technology” in your project?
- S5.02 Approximately, how many times did you use “Remote Access Technology” in your project?
- S5.03 Approximately, for how much time did you use “Remote Access Technology” in your project?

Reverse Coded Items

Using “Remote Access Technology”;

S3.07 ... decreased my willingness to work on our group project

S3.19 ... made our project boring

S3.14 ... has decreased my performance in our group project

S3.15 ... decreased my speed in our group project

S4.05 I was difficult to learn to use “Remote Access Technology”

S4.07 It was hard to understand the user interface of “Remote Access Technology”

Data Coding Guide

Variable Name	Section	Description / Code
Gender	Introduction Page	2-points nominal 1 = Male 2 = Female
Self-Reported Computer Competency	Section 1	Competency indicator items, 5-points ordinal, 0-4 (0=Not Applicable, 1=Beginner, 2=Novice, 3=Intermediate,4=Expert)
Self-Reported E-learning Experience	Section 2	Experience indicator items, 2-points nominal, 1 = Yes 2 = No
Perceived Usefulness, Perceived Effects on motivation towards the group projects	Section 3	Perception indicator items, Likert-Type scale, 1-5 (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree)
Perceived Ease of Use	Section 4	Perception indicator items, Likert-Type scale, 1-5 (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree)

APPENDIX C

Computer Attitude Scale

BİLGİSAYARA YÖNELİK TUTUM ÖLÇEĞİ

Bu anket, sizlerin bilgisayar konusundaki düşüncelerinizi öğrenmek amacıyla hazırlanmıştır. Anket verileri, Ortadoğu Teknik Bilgisayar Üniversitesi, Bilgisayar ve Öğretim Teknolojileri Eğitimi bölümünde sürdürülen bir tez kapsamında kullanılacaktır.

Cevaplarınız hiçbir şekilde notunuzu etkilemeyecek ve kesinlikle gizli tutulacaktır.

LÜTFEN CEVAPSIZ SORU BIRAKMAYINIZ.

Yardımlarınız için teşekkür ederiz.

İletişim:

Muhammet TURŞAK
tursoft@tursoft.net

Akademik Danışman:

Prof. Dr. M. Yaşar ÖZDEN

BÖLÜM 1:

Cinsiyetiniz Erkek Kadın

Bilgisayar konusunda daha önce bir eğitim aldınız mı?

Evet Hayır

Cevabınız **EVET** ise lütfen aşağıdaki soruları cevaplayınız.

Eğitim aldığınız yer :

Eğitim sonucunda bir belge aldıysanız;

Belgenin Adı :

Bilgisayar ile çalışma süreniz:

- Hiç çalışmadım
- 1 haftadan kısa
- 1 hafta – 3 hafta arası
- 1 ay – 2 ay arası
- 2 ay – 6 ay arası
- 6 ay – 1 yıl arası
- 1 yıldan fazla

BÖLÜM 2:

Lütfen aşağıdaki soruları dikkatlice okuyunuz ve görüşleriniz doğrultusundaki seçeneğin hizasındaki sütunu işaretleyiniz. Seçeneklerden sadece birini işaretleyiniz.

		Kesinlikle Katılıyorum	Katılıyorum	Katılmıyorum	Kesinlikle Katılmıyorum
1	Bilgisayarlar beni korkutmuyor.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	Bilgisayar kullanma konusunda hiç iyi değilim.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	Bilgisayarlarla çalışmayı isterim.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	Bilgisayarı yaşamımda birçok biçimde kullanacağım.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5	Bilgisayarlarla çalışmak sinirlerimi bozabilir.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6	Yeni bir problemi bilgisayar kullanarak çözmeye çalışmam gerekse genel olarak bu konuda kendimi iyi hissederim.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7	Bilgisayarlarla problemleri çözmek bana çekici gelmiyor.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	Bilgisayarlar hakkında bir şeyler öğrenmek zaman kaybıdır.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	Başkaları bilgisayarlardan söz ettiğinde rahatsızlık duymuyorum.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10	İleri düzeyde bir bilgisayar çalışması yapacağımı sanmıyorum.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11	Bilgisayarlarla çalışmanın zevkli ve teşvik edici olduğunu düşünüyorum.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12	Bilgisayarlar hakkında bilgi edinmeye değer.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13	Bilgisayarlara karşı saldırgan ve düşmanca duygular besliyorum.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14	Bilgisayarlarla çalışabileceğime eminim.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15	Bilgisayar problemlerini çözmek beni cezbetmiyor.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16	Gelecekteki çalışmalarım için bilgisayarda iyice ustalaşmam gerekecek.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17	Bilgisayar kursları almak için zahmete girmem.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18	Bilgisayar kullanmada iyi olabilecek tipte biri değilim.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19	Bir bilgisayar programında hemen çözemediğim bir sorun olduğunda cevabı bulana kadar vazgeçmem.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20	Günlük hayatımda bilgisayarları çok az kullanacağımı tahmin ediyorum.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21	Bilgisayarlar kendimi rahatsız hissetmeme neden oluyorlar.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22	Bir bilgisayar dili öğrenebileceğime eminim.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23	Bazı insanların nasıl olup da bilgisayarla bu kadar zaman geçirdiklerini ve bundan hoşlandıklarını anlamıyorum.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24	Bilgisayar dersinde huzurlu olurdum.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

25	Bilgisayar kullanmak sanırım benim için çok zor olurdu.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26	Bilgisayarlarla çalışmaya bir kez başlayınca bırakmak benim için çok zor olurdu.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27	Bilgisayarlarla çalışmayı bilmek, iş bulma olasılıklarını artıracak.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28	Bilgisayar kullanmayı düşündüğümde başımdan aşağı kaynar sular boşaldığımı hissediyorum.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
29	Bilgisayar derslerinde iyi notlar alabilirim.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30	Bilgisayarlarla mümkün olduğunca az çalışma yapacağım.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
31	Bilgisayarla çözülebilecek her şeyi başka yollarla da çözebilirim.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
32	Bilgisayarlarla çalışırken kendimi rahat hissedirim.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
33	Eğer bilgisayar dersinde bir problem çözülmeden kalırsa üzerinde sonradan düşünmeye devam ederim.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
34	Bilgisayar derslerinde başarılı olmak benim için önemlidir.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
35	Bilgisayarlar beni huzursuz eder ve aklımı karıştırır.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
36	Bilgisayarlarla çalışmak gerektiğinde kendime yeterince güvenirim.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
37	Başkalarıyla bilgisayar hakkında konuşmaktan hoşlanmam.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Sub-scale Items

1 Anxiety

- 1 Bilgisayarlar beni korkutmuyor.
- 5 Bilgisayarlarla çalışmak sınırlarımı bozabilir.
- 9 Başkaları bilgisayarlardan söz ettiğinde rahatsızlık duymuyorum.
- 13 Bilgisayarlara karşı saldırgan ve düşmanca duygular besliyorum.
- 17 Bilgisayar kursları almak için zahmete girmem.
- 21 Bilgisayarlar kendimi rahatsız hissetmeme neden oluyorlar.
- 23 Bazı insanların nasıl olup da bilgisayarla bu kadar zaman geçirdiklerini ve bundan hoşlandıklarını anlamıyorum.
- 28 Bilgisayar kullanmayı düşündüğümde başımdan aşağı kaynar sular boşaldığımı hissediyorum.
- 30 Bilgisayarlarla mümkün olduğunca az çalışma yapacağım.
- 35 Bilgisayarlar beni huzursuz eder ve aklımı karıştırır.

