T. C.
BAHÇEŞEHİR UNIVERSITY

THE EFFECTS OF PROBLEM BASED LEARNING ON COGNITIVE FLEXIBILITY, SELF REGULATION SKILLS AND STUDENTS' ACHIEVEMENTS

M.S. Thesis

Özge YÜCEL

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Director

This is to certify that we have read this thesis and that we find it fully adequate in scope, quality and content, as a thesis for the degree of Master of Science.

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ABSTRACT

THE EFFECTS OF PROBLEM BASED LEARNING ON COGNITIVE FLEXIBILITY, SELF REGULATION SKILLS AND STUDENTS' ACHIEVEMENTS

Yücel, Özge

Information Technologies Master Program

Supervisor: Assoc. Prof. Dr. Adem Karahoca

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The purpose of this study is to specify the effects of cognitive flexibility and self regulation skills on students' achievements in web mediated problem based programming language learning towards gender and class groups. Self regulation skills towards web based programming language education is discussed under three dimentions; learning skills, learning strategies and self efficacy. Level of cognitive flexibility is reviewed by comparison of time and percentage of success.

Causal-comparative research model is used in this study where five different class groups are compared in. First, the flexiblity test has been done on a sample of seventy-five students who are receiving education in a private university. As the next step, the self regulation skills scale has been done by the same students. For the last step, a web based problem was given to this students and their success is calculates as the the grades that they get from each step.

In the statistical analysis of the data, t-tests, ANOVA, MANOVA and correlation coefficient was used. The statistical analyses were done on SPSS 17.0. The significance of the data was tested at the significance level of .05.

The statistical analysis showed that, there is no significant difference between self regulation skills and cognitive flexibility towards gender and class groups. Also there is not a significant relationship between web based self regulation skills. When the corelation between level of cognitive flexibility and students' achievements is taken under consideration it is seen that there is a positive linear relationship between them. It can be said that students who have higher cognitive flexibility level also have advanced problem solving skills.

Keywords: Web-Based Learning, Problem-Based Learning, Cognitive Intelligence, Self-Regulation

ÖZET

PROBLEM TABANLI ÖĞRENME YAKLAŞIMININ BİLİŞSEL ESNEKLİK, ÖZ DÜZENLEME BECERİLERİ VE ÖĞRENCİ BAŞARISI ÜZERİNDEKİ ETKİSİ

Yücel, Özge

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Bu çalışmanın amacı, web destekli probleme dayalı programlama dili öğretiminde bilişsel esneklik düzeyi ve öz düzenleme becerilerinin sınıf gruplarına göre karşılaştırılması ve öğrenci başarısı üzerindeki etkisinin ölçülmesidir. Web destekli ortamda, programlama dili öğretimine yönelik problem tabanlı öğrenim yaklaşımı kapsamda öz düzenleme becerileri, öz yeterlik, öğrenme stratejileri ve öğrenme becerileri olarak üç boyutta ele alınmıştır. Bilişsel esneklik düzeyi ise süre ve başarı yüzdedelerinin kıyaslanması şeklinde incelenmiştir.

Beş farklı sınıf grubunun karşılaştırıldığı bu çalışmada karşılaştırmalı-nedensel araştırma modeli kullanılmıştır. İlk olarak bir vakıf üniversitesinde öğrenim görmekte olan toplam 75 kişi bilişsel esneklik testine tabi tutulmuştur. Daha sonra aynı çalışma grubu web destekli eğitime yönelik öz düzenleme becerileri ölçeği uygulanmıştır. Son olarak bu öğrencilerden web ortamında yapmaları için bir problem verilmiş ve her adımdan aldıkları puanlarla başarıları hesaplanmıştır.

Bu araştırmada, verilerin analizinde, istatistiki işlemlerden, eşli gruplar t testi, bağımsız gruplar t testi, ANOVA, MANOVA ve korelasyon katsayısı kullanılmıştır. İstatistiki işlemler SPSS 17.0 programında analiz edilmiştir. Elde edilen verilerin anlamlı olup olmadıkları .05 anlamsallık düzeyinde test edilmiştir.

Yapılan analizler sonucunda, Web destekli eğitime yönelik öz düzenleme becerileri ve bilişsel esneklik açısından cinsiyet ve sınıf gruplarına göre farklılık bulunmamıştır. Ayrıca web destekli eğitime yönelik öz düzenleme becerileri ve bilişsel esneklik arasında anlamlı bir ilişki olmadığı saptanmıştır. Öğrencilerin başarısı ile bilişsel esneklik düzeyi arasındaki korelasyon ele alındığında, aralarında pozitif doğrusal bir ilişki olduğu görülmüştür. Yüksek bilişsel zeka esnekliğine sahip öğrencilerin, aynı zamanda daha gelişmiş problem çözme becerisine sahip olduğu söylenebilir.

Anahtar Kelimeler: E-Learning, Probleme Dayalı Öğrenme, Bilişsel Esneklik, Öz düzenleme

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LIST OF ABBREVIATIONS

Analysis of Variance	**:**	**ANOVA**
Flexibility Test	**:**	**FT**
Mean of Squares	**:**	**Mean Sq.**
Multivariate Analysis of Variance	**:**	**MANOVA**
Percentage of Success	**:**	**PS**
Problem Based Learning	**:**	**PBL**
Realibility Coefficient	**:**	**α**
Self Regulation Skills Scale	**:**	**SRSS**
Standard Deviation	**:**	**Std. Dev.**
Statistical Package for the Social Sciences	**:**	**SPSS**
Sum of Squares	**:**	**Sum Sq.**
Traditional Learning	**:**	**TL**

LIST OF SYMBOLS

Correlation Coefficient	**:**	**r**
Density Function	**:**	**df**
f-Value in Analysis of Variance	**:**	**F**
Number	**:**	**#**
Sample Mean	**:**	**X**
Sample Size (Variable Quantity)	**:**	**N**
Seconds	**:**	**s**
Statistical Significance	**:**	**P**
t-Value in t-Test	**:**	**t**

1. INTRODUCTION

1.1 PROBLEM DEFINITION

In today's information societies, it is not only expected that students gain information but also use this gained information in solving complicated problems (Dochy et al., 2003, p.533). Therefore, students should also be taught the source of information and how they can gain this information, how they can evaluate it and how they can use this information in solving problems (Yaman and Yalçın, 2005, p.42). Concordantly, problem based education assumes an important role in attributing these characteristics to individuals.

Almost every day our lives are deeply affected by many problems. In these situations, what we want is to immediately remove this problem. However, this desire only is not enough. The way we reach the point of solution of the problems and our individual development is significantly important (Torp, 1997:1). It is required to define a set of key events regarding the problems, obtain the necessary information and come up with a solution with methods that we have developed ourselves (Saban, 2000:156).

Problem based education represents a new paradigm in the learning-teaching process. This strategy involves the student being exposed to a complicated situation or event. What is important is that the students embrace these problems and take their responsibility. If they have entirely taken responsibility and embraced the problem, then the students will try all methods in reaching a valid solution. What the teacher needs to do at the beginning of the strategy is take care that the problem is selected from real life. According to Torp and Sage, "Problem-solving based learning is organized around researching and solving real life problems and represents experience based learning that requires the active participation of individuals both in terms of mind and skill" (Saban, 2000:157).

PBE entered literature as an education strategy as a result of a research conducted by Barrows and Tombly at McMaster University, Medical School in the 1960s. This research investigated the reasoning skills of students. Barrows and Tombly pointed out

the differences problem solving created in learning. During the first trial, small groups were composed and they were expected to make a decision between the problem and situation (Rhem, 1998:1). Today this is an education strategy used especially in higher education of Medical Schools in countries such as Canada, America, Australia and England. When the research on education in Turkey is examined, it is observed that Problem Based Education Strategy is limited to the studies of Medical Schools in Dokuz Eylul University, Hacettepe University and Pamukkale University.