2 Liking

- 3 Bilgisayarlarla çalışmayı isterim.
- 7 Bilgisayarlarla problemleri çözmek bana çekici gelmiyor.
- 11 Bilgisayarlarla çalışmanın zevkli ve teşvik edici olduğunu düşünüyorum.
- 15 Bilgisayar problemlerini çözmek beni cezbetmiyor.
- 19 Bir bilgisayar programında hemen çözemediğim bir sorun olduğunda cevabı bulana kadar vazgeçmem.
- 24 Bilgisayar dersinde huzurlu olurdum.
- 26 Bilgisayarlarla çalışmaya bir kez başlayınca bırakmak benim için çok zor olurdu.
- 31 Bilgisayarla çözülebilecek her şeyi başka yollarla da çözebilirim.
- 33 Eğer bilgisayar dersinde bir problem çözülmeden kalırsa üzerinde sonradan düşünmeye devam ederim.
- 37 Başkalarıyla bilgisayar hakkında konuşmaktan hoşlanmam.

3 Usefulness

- 4 Bilgisayarı yaşamımda birçok biçimde kullanacağım.
- 8 Bilgisayarlar hakkında bir şeyler öğrenmek zaman kaybıdır.
- 10 İleri düzeyde bir bilgisayar çalışması yapacağımı sanmıyorum.
- 12 Bilgisayarlar hakkında bilgi edinmeye değer.
- 16 Gelecekteki çalışmalarım için bilgisayarda iyice ustalaşmam gerekecek.
- 20 Günlük hayatımda bilgisayarları çok az kullanacağımı tahmin ediyorum.
- 27 Bilgisayarlarla çalışmayı bilmek, iş bulma olasılıklarımı artıracak.
- 34 Bilgisayar derslerinde başarılı olmak benim için önemlidir.

4 Confidence

- 2 Bilgisayar kullanma konusunda hiç iyi değilim.
- 6 Yeni bir problemi bilgisayar kullanarak çözmeye çalışmam gerekse genel olarak bu konuda kendimi iyi hissederim.
- 14 Bilgisayarlarla çalışabileceğime eminim.
- 18 Bilgisayar kullanmada iyi olabilecek tipte biri değilim.
- 22 Bir bilgisayar dili öğrenebileceğime eminim.
- 25 Bilgisayar kullanmak sanırım benim için çok zor olurdu.
- 29 Bilgisayar derslerinde iyi notlar alabilirim.
- 32 Bilgisayarlarla çalışırken kendimi rahat hissederim.
- 36 Bilgisayarlarla çalışmak gerektiğinde kendime yeterince güvenirim.

Removed Questions

Following items were removed from the original questionnaire items after the correction request of Faculty Ethics Commission.

Faculty Ethics Commission Request;

In Turkish:

“Bilgisayara Yönelik Tutum Ölçeği” isimli anketin, Bilgisayar Eğitimi Bölümü öğrencilerine uygulanacağı düşünüldüğünde, “*Bilgisayarlarla çalışmanın benim için önemi yoktur*”, “*Bir bilgisayar dersini becerebileceğimi sanmıyorum*”, “*Meslek hayatımda hiçbir zaman bilgisayar kullanacağımı zannetmiyorum*” gibi bazı sorular öğrencilerin mesleklerine olan inançlarının ölçüldüğüne dair yanlış bir izlenim yaratabilir. Bu sorular daha genel bir kitle için çok anlamlıdır; ve nitekim farklı tez çalışmalarında da kullanıldığı belirtilmektedir. Öte yandan, bu tezde hedef kitlenin Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü öğrencileri olduğu düşünüldüğünde, bazı soruların öğrencilerin bölümlerinin meşruiyetini sorgular gibi algılanmaması için yumuşatılması veya çıkarılması düşünülebilir.

In English:

When the questionnaire which is called “Computer Attitude Scale” has been considered that it will be conducted by students of Computer Education

Department, following items may cause students to think that they are being questioned about their beliefs towards their profession: “*Bilgisayarlarla çalışmanın benim için önemi yoktur*”, “*Bir bilgisayar dersini becerebileceğimi sanmıyorum*”, “*Meslek hayatımda hiçbir zaman bilgisayar kullanacağımı zannetmiyorum*”. These questions can be valid for different researches however, since the participants of this study are Computer Education and Instructional Technologies Department, to prevent students to feel that the questionnaire queries the validity of their profession some questions should be softened or removed.

Removed Usefulness Questions

- Meslek hayatımda hiçbir zaman bilgisayar kullanacağımı zannetmiyorum.
- Çalışma hayatımda bilgisayarlarla çalışmanın benim için önemi yoktur.

Removed Confidence Questions

- Bir bilgisayar dersini becerebileceğimi sanmıyorum.

Reverse Coded Items

- 2 Bilgisayar kullanma konusunda hiç iyi değilim.
- 5 Bilgisayarlarla çalışmak sınırlarımı bozabilir.
- 7 Bilgisayarlarla problemleri çözmek bana çekici gelmiyor.
- 8 Bilgisayarlar hakkında bir şeyler öğrenmek zaman kaybıdır.
- 10 İleri düzeyde bir bilgisayar çalışması yapacağımı sanmıyorum.
- 13 Bilgisayarlara karşı saldırgan ve düşmanca duygular besliyorum.
- 15 Bilgisayar problemlerini çözmek beni cezbetmiyor.
- 17 Bilgisayar kursları almak için zahmete girmem.
- 18 Bilgisayar kullanmada iyi olabilecek tipte biri değilim.
- 20 Günlük hayatımda bilgisayarları çok az kullanacağımı tahmin ediyorum.
- 21 Bilgisayarlar kendimi rahatsız hissetmeme neden oluyorlar.
- 23 Bazı insanların nasıl olup da bilgisayarla bu kadar zaman geçirdiklerini ve bundan hoşlandıklarını anlamıyorum.
- 25 Bilgisayar kullanmak sanırım benim için çok zor olurdu.
- 28 Bilgisayar kullanmayı düşündüğümde başımdan aşağı kaynar sular boşaldığımı hissediyorum.
- 30 Bilgisayarlarla mümkün olduğunca az çalışma yapacağım.
- 31 Bilgisayarla çözülebilecek her şeyi başka yollarla da çözebilirim.
- 35 Bilgisayarlar beni huzursuz eder ve aklımı karıştırır.
- 37 Başkalarıyla bilgisayar hakkında konuşmaktan hoşlanmam.

Data Coding Guide

Variable	Description / Code
Gender	2-points nominal 1 = Male 2 = Female
Anxiety	Anxiety indicator items, 4-points scale, 1-4 (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree)
Liking	Liking indicator items, 4-points scale, 1-4 (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree)
Usefulness	Usefulness indicator items, 4-points scale, 1-4 (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree)
Confidence	Confidence indicator items, 4-points scale, 1-4 (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree)

APPENDIX D

The Instructor' and the Laboratory Assistant' Perception about Remote Access Technology Interview Guide (ILAPRAT-IG)

Instructor Interview Guide about Remote Access Technology

The aim of this interview is to explore the perceptions of the instructor of the CEIT 211 course instructor about the use of Remote Access Technology that is used in CEIT 211 course group projects by students.

The interview is prepared to be used for a master thesis study performed in Computer Education and Instructional Technologies Department in Middle East Technical University.

If is it all right for you, I would like to record our conversation to make sure that I will not miss any point of the interview.

Your responses will be kept confidential and will be used only for this study.

Contact:

Muhammet TURŞAK
tursoft@tursoft.net

Academic Supervisor:

Prof. Dr. M. Yaşar ÖZDEN

Interview Date	:	___ / ___ / _____
Interviewer	:	_____
Interviewee	:	_____

SECTION 1:

1. How long have you been working as an instructor in METU?
2. How long have you been giving CEIT 211 course?
3. Have you ever used any Remote Access Technology until now?

If the answer is yes, continue with following questions;

- 1.1 Have you ever used any Remote Access Technology in any course previously as an instructor?
- 1.2 Have you ever made your students use any Remote Access Technology in your CEIT 211 course previously?

SECTION 2:

4. How did the use of this technology effect the motivation of the students towards their group projects? Positively, negatively or not effected?

If the answer is “not effected”, continue with the following questions;

- 4.1 Why do you think that the use of the system not effected students’ motivation? What can be the possible factors in your opinion?

Continue with question 4.2.1 to drill down to get detailed information and to ensure negative answer.

If the answer is “negatively”, continue with the following questions;

- 4.1 Why do you think that the use of the system effected students’ motivation negatively? What can be the possible factors in your opinion?

Continue with question 4.2.1 to drill down to get detailed information and to ensure negative answer.

If the answer is “positively”, continue with the following questions;

- 4.2 What are the indicators of the increase of the students’ motivation by the use of this technology?

If the following indicators are not covered, ask following questions.

Have you observed that the use of the technology has increased;

- 4.2.1 ... students' participation to their group project studies?
- 4.2.2 ... students' interest to their group project studies?
- 4.2.3 ... students' enjoyment in their group project studies?
- 4.2.4 ... students' study time in their group project studies?
- 4.2.5 ... students' satisfaction about their group project studies?
- 4.2.6 ... students' willingness to work on their group project studies?

SECTION 3:

- 5. What do you think about the usefulness of this technology in students' group project studies? Was it useful or not?

If the answer is negative, continue with the following questions;

- 5.1 Why do you think that the use of the system was not useful?

- 5.1.1 What were the insufficient features?

- 5.1.2 What can be the possible improvements?

Continue with question 5.2.1 to drill down to get detailed information and ensure negative answer.

If the answer is positive, continue with the following questions;

- 5.2 In what ways, was this technology useful in students' group project?

If the following indicators are not covered, ask the following questions.

Have you observed that the use of the technology has;

- 5.2.1 ... increased students' work speed in their group project studies?
- 5.2.2 ... increased students' performance in their group project studies?
- 5.2.3 ... increased students' productivity in their group project studies?
- 5.2.4 ... increased students' contribution in their group project studies?

- 5.2.5 ... made the development of group projects for students easy?
- 5.2.6 ... made it easy for students to access to the project server?
- 5.2.7 ... improved students' opportunity to work on group projects?

5.3 Was the use of this technology useful overall?

SECTION 4:

Please answer the following questions based on your observations.

- 6. Was learning to use “Remote Access Technology” easy for your students?
- 7. Was becoming skillful at using “Remote Access Technology” easy for your students?
- 8. Were user interfaces and messages of “Remote Access Technology” clear for your students?
- 9. Were user interfaces and messages of “Remote Access Technology” user friendly for your students?
- 10. Does user interfaces and messages of “Remote Access Technology” uses terms familiar for your students?
- 11. Was it hard to understand the user interfaces of “Remote Access Technology” for your students?
- 12. In overall, was the use of “Remote Access Technology” easy for your students?

SECTION 5:

13. What can be your suggestions about the future and other possible uses of this technology in this course and other programming courses?
14. What can be other advantages of the use of this technology?
15. What can be other disadvantages of the use of this technology?

My questions end here. Thank you very much for your contribution.
Do you have any other comments on the issue or the questions?