1.1.1 Problem Based Education

Problem Based Education is an approach that aims to ensure students to think deeply by leaving them face to face with a well-structured problem they may encounter during real life and provide the sources and guidance they may require, thus enable them to learn on the issue on their own during the problem-solving phase and gain problem-solving skills (Barrows, 1985; cit. Alper, 2003).

According to Bubonics PBL (2001); is a curriculum and teaching approach that puts students face to face with a well-structured problem taken from real life and that develops the students problem-solving strategies, knowledge and information skills during the problem-solving phase.

Problem Solving Based Education Methods, whose foundation was laid with John Dewey in the 1930s, was developed by Jerome Bruner in the 1960s and many researches like Bridges and Hallinger in 1990 and Vernon and Blake in 1993 conducted many applications on students.

Problem based learning is an approach with which students learn by using their experiences and their experimental findings they obtain by considering the tasks that occur with a specific problem situation (Torp and Sage, 2002).

Today, problem-solving strategies are used in almost every field from medicine to literature and from history to economics.
PBL, is a teaching method that contains processes such as approaching a problem from different aspects, formulizing it, evaluating data necessary for solving the problem and

efficiently using the available opportunities and tools in solving the problem. During the problem identification and solving phase, individuals obtain new teachings along with the pre-teachings they have.

Problem based learning environments offer students an opportunity to implement what they have learned. Organizing information and materials and presenting them gives students a better opportunity to use their high level thinking skills more when compared to conventional learning environments. Problem based learning, which is one of the fundamental approaches of the constructivist approach, directs the students the thing, question and discover (Wilkie and Burns, 2003; cit. Ozdemir, 2005, p.6-7).

Duch et al. (2001) have suggested 5 steps to write a problem efficient in problem based learning. These are:

i. Brainstorming and determining learning objectives: Students try to focus on an idea, concept, principal or method by thinking about the problems given in the end of the unit in textbooks or the assignments traditionally given in the course during previous years. The learning objectives that students may encounter while they are working on a problem are listed.

ii. Reviewing the concepts in terms of real life: Students try to develop a story by considering the questions given in the end-of-the-unit questions, by examining incidents that can be adapted to real life and by adding elements that will increase the students' motivation in problem solving. For this, brainstorming for a story can be done by examining newspapers, magazines and articles.

iii. Identifying and shaping the problem: The problem should be identified and shaped in a specific way step-by-step. Thus, the students will clarify what is important in learning and perform their research in a specific framework. The questions below may be of assistance;

    a. How will the problem be structured?

    b. How large is the scope of this problem? How many hours of class would be required to solve the problem?

c. Which sources would the students require?

d. What is the final output that the students will gain when the problem is solved?

iv. Preparation of the teacher's guide: A detailed teacher's guide is written for a problem to be used in class.

v. Determining the sources that students can use: The last stage, however, is determining the sources the students can use. It may be good to give the students a few specific sources. Today, some students think that the internet is a sufficient source. Therefore, students should also be encouraged to use library sources.

In contrast to traditional class environments, a problem based learning environment provides students with opportunities to adapt their skills and methods to new situations and to change them. In addition to this, the minds of students taught in environments offering traditional mathematics education are previously filled with exercises, rules and equations that are necessary however limited in terms of use in unfamiliar situations such as project tests. Moreover, students in problem based learning typically have a greater opportunity to learn mathematical processes regarding communication, representation, modelling and ratiocination (Roh, 2003).

1.1.2 Characteristics Of Problem Based Learning

Problem based learning requires an inter-disciplinary approach because problem based learning requires that students read, write, research and analyse, think and calculate thus use a couple of disciplines (Delisle, 1997, p.10).

Problem based learning develops cooperation based learning. Students develop their skills by using problem based learning, solving the problems with teamwork and by learning from each other. Each student in the team can work on a different aspect of the problem. Furthermore, they also develop their leadership by taking on tasks in their own team or helping the other students (Delisle, 1997, p.12).

1.1.3 Problem Based Learning Process

The problem based learning process starts with presenting a problem suitable within the framework of the students' field. A connection between the problem and real life is established. The issue is constructed with regard to the problem and the students are given the responsibility of learning on their own by teamwork. Students are encouraged to work together and present their products of learning to the class and discuss them (Savoie and Hughes, 1994).

Most PBL definitions have four common elements (Jones, 2006). These are:

i. The learning objectives are turned into a problem,

ii. They require perfect solutions, possible solutions and behavioural preferences, and an explanation,

iii. Students use small group debates in order to analyse the problem and its potential solutions and to understand it,

iv. Questions or situations that cannot be answered within group debates constitute a base for outer-group future learning.

While Torp and Sage (2002) divide the process into two as Problem Design and Problem Application, according to Barrows' this process is constituted by four stages as listed below;

i. First Stage; students discuss what they know and what they don't, they form a hypothesis and then the issue starts to clarify as a result of the discussions. In addition to this, students gain the skill to criticise their classmates' comments.

ii. Second Stage; students work on it and make their plan active. They put forth how they are going to learn the information and skills that they do not know. The sources that are required are determined during this stage. During this stage, students will have taken a big step in learning on their own.

iii. Third Stage; in this stage, students use the information that they have gained to accept or to object to the hypotheses that they have formed. They get an idea of

which research methods are productive, which sources are useful and which research methods and sources are necessary by criticising the methods and sources.

iv. Fourth Stage; during practice, students summarize what they have learned and then discuss how they can use this information and these skills in the future. Consequently, students reflect what they have learned by integrated with it.

Duch (1995), however, defines the PBL process in four stages as well;

i. Students are presented with a problem (such as situation, worksheet, video recording). Students organize their opinions and their previous information regarding the problem (within a group) and try to define the problem's general structure.

ii. During the discussion, students reveal the aspects of the problem that they don't understand with questions named as learning issues. These learning discussions are recorded by the group. Students are constantly encouraged regarding what they know and, more importantly, what they don't know.

iii. Points which are important for students are formed within the learning discussion session. Students decide on which questions will be followed by the entire group and later on taught to the entire group, and which sections are to be given to which individuals. The students and the teacher discuss which sources they need for which additional learning debates and where they can find them.

iv. When the students gather up again, they examine their previous discussions and integrate the content of the problem and their new information. Students are also encouraged to summarize their knowledge and combine their new opinions with the old. Students continue to organize different learning debated throughout the problem-solving process. Students later on see that learning is an ongoing process and that learning debated will always continue.

Walsh (2005) and Pelech (2006) list PBL's stages as:

a. Encountering and defining the problem
b. Defining what they know and what they need and listing their opinions
c. Collecting and sharing the information
d. Producing possible solutions and hypotheses
e. Defining learning issues
f. Applying the new information on the problem and re-assessment
g. Determining the best solution
h. Briefly explaining the problem and solution
i. Presenting an evaluation and what has been learned.

Considering the researches that have been conducted, PBL's application phases can be described in 6 steps.

i. Encountering the problem: The teacher presents a problem that is related to real life and is ill-structured as a scenario to the students in small groups. The students try to define this problem which has fundamentally been presented with its foreknowledge.

ii. Planning the learning: What is known about the problem is listed by exchanging opinions on the issue as a group and the points that are required to be known are noted under the learning issues. The hypotheses that are produced are recorded by discussing suggestions for possible solutions. Which data collection methods and sources will be required for the solution and how they can be achieved are determined by also using the teacher's guidance. Plans are made regarding each learning issue by taking work-sharing into account.

iii. Data collection: Information is gathered by reaching data sources (libraries, internet, personal sources, etc). The required data is obtained by making measurements with regard to the solution of the problem (observation, experiment, etc.).

iv. Solution: The information that has been obtained is shared and interpreted. The probable solutions regarding the problem are discussed as a group and the most suitable solution is determined.

v. Presentation: The solution determined for the problem issue is compendiously explained to the other groups in the class as suggestions. The opinions and criticisms on the suggestion are noted.

vi. Assessment: The students assess the elements of the PBL program and the performance they have displayed from their own aspect. The teacher makes measurements and assessments based on learning products with regard to the students' performances.