APPENDIX E

System Screenshots



Figure-1 - Login Screen of Microsoft Remote Desktop Connection Client



Figure-2 - Advanced Login Screen of Microsoft Remote Desktop Connection Client

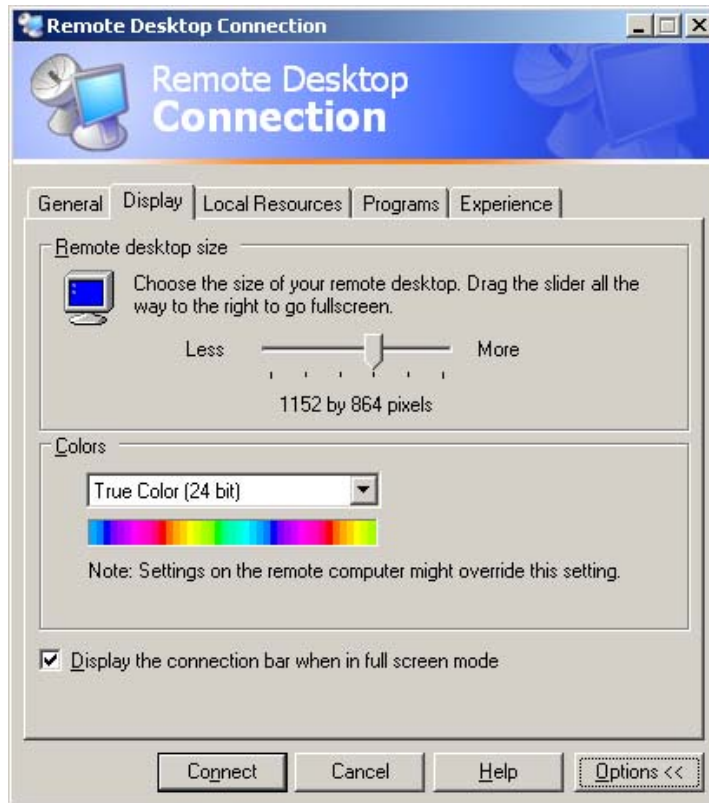


Figure-3 - Display Options Screen of Microsoft Remote Desktop Client



Figure-4 - Local Resource Options Screen of Microsoft Remote Desktop Client

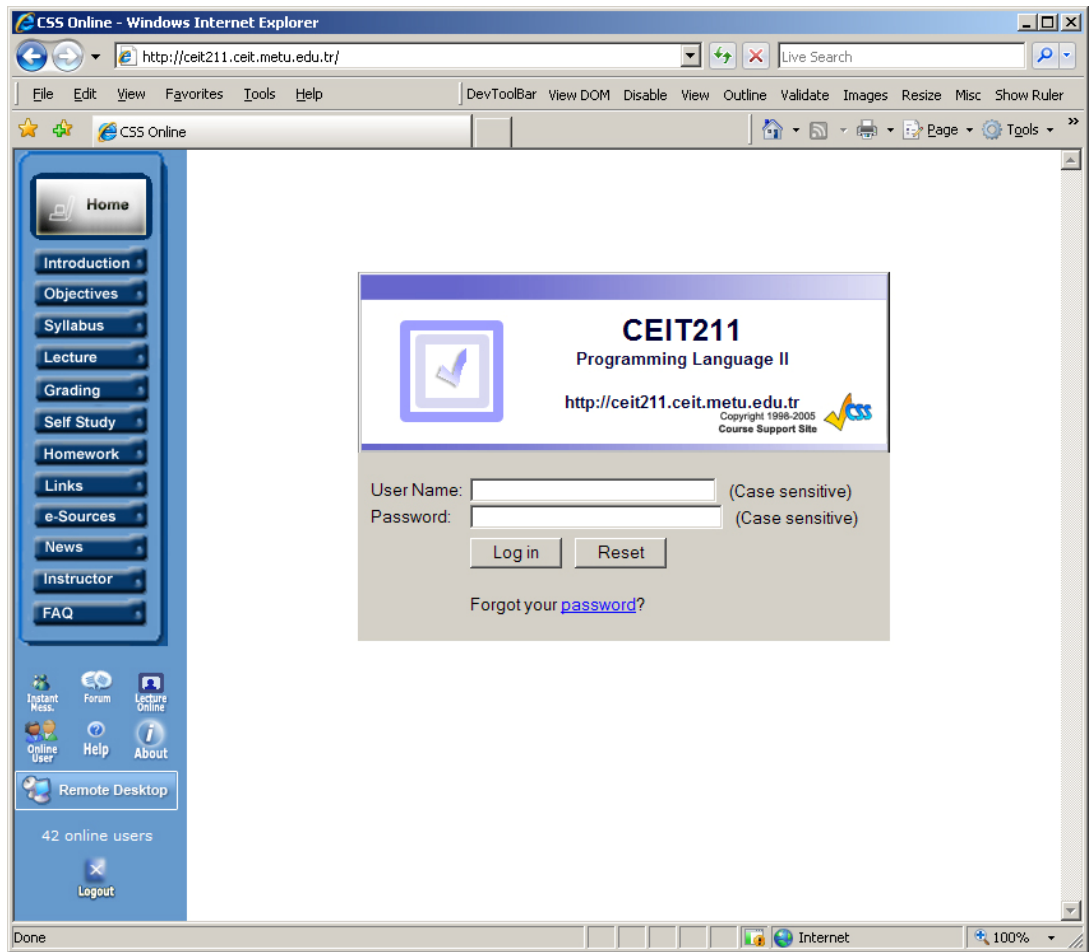


Figure-5 - Login Screen of CEIT211 Course Website

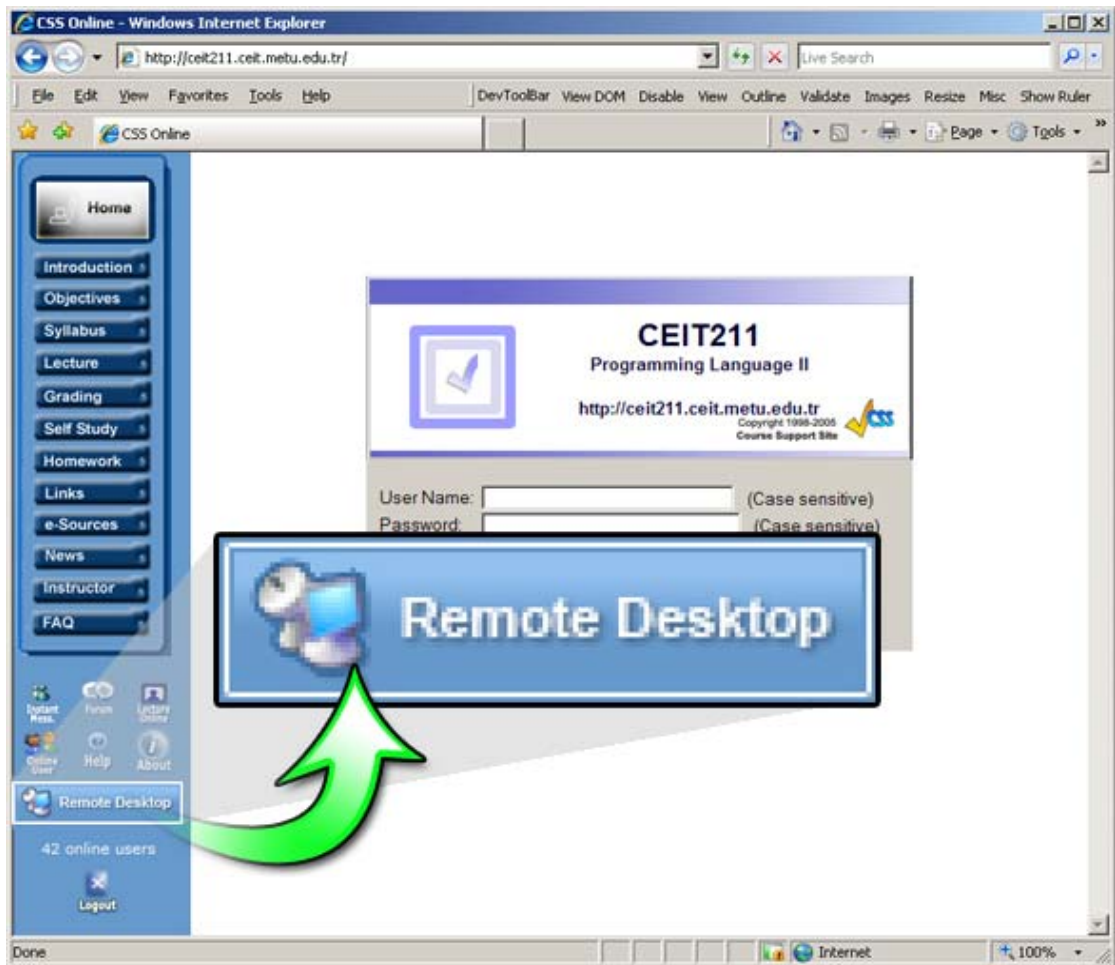


Figure-6 - Web-based Remote Desktop Connection Page Button in CEIT211 Course Website

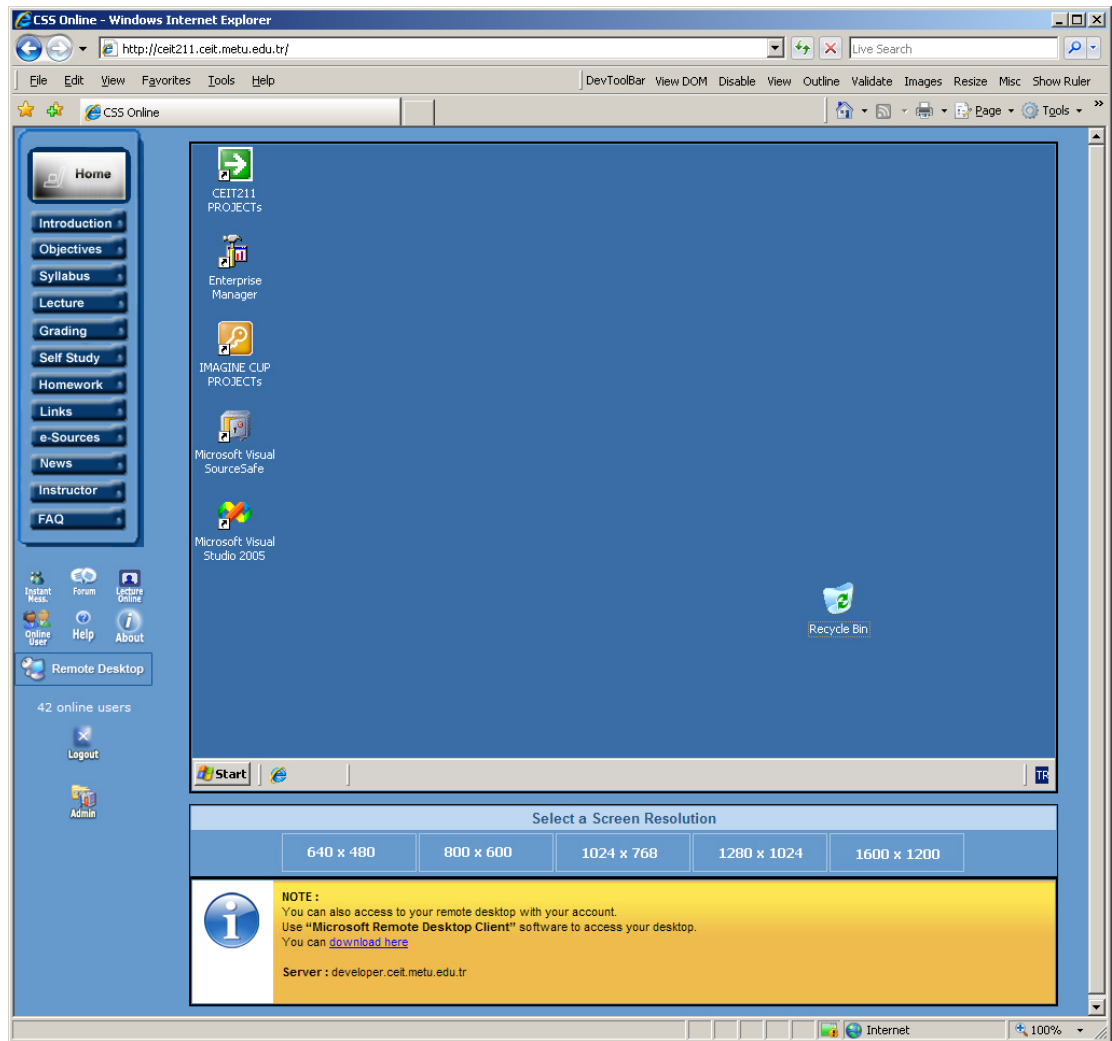


Figure-7 - Web-based Remote Desktop Connection Page of CEIT211 Course Website

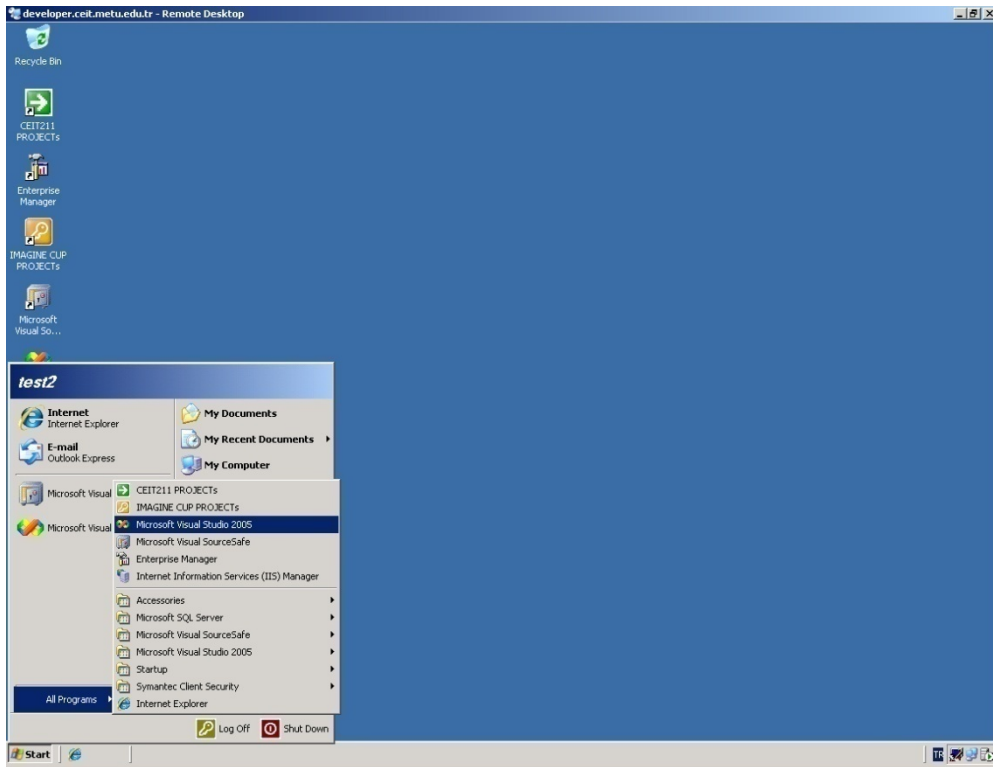


Figure-8 - User Desktop on the Server

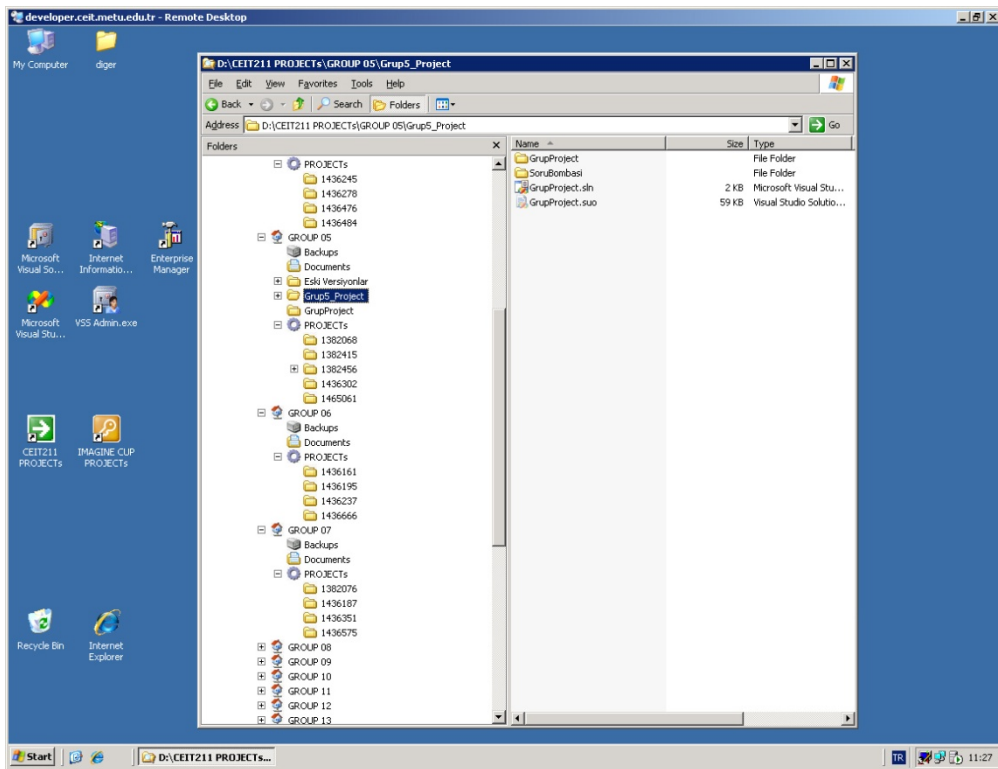


Figure-9 - Group and User Directory Structure on Server

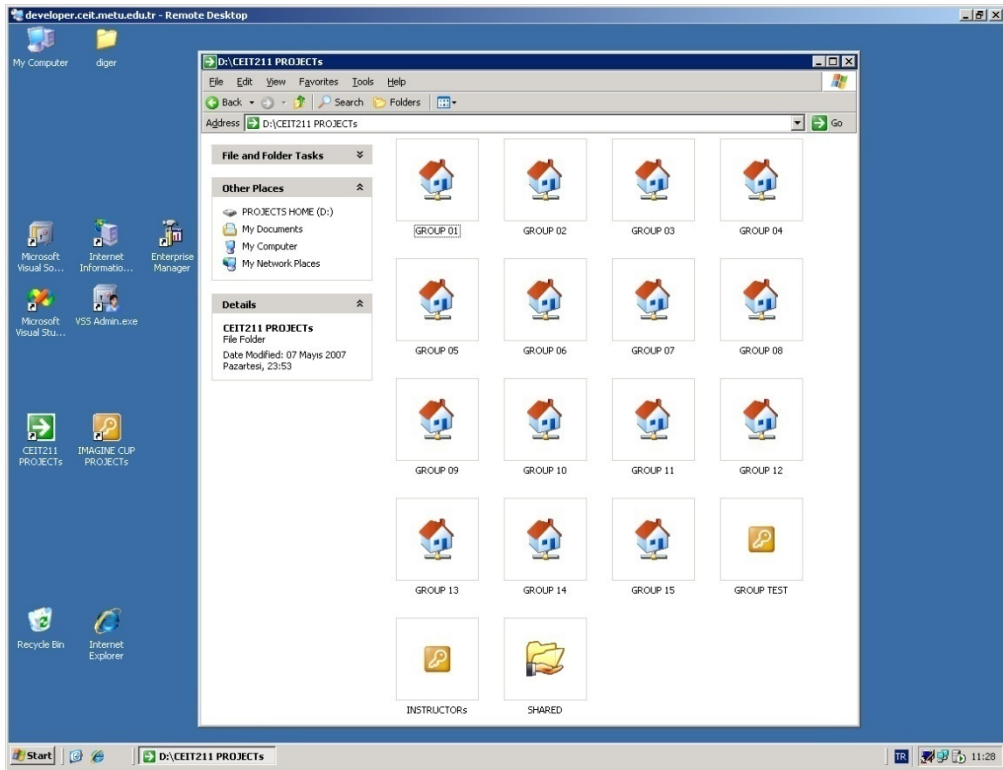


Figure-10 - Group Directories on Server