Table 1.1 : Traditional Learning Strategies and Problem Based Learning Strategy

Learning Strategy	Objective	Teacher's Role	Student's Role	Information
Direct Learning Strategies	Ensuring that students exactly repeat the information they have learned when requested	1.The teacher, as the expert, possesses the information and directs the students' thinking 2.The teacher, as the controller, directs the students' learning and evaluates the students	1.The student, as receiver, is passive and perceived as an empty tank. 2.Students, as a follower, waits upon the leadership of the teacher	The information is organized by the teacher and then presented to the students
Problem Based Learning Strategy	Enable students to establish their own knowledge so that they can find a solution in a problem situation	1.The teacher, as a cognitive guide, present the students with a problem, 2.The teacher as a source, directs questions to the students, establishes relationships with the students' world and directs the students' learning	1.Students, each as a problem-solver, produce various suggestions for solutions to problems they encounter by using the available sources. 2.Students, each as a participant, are active in the learning process and internally research the problem	A very little amount of information is presented by the teacher; the greater part, however, is collected and structured by the students.

1.1.4 Advantages Of Problem Based Learning

The advantages that PBL education practices provide and that are especially important in terms of science are should not be underestimated. Below, some of these advantages have been presented as articles.
Problem Based Learning;

a. Enables active learning

It is aimed that students gain skills for observation, classification, measurement and using numbers, establishing communication, estimation, data collection, recording and interpreting, defining and controlling variants, making definitions, hypotheses, experimenting and creating and using models at the end of the active learning process (Dokme, 2005). One of the four active learning strategies that is used in the practice process of the constructivist approach that asserts that learning is an active process and contains project based learning, research based learning and cooperation based learning is PBL. There is an increase in the students' interests, practical skills and active learning with the PBL format (Norman and Schmidt, 1992). PBL contributes to an active learning process in which the student is in the centre of the learning process, where they have the responsibility and are given the opportunity to organize. The student is active and conducts researches, like a scientist, that leads to a solution to the problem that has been presented with the guidance of a teacher.

b. Develops teamwork skills

PBL focuses on developing the students' skills to work as a team and within small groups (Duch et al. 2001; Uden and Beaumont, 2006). Lessons that involve learning in small groups have a more positive impact on the students in terms of their academic success, interest in the lessons and programs and their approach on learning when compared to traditional learning (Springer et al., 1999).

c. Helps gain problem-solving skills

During the last thirty years, there have been significant changes in all aspects of our lives from how we communicate, how we run how business, how we obtain information

to how we use technology. Today, students should be prepared to function in a world that runs differently from even ten years before. The problems awaiting the future generation professionals are going to be from different disciplines and require new approaches and skills to solve complicated problems (Duch et al., 2001). Ensuring that students gain and fortify their problem-solving skills that are from real life and have complicated structures, are among the objectives on which PBL focuses (Hsu 1999; Duch et al., 2001; Uden and Beaumont, 2006). Studies conducted in line with this issue show that PBL increase students' problem-solving skills more when compared to learning based on traditional education (Kaptan and Korkmaz, 2002; Yaman and Yalcin, 2005b).

d. Helps gain information that are easy to remember

Although some sources indicate that PBL gives less knowledge when compared to other methods there are also studies that indicate otherwise and even state that the knowledge gained by PBL is easier to remember. Norman and Schmidt (1992), indicate that even if at the beginning it is not so much, students can keep what they have learned in mind for longer periods later on. According to Hmelo and Ferrari (1997), PBL aims to structure a wide and flexible foundation of information. PBL provides students with at least as much science knowledge as does a traditional lesson (Hsu, 1999). As a result of the experimental research conducted by Dods in 1997, it is indicated that PBL supports gaining knowledge and the ability to remember the knowledge that has been gained much more than traditional lessons (Ward and Lee, 2002).

e. Helps gain self-directed learning skills

Self-directed learning, shouldn't be confused with self-indulgent study that is studying with their own will like they have to in the traditional system or self-directed learning which is learning without getting help from others. Teachers are not information-providers ready to readily feed, but are teachers that facilitate the learning process (Kwan, 2000). What is referred to with self-directed learning is that students direct and plan their own learning activities. The PBL approach – stated as learning to learn in literature‖ (Savin-Baden and Major 2004; Duch 2007) enables the development of the student's self-directed learning skills to achieve an objective (Hsu, 1997). Thus,

students gain the qualification to be able to conduct self-willed learning throughout their lives. Norman and Schmidt (1992), have indicated that PBL increases students' self-directed learning skills and that this increase is sustainable.

f. Helps gain cooperation-based learning

According to Miller and Peterson (2003), cooperation based learning promises positive effects on the students' futures by increasing their academic success and developing their social attitude and behaviours. The general principle behind cooperation-based learning is that students work together as a group for a common objective, in other words, what makes cooperation-based learning important for each student is that they learn. PBL, develops cooperation-based learning skills (Duch et al. 2001). Students study in small groups and compare their own learning with that of the others. PBL not only provides the chance to communicate within a social frame, but also helps understand others opinions by working in cooperation (Hsu, 1999).

g. Ensures high motivation and a positive approach

Students in a PBL program are active students and possess their own learning. Therefore, when compared to students in a traditional program, they express that they have higher motivation and a more positive attitude towards learning (Hsu, 1999). In problem-based learning, complex and real life problems are used in order to motivate them to research and determine the principles and concepts that students need to learn while working with these problems (Duch et al., 2001).

Problem based learning is one of the best learning approaches where efficient learning occurs in a controlled way, as long as it is applied correctly. The learning phases in problem-based learning are continuously reviewed depending on the feedback and explanations students receive from each other and the teacher. Within these phases, problem-based learning contribute to students' problem-solving, self-directed learning, independent learning, thinking skills, attaining teamwork skills, communication, gaining and assessing knowledge, abilities and attitudes with regard to computers (Akpınar and Ergin, 2005, p.4, Bagcı, 2003).

1.1.5 Computer Assisted Learning

With technological developments and increase in the importance given to education, it has become inevitable not to use technological developments in the solving of educational problems. The computer, which is one of these technologic developments, is one of the main cultural elements of our century and has become a tool that is rapidly dispersing. Knowing what a computer is has become an inevitable concept in our day. Furthermore, knowing computers has become something like legibility to modern people.

Computer Assisted Learning can be defined in various ways. According to the first definition, Computer Assisted Learning technology is each of the phases of application of computer technology. These applications may be presenting information, tutoring, contribute in developing a skill, simulation and provide problem-solving data.

According to another definition, however, Computer Assisted Learning is students directly taking their lessons by interacting with them through a computer system that they have been programmed on.

Computer Assisted Learning is an application involving the computers directly presenting the lessons, repeating what has been learned with other methods, problem-solving, and using the computer as an exercise and similar tool.

Computer Assisted Learning fundamentally constitutes of the simulation, response and revision elements. Information is presented to students from a terminal or screen connected to the computer as a simulator, the students answer the question related to this information and then they are presented reviews according to the quality of the response. Repeating these events causes a change in the behaviour of the student with regards to specific issued. This means that there has been learning.

1.1.6 Advantages Of Computer Assisted Learning

No doubt every method or system simultaneously comprises of advantages and limitations. Knowing the advantages and limitations of a method aids people who want

to implement that method. Therefore, this unit shall first describe the advantages of Computer Assisted Learning and then its limitations.

It is possible to list Computer Assisted Learning as below;

i. Computer Assisted Learning gives students the opportunity to continue at their own pace and level thus enables individualized, student-centred education.

ii. Computer Assisted Learning can make even the most boring studies entertaining as it is interactive. Learning is effective thanks to visual applications such as colours and graphics.

iii. It presents a comfortable environment to students because it both gives instant feedback and because the feedback is not expressed among everyone else as it is with the teacher.

iv. Offers unique opportunities to students thanks to simulations. Students get the chance to interact with the outer world with simulations. Computer Assisted Learning software can be used in conducting experiments that would be impossible or dangerous in class.

v. Teachers can also use the time more efficiently thanks to Computer Assisted Learning. Studies such as research that lead to waste of time by having to be written on the board can be presented via the computer. On the other hand, a student left behind on the subject can re-study the topic from the computer without interrupting the teacher.