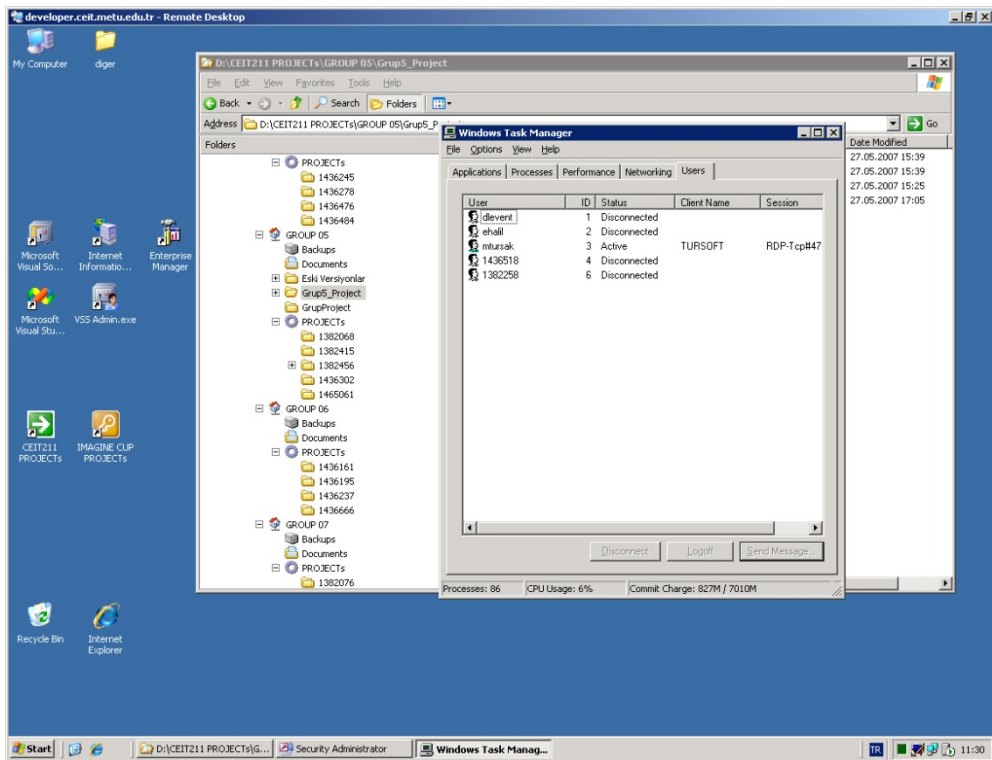


Figure-11: Task Manager to List Online Users and Their Status

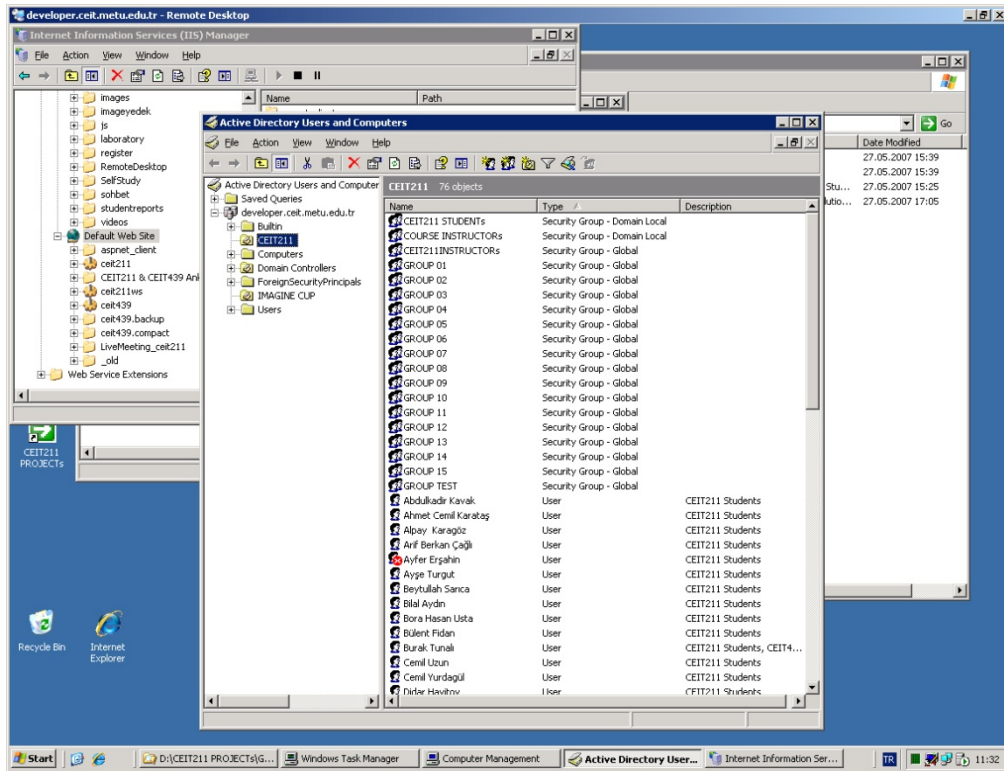


Figure-12 - User Account Management Screens Used by Instructors

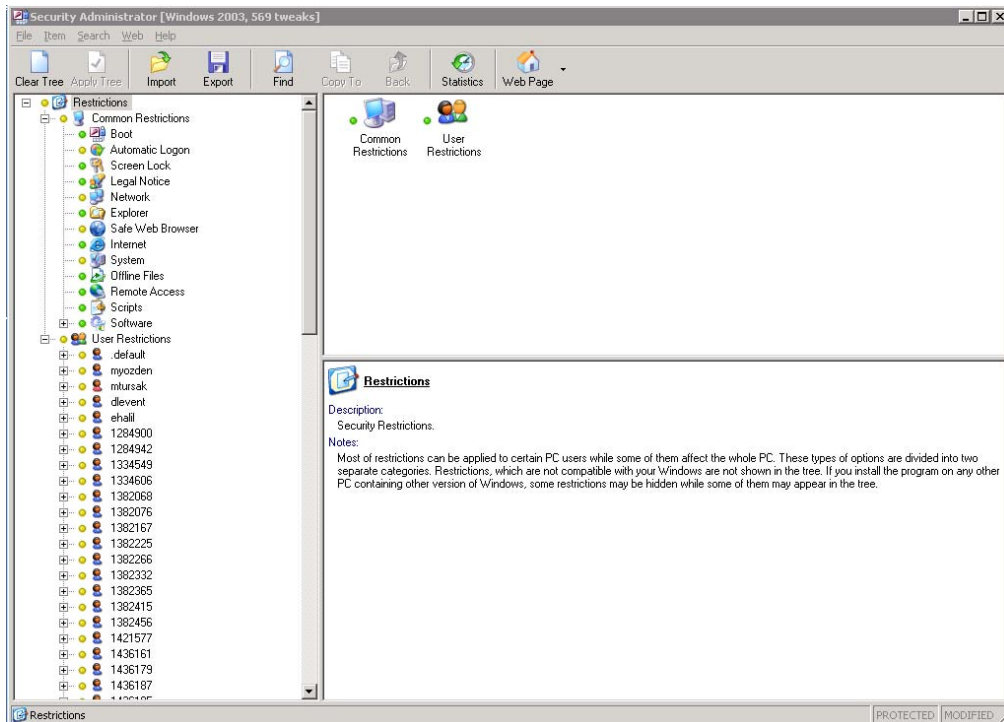


Figure-13 - Security Administrator Software to Manage User Account Limitations on the Server

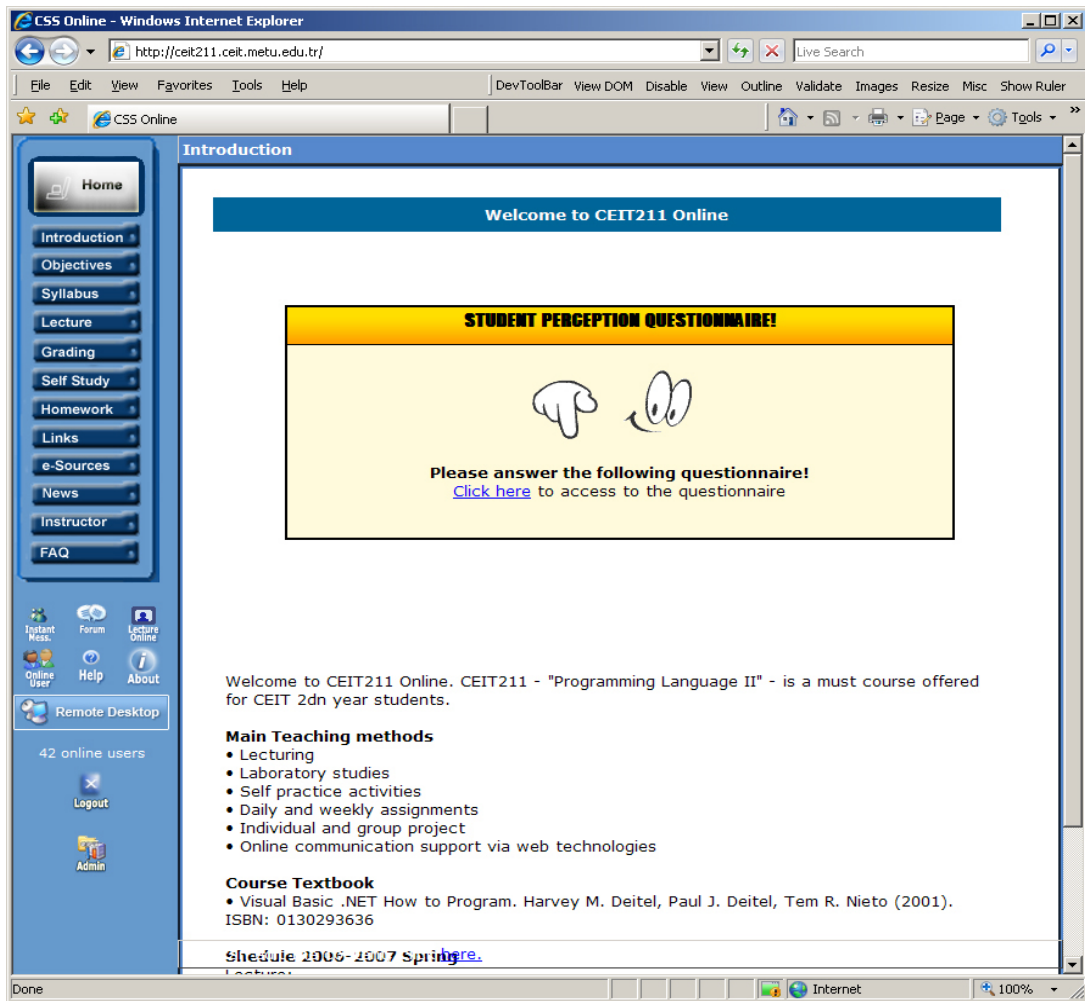


Figure-14 - Introduction Page of CEIT211 Course Website

Student Perception Questionnaire

about Use of the Remote Access Technology

This questionnaire is prepared to explore your perceptions about the use of Remote Access Technology, which is called as "Remote Desktop Connection" that you have used in your group projects in the scope of CEIT 211 course.