1.1.7 Limitations Of Computer Assisted Learning

The limitations of Computer Assisted Learning can be listed as;

i. Students being in one-to-one communication with the computer prevents the communication among students thus students are deprived of a socializing process.

ii. As computer software draws a definite line between right and wrong, it expects the students to be perfect. In this situation, there is no mechanism to encourage the student and direct them towards the right answer.

iii. Working with a computer is most certainly harder than studying by turning book pages. Therefore, students that are to participate in Computer Assisted Learning should previously have gained computer literacy.

iv. Computer Assisted Learning software is mostly focused on foreign language and science studies. Not developing software in Social Sciences studies is a deficit.

1.1.8 Cognitive Flexibility Theory And Principles

One other factor that may have an effect on problem based learning's success is cognitive flexibility.

The aim of learning is to take the student to the level of expertise. It is only possible to achieve this by showing the student different points of views (Spiro et al., 1992).

Spiro and Jehn (1990), define the hypertext as a computer based text that is not ready linearly and can be organized in various ways. Hypertexts are nodes that contain texts, fixed graphics, images, pictures or tables and links that enable these nodes to be used together; thus the informational structure pertaining to a field and the relations within this field is presented (Tolhurst, 1995; De Vries and De Jong, 1999). In this environment, the student is able to choose and reach the information that is in accordance with their own interest and need. Students are able to see the material from different aspects and control their own learning thanks to hypertexts not having a linear structure (Dede and Lewis, 1995; Altun, 2000; Kommers, 2002). Thus, with its flexible structure this environment enables students to reach information in ill-structured fields that they configured themselves by different methods and different tasks, this is namely crisscross landscape. As Altun (2002) stated, students are able to reach the information they desire whenever and however they want with this crisscross landscape and are able to see this information and these concepts in an non-linear way.

In the teaching-learning process, students are expected to be successful while the teachers' qualification increases. Traditional teaching approaches accept the importance of the teacher however, underline that information is less transferable and that the memory level is low. The cognitive flexibility theory however, is a theory involving the transfer of information and the behaviour after the initial learning. This theory also encourages the students towards different points of views and enables information transfer to different areas. Students initially learn the information with a linear content; new information is formed by the simultaneous presentation of important concepts and examples (Kearsley, 2000; Spiro et al., 1994). The 'cognitive' part of this theory is recalling the previous information from the memory and configuring it within; the 'flexibility' part is however the students being able to flexibly use this information in different situations (Spiro et al., 1992). Therefore, cognitive flexibility actually presents itself as a diversity of individuals. Spiro et al., (1992), were in the opinion that students should attain "cognitive flexibility".

The cognitive flexibility theory comprises of the transfer of information and preliminary information. Thus, the students learn fundamental concepts and theories with linear content. When there is advanced information ganining, a non-linear approach constitutes the base for learning of a ill-structured area (Swindler, 2001). Therefore, it could be said that cognitive flexibility is involved with complicated structured being presented more flexibly and personally, not with a strict content.

Principles of the Cognitive Flexibility Theory;

i. Learning activities display the content differently: Organizing the same material in different ways, for different objectives so that the student can see different aspects of the same topic.

ii. Learning materials should be prevented from oversimplifying the content and connected information should be given: Presenting simplified versions of complicated and irregular concepts of a field to students leads to incorrect conceptualizing that are to change later on. To prevent this, the cognitive flexibility theory indicates that inter-conceptual relations should be underlined

and presented to the students by considering these relations in problems that students may encounter in real life.

iii. Teaching should be based on example situations and information structuralizing should be emphasized: Example situations should be used in order to ensure advanced information in students for ill-structured fields and so that students can transfer this information to different situations.

iv. Information sources should not be entirely different nor closely linked: when students are working with example situations or solving problems, they should be able to reach information they require whenever they need it and the relevant information needs to be in one place. This is only possible by choosing a suitable environment.

1.2 THE IMPORTANCE OF STUDYING

Considering the technologically-integrated problem based learning implementations conducted in Turkey and the great number of studies involving the effects of it on students, studying is important in terms of these features it contains and the possible contributions it will make to science in line with its sub-objectives.

1.3 THE PROBLEM SENTENCE

In programming language education, how does the web assisted problem based learning approach affects students' achievements, their level of cognitive flexibility and self regulation skills?

1.3.1 Sub-Problems

The general aim of this research is to determine the effects of the level of cognitive flexibility in problem based learning on the success rate and self-organization skills of

student. The answers of the below listed questions were searched in line with this objective.

i. Is there a difference between groups in terms of self-organization skills with regard to web based learning?

ii. Is the success rate of students that have a higher cognitive flexibility level, higher than students that have a lower cognitive flexibility level?

iii. Are the self-organization skills of students with high cognitive flexibility levels higher than students with low cognitive flexibility levels?

iv. Does the level of cognitive flexibility vary according to gender?

v. Learning will be more permanent in students that have a higher level of cognitive flexibility when compared to students with a low cognitive flexibility level.

vi. Is the algorithm logic and qualities of the steps that need to be taken during problem-solving in problem based learning for students that have a high level of cognitive flexibility more comprehensive than those of students that have a low level of cognitive flexibility?

1.4 LIMITATIONS

Research,

i. Limited to the information and findings obtained from students attending C# programming class in the education year 2010-2011, spring term at Bahcesehir University, Faculty of Engineering, Department of Software Engineering.

ii. Limited to online learning media and internet tools developed by the researcher.

iii. The obtained data is limited to the scales used.

1.5 DEFINITIONS

PROBLEM BASED LEARNING: A learning strategy comprising of defining a problem, presenting it, determining alternative solutions, selecting one of the solutions and implementing the solution in a planned way (Özdemir, 2005).

COOPERATIVE LEARNING: The period of learning; with students working in small groups and helping each other learn. The term ‘cooperative learning’ is used for situations when the interaction between students is not based on a fixed teacher or student role (Dansereau, 1985).

WEB BASED LEARNING: (E-Learning) : Learning done via the internet or a computer network by self-willed learning, without having any time or place restrictions in reaching information that enables communicating simultaneously or non-simultaneously with other learners or teachers, interacting with visual and audio reactions provided by computer technology, that eliminates socio-economic status limitations and that provides individuals the chance to benefit from the superiority of life-time-learning. Today’s computer technology makes it possible to create environments the same as real life on networks, in other words, on the web. Simulations created with the aid of various software can be transmitted to students on the web. These simulations can be the identical copy of real life situations according to the details developed. Students or learners can study on real life simulations with the aid of computers, solve the presented problems or develop solutions (Ataizi, 2002).

COGNITIVE FLEXIBILITY: Cognitive Flexibility theory is a conceptual model for designing learning environments based on cognitive learning theory. Spiro and Jehng (1990) defined cognitive flexibility as “the ability to adaptively re-assemble diverse elements of knowledge to fit the particular needs of a given understanding or problem-solving situation”.

SELF-REGULATION: Self-regulation is an integrated learning process, consisting of the development of a set of constructive behaviours that affect one's learning. These

processes are planned and adapted to support the pursuit of personal goals in changing learning environments.

2. RELEVANT LITERATURE

This section examines both domestic and foreign studies and presents information regarding the focus of control found within the research problem, problem based learning and problem-solving skills.

2.1 STUDIES REGARDING PROBLEM BASED LEARNING

First of all, researches examining students' approaches and academic success with regard to problem based learning in different fields have been presented below.

Deveci (2002), studied the effects of problem based learning's on students' attitudes towards classes, academic success and level of recollection in social sciences. This research has been patterned and conducted according to the experiment "pre-test and post-test control grouped model" in order to examine the students' attitudes towards classes, academic success and level of recollection in social sciences in the Social Sciences class of the fourth grade of elementary school. For the research, a survey was developed in order to equilibrate the students for data collection, an achievement test was developed in order to test the students' success rate and recollection level and also, teaching materials were developed for lesson plans, lesson notes and class activities in order to conduct the Social Sciences class according to problem based learning. The SPSS packet program was used for all statistical analyses regarding the research. The standard deviations of all average scores and score distributions of the groups were calculated. The t-test was used for all intra-group and inter-group comparisons and a .05 confidence level was adapted as the level of significance. As a result of the conducted research, it has been deducted that there is an advantageous statistically significant difference in terms of information recollection and academic success for the experimental group, to which problem based learning was implemented in the social sciences class, when compared to the control group, to which traditional education was implemented.

Uslu (2006), examined the effect of problem based learning on the students' attitudes towards classes, academic success and level of recollection in mathematics. The pre-test-post-test experiment design was used in the research. The research was conducted on forty tenth grade students attending the first term of the 2005-2006 education year. Problem based learning was applied to the experiment group while traditional learning was applied to the control group. Prior to application, the groups were given an attitude scale and an achievement test that was prepared as a pre-test. At the end of application, an attitude scale and an achievement test was given as a post-test. The achievement test was given again fifteen days after application in order to measure memorability. The findings that have been obtained show that problem based learning positively affects the students' attitude, success and memorability when compared to the traditional method significantly.

In this research Tavukçu (2006) examined the problem based learning approach's effect on academic success, attitude towards science, scientific process skill and creativity levels. The research was semi-experimental and the pre-test-post-test pattern with the control group was used. A total of 79 students took place in the research; there being the experiment (N=40) and the control (N=39) groups. While the approach of Problem Based Learning was used in the experimental group, the traditional approach was used in the control group. The Academic Achievement Test, Attitude Scale for Science Class, Scientific Process Skills Test, Torrance Creative Thinking Test, Modal Form and interviews were used as data collection tools in the research. The t-test was used for dependent and independent data collection groups in order to test the research hypotheses. The qualitative data, however, was obtained by analysing the audio records of the interviews and evaluated by using the descriptive analysis method. As a result of the qualitative and quantitative analyses; it has been deducted that the problem based learning approach developed the academic success of students, increased their attitude level towards science class, developed their science process skills and increased their creative thinking levels for science.

Arıcı and Kıdıman (2007), examined the effect of problem based learning on the academic success level of students attending the department of computers in a vocational high school. The research was conducted on 27 students attending the 10^{th}

grade of the Computers Department in Yıldırım Beyazıt Industrial Vocational High School. The topic approached in the research is "ARRAYS" in the Pascal Programming Language. A pre-test was used in order to measure the students' pre-knowledge on the subject. The experiment and control groups were objectively determined according the pre-test results. The problem based learning method was applied to the experiment group while the traditional method was applied to the control group. After the implementation of problem based learning, the post-test was applied. Arithmetical average, standard deviation and "t" test was used in the statistical analyses of the obtained data, the results were evaluated on a 0.05 significance level. At the end of the research, it has been determined that PBL does not have a significant difference in terms of the success level, the memorability of what has been learned and the students' attitude towards science.

Çiftçi et al., (2007) examined the effect of problem based learning on the success and attitude of students for Social Sciences in the 6^{th} grade of elementary school. The research was conducted with a total of 40 students and two equal classes in Meram Sare Özkaşıkçı Elementary School in the first term of the 2004-2005 educational year. The scales were used as the pre-test before the research and post-test after implementation. The t-test was used for analysing the data obtained during the research. As a result of the test, significant difference was found in favour of the experiment group in terms of the success and attitudes of students of the experiment and control group.
Considering the researches mentioned above, it could be said that the approach of problem based learning can positively affect the academic success and attitudes of students in different fields and for different grades.

Secondly, researches regarding the comparison of problem based learning; traditional learning and computer aided learning have been presented below.

Gürpınar (2007), defines the aim of the study as to determine develop computer based learning that supports problem based learning in medical school, if there is a difference between the exam scores of the classic PBL module and the problem based learning module supported by computer aided learning environments and the students' satisfaction with regard to the web-based learning application. In accordance to this aim,

a web learning page that they could use during the independent research process with students and that comprehensively contains the subjects and relevant learning aims that takes place in PBL was formed. All students (174 students) attending the 1st term of the 2006-2007 Akdeniz University Medical School constituted the population of the research. As a result, it has been determined that web-based learning applications have a positive effect on the students' success and that most of them were pleased with the application.

Gökmen (2008), examined the effects of problem based learning method with the students' pre environmental attitude under control (PBL1), the problem based learning model in which a local problem was used (PBL2) and traditional learning (TL) methods on students' environmental attitudes; especially sub-titles of attitudes on general environmental solutions and awareness of personal responsibility. The sample of the research is constituted by 95 seventh grade students attending an elementary school in the province of Niğde. An Environmental Attitude Test was given in order to determine their pre-environmental attitude. Moreover, the group worksheets that the students in the experiment group used during the application were examined in order to evaluate the content of the application and the development of the students. In the Environmental Attitude Test, which aims to measure the results of the research, the general environmental awareness of the students, their attitude regarding general environmental solutions and personal responsibility awareness for all groups in order to compare the effect of PBL (1 and 2) and TL methods' effect on the students' environmental attitude; it has been observed that PBL students have a higher average for all three sub-titles in the Environmental Attitude Test compared to PBL2 students, the TL students however, had a higher average than PBL students in the personal responsibility sub-title.

In the study conducted by Gallagher, Stepien and Rosenthal in 1992 compare PBL and the traditional methods in terms of various variants. At the end of the implementations, it was determined that students taking lessons according to the PBL method displayed better development in terms of problem-solving categories, reaching information relevant to the problem, recognizing the problem, brainstorming, producing a solution, application and evaluation processes when compared to the control group to which traditional methods were applied.

The research conducted by Khoiny (1995), compared the methods of PBL and traditional simple narration. According to the findings obtained from the research conducted on a total of 28 students, 15 of which were in the experiment and 13 of which were in the control group, studying in the department of nursing, the experimental group to which PBL was applied was much more superior in contrast to the control group in which the method of narration was used, in terms of both success and problem-solving skills. Consequently, it was indicated that PBL increased academic success and the skill of problem-solving.

A total of 32 students participated in the research that Elsfahei conducted on 2nd grade students attending different high schools in 1992 in order to test the effect of PBL on success and attitude. The research compared the traditional method and PBL. According to the findings of the research; students and teachers using the PBL method stated that they were going to adapt these applications in the future. Additionally, it has been found that students educated with the PBL method produce more reasonable solutions to the problems they encounter and are more successful compared to the students learning with traditional teaching methods.

The objective of the study conducted by Şahin (2011), was defined as determining the effect of Problem Based Learning approach and traditional learning method on the students' academic success in general physics laboratory class, on the simple electrical circuits topic. The study's pattern is the "non-equal control group pattern". The sample of the research is constituted by a total of 77 first grade students attending the general physics laboratory class at Ataturk University, Kazim Karabekir Faculty of Education, Science Teaching in Elementary school. The implementation was conducted in 8 weeks during the spring term of 2009-2010. The data of the research was collected with the "Academic Achievement Test (ABT)", and the "Problem Based Learning Environmental Scale (PBL Environmental Scale)". The results of the analysis showed that although there was no significant difference between the experiment and control group with regard to academic success for the total of multiple choice questions, experiment group students were more successful for the total of conceptual questions.

The study conducted by Gürsul in 2008 tries to determine the effect of computer aided learning and face-to-face problem based learning on students' success, attitude toward mathematics and the opinions regarding these approaches. The research was conducted on a total of 42 students attending the first grade of Computer and Teaching Technologies Teaching Department of the Faculty of Education in Hacettepe University during the fall term of the 2006-2007 educational year. The research was conducted on the subject of derivatives in Mathematics-I class for a period of 7 weeks. The mathematics attitude scale was used in order to determine the students' attitude towards mathematics, the performance evaluation scale (rubric) in order to quantize their problem solving skills within the scope of the application and also, a survey of open-ended questions was used in order to determine the students' opinions on the process. The elements that seemed entertaining to students in the computer aided problem based learning environment was classified as, respectively, the increase in relations with friends, the positive effect of the opportunities of the method, the independency of location, focusing on a common objective and increase of research awareness; the elements that seemed entertaining to students in the face-to-face problem based learning environment was classified as, however, the increase in relations with friends, increase of research awareness, focusing on a common objective and other. Students in the computer aided problem based learning environment determined the problems that they experienced among themselves as, respectively, access, obstacles in the decision process, technological troubles, problems; the students in the face-to-face problem based learning environment indicated their problems to be, respectively, access, religious holidays, final exam week, degree of intra-group closeness, task sharing/responsibility.