The questionnaire is prepared to be used for the master thesis study performed in Computer Education and Instructional Technologies Department of Middle East Technical University.


Your responses will be kept confidential and will only be used for this study.

Contact:
 Muhammet TURŞAK
tursoft@tursoft.net

Academic Supervisor:
 Prof. Dr. M. Yaşar ÖZDEN

ERROR

There is/are missing or invalid data!
 Please correct your answers in red colored questions.



Please enter following information about yourself.

Gender	<input checked="" type="radio"/> Male	<input type="radio"/> Female
---------------	---------------------------------------	------------------------------

Figure-15 - Direction and Information Section of Student Perception Questionnaire

SECTION 1:
 In this section, 7 technologies are listed. For each of the technology, please select one of the competency level that best describes your competency. Use mouse pointer for selecting your choice and please select only one for each technology.

		Not Used	Beginner	Intermediate	Expert
1.1	Web browsers <i>(Examples: Internet Explorer, Firefox, Netscape, Opera)</i>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.2	Search Engines <i>(Examples: Google, Alta vista, Yahoo, MSN, Lycos)</i>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.3	E-mail <i>(Examples: Hotmail, Yahoo! Mail, Gmail, Outlook, etc.)</i>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.4	Online Forums & Blogs	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
1.5	Online Chat Applications <i>(Examples: IRC, MSN Messenger, Yahoo! Messenger etc.)</i>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
1.6	Microsoft Office Applications	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
1.7	Remote Access Applications <i>(Examples: Microsoft Remote Desktop Connection, VNC, RemoteAdmin, PCAnywhere, etc.)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

Figure-16 - Section 1 of Student Perception Questionnaire

SECTION 2:
This section contains questions about your previous experiences about online and web supported learning environments. Use your mouse pointer for selecting your answer and please select only one answer for each question.

		Yes	No
2.1	Have you ever taken any <u>web-supported</u> or <u>online course</u> until now?	<input type="radio"/>	<input type="radio"/>
2.2	Have you ever taken any <u>web-supported programming language courses</u> until now?	<input type="radio"/>	<input type="radio"/>
2.3	Have you ever used the <u>internet for your course studies</u> until now? (Examples: Researches, homeworks, projects, etc.)	<input type="radio"/>	<input type="radio"/>
2.4	Have you have ever used any <u>remote access technology in your courses</u> until now? (Examples: Microsoft Remote Desktop Connection, VNC, RemoteAdmin, PCAnyWhere etc.)	<input type="radio"/>	<input type="radio"/>

Figure-17 - Section 2 of Student Perception Questionnaire

SECTION 5:

5.1 Approximately, how frequently did you use "Remote Desktop Client Software" in your 1-month period of your project? Please select one of the choices which best describes your usage.

- never
- once in a week
- three times in a week
- everyday
- more than one in a day

ERROR: Please select one of the above choices!

Please indicate your reason:

5.2 Approximately, how many times did you use "Remote Desktop Client Software" in your 1-month period of your project? Please enter your answer in the following box.

times

ERROR: Enter a positive number!

Please indicate your reason:

5.3 Approximately, for how many hours did you use "Remote Desktop Client Software" in your 1-month period of your project? Please enter your answer in the following box.

hours

Figure-18 - Section 3 of Student Perception Questionnaire

APPENDIX F

Descriptive Statistics of Questions for Students' Perceptions Questionnaire

Question	SD		D		N		A		SA		Mean	Std. Dev.
	N	%	N	%	N	%	N	%	N	%		
S3.01	0,0	0,0	0,0	0,0	13,0	35,1	19,0	51,4	5,0	13,5	3,784	0,6723
S3.02	0,0	0,0	2,0	5,4	20,0	54,1	11,0	29,7	4,0	10,8	3,459	0,7672
S3.03	0,0	0,0	3,0	8,1	18,0	48,6	12,0	32,4	4,0	10,8	3,459	0,8026
S3.04	0,0	0,0	2,0	5,4	20,0	54,1	12,0	32,4	3,0	8,1	3,432	0,7280
S3.05	0,0	0,0	3,0	8,1	18,0	48,6	12,0	32,4	4,0	10,8	3,459	0,8026
S3.06	1,0	2,7	4,0	10,8	15,0	40,5	13,0	35,1	4,0	10,8	3,405	0,9267
S3.07	0,0	0,0	1,0	2,7	20,0	54,1	14,0	37,8	2,0	5,4	3,459	0,6496
S3.08	0,0	0,0	2,0	5,4	17,0	45,9	14,0	37,8	4,0	10,8	3,541	0,7672
S3.09	0,0	0,0	1,0	2,7	14,0	37,8	17,0	45,9	5,0	13,5	3,703	0,7403
S3.10	0,0	0,0	1,0	2,7	10,0	27,0	21,0	56,8	5,0	13,5	3,811	0,7007
S3.11	0,0	0,0	0,0	0,0	20,0	54,1	15,0	40,5	2,0	5,4	3,514	0,6065
S3.12	1,0	2,7	4,0	10,8	18,0	48,6	11,0	29,7	3,0	8,1	3,297	0,8777
S3.13	0,0	0,0	1,0	2,7	14,0	37,8	16,0	43,2	6,0	16,2	3,730	0,7691
S3.14	0,0	0,0	2,0	5,4	20,0	54,1	11,0	29,7	4,0	10,8	3,459	0,7672
S3.15	0,0	0,0	0,0	0,0	13,0	35,1	19,0	51,4	5,0	13,5	3,784	0,6723
S3.16	0,0	0,0	1,0	2,7	16,0	43,2	16,0	43,2	4,0	10,8	3,622	0,7208
S3.17	0,0	0,0	1,0	2,7	13,0	35,1	17,0	45,9	6,0	16,2	3,757	0,7603
S3.18	0,0	0,0	1,0	2,7	20,0	54,1	14,0	37,8	2,0	5,4	3,459	0,6496
S3.19	1,0	2,7	4,0	10,8	15,0	40,5	13,0	35,1	4,0	10,8	3,405	0,9267
S4.01	2,0	5,4	2,0	5,4	8,0	21,6	19,0	51,4	6,0	16,2	3,676	1,0015
S4.02	0,0	0,0	1,0	2,7	16,0	43,2	16,0	43,2	4,0	10,8	3,622	0,7208
S4.03	0,0	0,0	2,0	5,4	12,0	32,4	20,0	54,1	3,0	8,1	3,649	0,7156
S4.04	0,0	0,0	2,0	5,4	14,0	37,8	18,0	48,6	3,0	8,1	3,595	0,7249
S4.05	2,0	5,4	2,0	5,4	8,0	21,6	19,0	51,4	6,0	16,2	3,676	1,0015
S4.06	1,0	2,7	4,0	10,8	10,0	27,0	20,0	54,1	2,0	5,4	3,486	0,8699
S4.07	0,0	0,0	2,0	5,4	12,0	32,4	20,0	54,1	3,0	8,1	3,649	0,7156
S4.08	0,0	0,0	0,0	0,0	13,0	35,1	19,0	51,4	5,0	13,5	3,784	0,6723