Ultimately, researches examining the effects of problem based learning on students' critical thinking, problem-solving, decision making, attitude and success have been presented below.

The study conducted by Birgerard and Lindquist in 1998 involves medical school students' opinions regarding that if PBL had provided them with critical thinking, problem solving, decision-making and attitudes to study other books than those given for the lesson. According to the findings of the research, it was determined that PBL did

aid in providing students with critical thinking and problem solving skills, decision making and attitudes to study other books than those given for the lesson.

Ak's (2008) research examines PBL's effect on the pre-knowledge level of university students and learning approach on their problem-solving skills and motivation. 3 X 3 factorial design was used in the research. The initial factor of the research is the pre-knowledge level of students classified as low, medium and high. The second factor of the research, however, is the learning approaches of students classified as deep, superficial and achieving approach. The experimental procedures of the research, which lasted 5 weeks, were conducted on a total of 83 university students; 38 of them attending Ankara University, Faculty of Educational Sciences, "Design, Development and Evaluation of Educational Software" class during the spring term of the 2006/2007 educational year and 45 of them attending the 4th grade of Gazi University, Faculty of Education, Department of Computer and Teaching Technologies Teaching. The "Learning Approaches Scale" developed by the researcher, "Motivation Scale for Problem Based Learning", "Pre-knowledge Test" and the "Problem Solving Inventory" developed by Heppner and Peterson, was used as data collection tools. According to the results that were obtained, it has been determined that the PBL application had a significant affect in developing problem solving skills of students and increasing their motivation level. It was shown that there were no individual or common effects of pre knowledge levels and learning approaches on perception and motivation of problem solving skills. In light of this finding, it could be said that no matter what their main learning approach and pre-knowledge level is for this research group, PBL has positive effects perceptions regarding problem-solving skills and motivation.

Digss' (1999) study conducted on 127 students studying in the 9th grade of elementary school examines the attitude and approach of PBL students. While the experiment group students' success increased in the achievements tests conducted in a two year interval, it was determined that the success of students in the control group dropped with time. No significant difference was found between the experiment and control group prior to the application however, a significant difference was found afterwards between the experiment and control group, it being in favour of the experiment group. Although there was no difference between the groups regarding their scores of attitude toward

class, there was a significant difference after the application. In addition to this, it was determined that the students in the experiment group had developed their problem-solving, communication and self-willed learning skills more.

Günbatar (2009) has examined effects of Problem Based Learning conducted via the web on the creative thinking skills of students and has determined the attitudes of students after the study. The study was conducted with the experimental pattern model. The creative thinking scale and we based problem based learning attitude scale was used as data collection tools. The relevant scale tools were applied to 60 persons attending the Computer II class registered to Yüzüncü Yıl University, Faculty of Education, Elementary School. One class was entirely the control and the other class was entirely the experiment group. The experiment group conducted lessons with Web Based Problem Based Learning and the control group with Face-to-face Problem Based Learning. There was no significant difference in the total creativity scores of the pre-test and post-test carried out on the experiment and control group before and after the experiment. There is no significant difference in the pre-test-post-test average creativity scores with regards to the creativity of the students. It has been found that the creativity of the experiment and control group students, which were educated in different environments, did not display a significant difference, in other words, being in different process groups (experiment and control group) has showed that repetitive scale factors do not have significant common effects on levels of creativity.

After the experimental process, the students in the experiment group had a positively high general attitude towards Web Based Problem Based Learning. In addition to this, the attitude of students in the experiment group were positively high for the sub-dimensions of “Computer class”, “Cooperation Based Learning, “Web Based Learning”, “Self-willed Learning” and “Problem-solving”.

The general objective of the research conducted by Tekedere in 2009 was indicated as determining the effect of focus of control on the students success, problem-solving skill, web based learning and problem based learning for web based problem based learning. Single factored, pre-test, post-test three grouped mixed experimental pattern was used from among the real experiment models. According to the findings obtained from the

research; it was determined that the difference in the focus of control did not make a difference on the success in the test however, students whose focus of control could not be determined displayed a better performance compared to those controlled from the outside. When the friend evaluation scores are considered, it has been determined that students controlled from the inside gave lower points to their friends when compared to students without determined controls or those controlled from the outside. Moreover, it has been determined that students controlled from the outside work on the material that has been presented for shorter periods when compared to students that were controlled from the inside and those whose focus of control could not be determined. While it was observed that those controlled from the inside displayed a better attitude towards web based learning in contrast to those controlled from the outside and those whose focus of control could not be determined however; no significant difference has been determined between the students with different focuses of control when considering their problem solving skills. Furthermore, it has been determined that those controlled from the inside and those whose focus of control could not be determined display a more positive attitude towards problem based learning when compared to those who are controlled from the outside.

The dissertation conducted by Kuşdemir in 2010, aims to examine the effects of the Problem Based Learning model on the success, attitude and motivation of 10^{th} grade high school students in chemistry class. In accordance with this, this study was conducted with 52 10^{th} grade students during the spring term of the 2009-2010 educational year. The students were divided into 2 groups; the experiment and control group. In the experiment group, the “mixes” unit was developed as a problem scenario and used in class for the experiment group while the same unit was used in classed with the traditional method. These lessons were given 9 weeks for each group. The “Acheivement Test on Mixes”, “Attitude Scale towards Chemistry Class” and “Motivation Scale towards learning Chemistry” was used as a pre-test and post-test in both the control and experiment group in order to collect data. In addition to this, the “..” scales were used in order to collect the opinions regarding problem based learning model applied to the experiment group students. The analysis of the quantitative data obtained in the research was done with SPSS 13 packet programme. Independent groups t-test and frequency analysis was conducted for the analysis of the data. The qualitative

data, however, was evaluated by being analysed according to content. Prior to be research, no statistically significant difference was found in the experiment and control groups' success, attitude towards class and motivation for chemistry class however; a statistically significant difference was determined in favour of the experiment group with regard to the experiment and control groups' success, attitude towards class and motivation for chemistry class.

Studies combining problem based learning and computer aided learning are continuously increasing, especially during recent years. Considering the researches in which the computer aided problem based learning approach has been used, we could say that this approach is used within a very large range and that it gives positive results on the students' academic success and attitudes. Based on the researches that have been conducted, it can be deducted that although using the problem based learning approach may cause trouble in students at first, it later on ensures that the communication between students is positively affected by means of simultaneous and non-simultaneous tools such as e-mails and MSN and that students could use computer aided media better. As it can be understood from the above-summarized researches, it has been concluded that the success and attitude towards class is higher in students of problem based learning compared to traditional learning students and that computer based learning has higher scores than both face-to-face traditional learning and face-to-face problem based learning in terms of success and attitude.

3. METHODOLOGY

3.1 RESEARCH MODEL

Within this research a comparision of cognitive flexibility with regard to gender and self-regulation skills is discussed and it is analyzed whether there is a significiant difference in achievement of courses for C# (programming language) in computer assisted problem based learning approach. In this regard, cognitive flexibility is specified as dependent variable and achievement of courses is specified as independent variable. Self-regulation skills scale is attached in Appendix-1.

3.1.1 Creating The Computer Assisted Problem That Will Be Given To Students

In this research, which is carried out within the scope of C# courses, students are supposed to develop "one way messenger application". The design of the form should be like the one shown in the Figure 3.1 and program controls that students are asked to use while codding are shown in the Table 3.1.

Tablo 3.1 : Program controls

Control Number	Control Name
1	Contact Info TextBoxes
2	Add Contact Button
3	Message RichTextBox
4	Contacts Listbox
5	Chat RichTextBox
6	Send Message Button

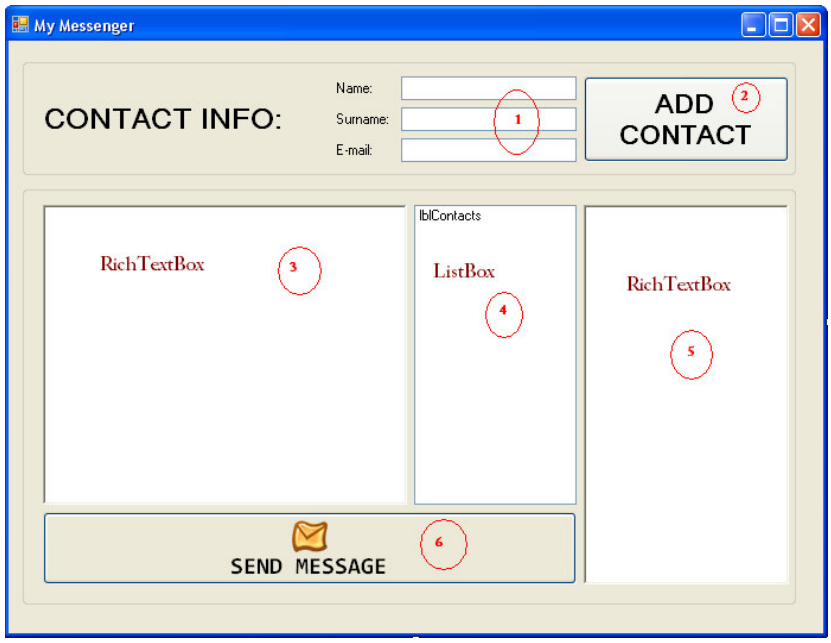

Figure 3.1 : One way messenger application design

Expected steps for this applications is given below:

i. When the form first loaded; if the user has some contacts, these contacts' Nick Name properties will be listed in users contacts listbox.

ii. The user can always add new contacts by using the Contact Info TextBoxes. When the user fills the textboxes and clicks the add contact button, the new contact's nickname will be named after the last item of contacts listbox. According to the Figure 3.2 below; Özge Yücel will be added as Contact 4.

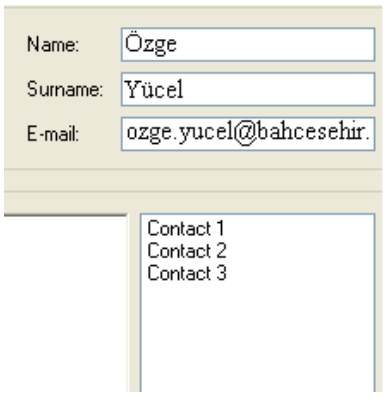

Figure 3.2 : Adding new contact

iii. The user will be able to send messages to any contact that he/she chooses from the contacts list by writing a message to the Message RichTextBox and click the send message button.

iv. When the user sends a message to the user that he/she choose, the message will be shown in the Chat RichTextBox as the following format.

When user enters 'Hello' to the Message RichTextBox and clicks send message button; system takes the system time and shows the message in the Chat RichTextBox as 'time-message' format and finally clears the Message RichTextBox. Then user can enters a new message and send unlimited messages to any contact (Figure 3.3).

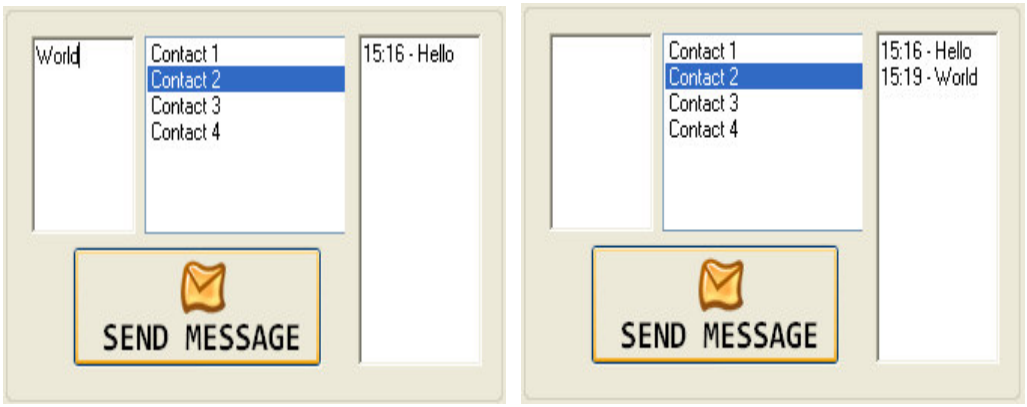

Figure 3.3. : Sending messages to other contacts

v. When user changes the selected contact from the contacts listbox, selected contact's sent messages will be shown in the chat richtextbox. So all contacts' messages should be stored in an ArrayList and the user should always see the old sent messages.

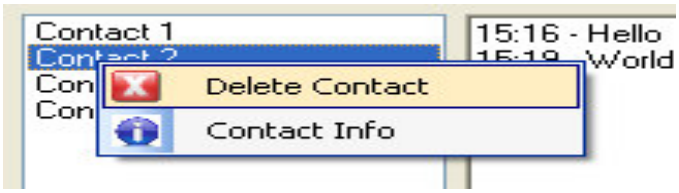

Figure 3.4 : Deleting selected contact from the list

Also, when the user chooses one contact and right-click on it, he/she should has 2 choices to select: Delete Contact and Contact Info (Figure 3.4). When the user clicks Delete Contact; this contact and all sent messages that are stored for that contact will be deleted. When the user clicks Contact Info; a messagebox like the one above will be shown (Figure 3.5).

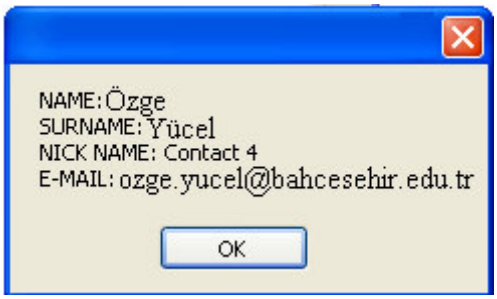

Figure 3.5 : Displaying contact info

vi. While writing the code, there must be 2 classes named Contacts and MessageList and these classes should at least include the followings.

In MessageList Class;

i. Properties (string Message, DateTime Time)

ii. 1 Constructor

iii. ToString override method

In Contacts Class you should have;

i. 5 Properties (string Name, string Surname, string NickName, string Email, ArrayList Messages)

ii. 1 Constructor

iii. 1 returnMessages function (returns all messages of the contact)

iv. 1 returnContactProperties function (returns contact's properties for ContactInfo button)

v. ToString override method.

3.2 EVALUATION

While evaluating individual work within the approach of problem based learning, it is required to to lead them and help students to improve themselves. In this research, each stage of problem steps are graded individually in order to lead them and to help them to improve themselves. Students' success is indicated by the total grade achieved in those steps. The stages are shown in the Table 3.2.

Table 3.2 : Problem Stages

Steps	Step Names
1	Giving Proper Control Names
2	Writing the Properties of MessageList Class
3	Writing the Constructors of MessageList Class
4	Writing the Functions of MessageList Class (ToString&MessageInfo)
5	Writing the Properties of Contact Class
6	Writing the Constructors of Contact Class
7	Writing ContactInfo function of Contact Class
8	Writing the ReturnMessages Function in Contact Class
9	Writing the Form Load Event
10	Writing Add Contact Button Click Event
11	Increase Contact Counter Automatically
12	Writing Send Message Button Click Event
13	Writing ContactListBox Selected Index Change Event
14	Writing Delete Button Click Event
15	Writing ContactInfo Button Click Event

3.3 STUDY GROUP

The research is carried out in Bahçeşehir University. The study is carried out with second-year and third-year undergraduate students who are taking course of C# which is lectured at department of Software and Computer Engineering in Engineering Faculty. The research is carried out on the whole students taking course of C# in spring term of 2010-2011 academic year. These participants, who composed the working group, are subjected to the scale of self-regulation skills towards web-based education and a brain

test is applied in order to measure cognitive flexibility. The participants composing the working group, are made up of 5 groups that are including 49 male and 26 female in total. Student distribution for the first group is 15 students, for the second group 14 students, for the third group 14 students, for the fourth gruop 14 students and for the fifth group 18 students.

3.4 DATA COLLECTION TOOLS

In this resarch "Cognitive Flexibility Test" is used in order to determine how the flexibility differs from one student to another and also "The Scale of Self-Regulation Skills Towards Web-Based Education" which is a five point likert scale and made up of 64 items that is advised by Petek Aşkar and is developed by Turgay Baş, who is a lecturer at Hacettepe University.

A working group is made up of undergraduates, who have experience of web based education, so as to analyze validity and reliability of the scale of self-regulation skills towards web-based education. The questions in the scale are made up 3 dimensions. These 3 dimentions are determined as 34 items on “Learning Strategies”, 24 items on “Learning Skills” and 6 items on “Self-Efficacy”.

Cognitive Flexilibity test, which is developed by Institue for Neuroscience and Human Behaviour at the University of California, is applied online to 75 people that are constituting working group. By means of the the test mentioned, students' attention and their level of flexible thinking are measured. The number of correct answers and total time that students spent to complete the test are taken into consideration.

The scale of self-regulation skills towards web-based education, that consists 64 items, is applied to 75 students who are taking the course of C#. The data collected is reviewed and the test is checked to find out whether it was performed properly. While analysing the data, 5 points for "strongly agree", 4 points for "agree", 3 points for " Neither Agree Nor Disagree ", 2 points for "disagree" and 1 point for "strongly disagree" are given.

The scale of self-regulation skills towards web-based education and cognitive flexibility

test are performed online by users. Besides, participants are given one piece of problem in web environment for codding. The time given to participants vary between 1-2 weeks with regard to difficulty of problems.

The data collected is analyzed via SPSS 17.0 packaged software. Factor analysis could not be done as the number of people constituting the working group is less than the number of items in the scale.

With the aim of measuring reliability of the scale of self-regulation skills towards web-based education, Cronbach Alfa coefficient of each dimension is checked. As a result of analyses performed, realibility coefficient for learning strategies is a =0.91 , for learning skills a=0.92 and for self-efficacy a=0.78 are obtained. (Table 3.3)

Tablo 3.3 : Reliability results for the three dimention of self-regulation skills scale towards web-based education

Dimention	Number of Item	Realibility Coefficient (α)
Learning Strategies	**34**	**0.91**
Learning Skills	**24**	**0.92**
Self-Efficacy	**6**	**0.78**

3.5 INTERNAL VALIDITY OF THE RESEARCH

Internal validity is a measure to define whether documents are understood correctly or not and whether findings are effected by experimental variable (Kaptan, 1995). Internal validity is a concept that rather emphasize the ways acquiring correct and consistent data (Marriam, 1988; Çepni, 2005).

The working group from, which the data is acquired in order to be used in this research, is composed of voluntary participants with the aim of minimize data loss.

3.6 EXTERNAL VALIDITY OF THE RESEARCH

External validity emphasize to what extend the conclusions drawn can be generalized to other circumstances. External validity is related to generalizability of research results. If results of a research can be generalized to similar circumstances and similar situation, it can be said that the research has external validity.

In the working group that is used in this research can be said to have a limited generalization. The study is merely applied to second-year and third-year students at department of Software and Computer Engineering at Bahçeşehir University and the research results obtained can merely be generalized for groups having similar feautures.

4. FINDINGS & RESULTS

This section includes the findings are collected which are reached through performing statistical analysis of the data concerning subproblems examined in the research SPSS 17.0 packaged software is used for statistical analyses. The average and total points that participants achieved in the scale of self-regulation skills towards web-based education are individually calculated and this calculation is individually repeated for each dimension. The points achieved in cognitive flexibility test are also turned into percentage of success. For the problem that participants were given in web-based environment, each step is individually graded and sum of these points is matched to the total points that student achieved in that problem.

Using the scores achieved, comparisions are made between class groups and gender. While making the comparision One-Way ANOVA, MANOVA and independent t-test statistics are used. Moreover, correlation coefficient was used in order to interpret the relationship between students' level of cognitive flexibility and self regulation skills towards project-based learning.

4.1 FINDINGS CONCERNING THE FIRST SUBPROBLEM

a. The First Subproblem: Is there any difference between groups in terms of self regulation skills towards web based education?

For this subproblem with which the question of whether there is a difference between groups in terms of self-regulation skills towards web-based education is researched, ANOVA analysis is done using the scores that participants achieved in all scales. However it is concluded that there is not a significant difference between groups (p=.52). The results concerning the analysis carried out are shown at Table 4.1.

Tablo 4.1 : The ANOVA results according to the comparison of the total points obtained from all the questions in the SRSS

Sections	n	Mean	Std. Deviation	F	p	Levene
1	15	157.93	38.302	2.48	.52	.54
2	14	169.07	20.136			
3	14	159.14	29.262			
4	14	165.07	24.474			
5	18	138.61	31.643			
Total	75	156.93	30.946			

4.2 FINDINGS CONCERNING THE SECOND SUBPROBLEM

The Second Subproblem: *Is there any difference between gender in terms of self regulation skills towards web based education?*

For this subproblem with which the question of whether there is a difference between gender in terms of self-regulation skills towards web-based education is researched, independent t-test analysis is done using average scores that participants achieved in all scales. However it is concluded that there is not a significant difference between gender ($p>.05$). Therefore we can deduce that the correlation between gender and self regulation skills towards web based education is at the level of $p>.05$ is statically insignificant. The results concerning the analysis carried out are shown at Table 4.2.

Table 4.2 : Independent samples t-test results of SRSS according to the genders

	gender	N	Mean	Std. Deviation	p
Average points	1	49	2.461	.4907	.970
	0	26	2.435	.4899	

4.3 FINDINGS CONCERNING THE THIRD SUBPROBLEM

The Third Subproblem: Is the success of students with high level of cognitive flexibility higher than the students with low level cognitive flexibility?

In this subproblem with which the question of whether the success of students with high level of cognitive flexibility is higher than the students with low level cognitive flexibility is researched, percentage of success (accuracy) that students achieved in cognitive flexibility test and the scores that students achieved in web-based problems are used. As a result of the analysis carried out, when the Table 4.3 is examined, at a significance level of 0.05 (620; $p < .05$), a significant correlation between students' cognitive flexibility and success could not be ascertained.

Table 4.3 : Correlation between students' achievements and cognitive flexibility

		FT_Accuracy	Score
FT_Accuracy	Pearson Correlation	1	.058
	p		.620
	N	75	75
Score	Pearson Correlation	.058	1
	p	.620	
	N	75	75

4.4 FINDINGS CONCERNING THE FOURTH SUBPROBLEM

The Fourth Subproblem: Is the self regulation skills of students with high level of cognitive flexibility higher than the students with low level cognitive flexibility?

In this subproblem with which the question of whether the self regulation skills of students with high level of cognitive flexibility higher than the students with low level cognitive flexibility is reseached, percentage of success that students achieved in cognitive flexibility test and the avegare scores that students achieved in scale of self regulation skills are used. As a result of the analysis carried out, when the table below is examined, at significance level of 0.05 (.557; $p < .05$), a significant correlation between students' cognitive flexibility and self regulation skills could not be ascertained (Table 4.4).

Table 4.4 : Correlation between students' level of cognitive flexibility and SRSS

		FT_Accuracy	SRSS_Average
FT_Accuracy	Pearson Correlation	1	-.069
	p		.557
	N	75	75
SRSS_Average	Pearson Correlation	-.069	1
	p	.557	
	N	75	75

4.5 FINDINGS CONCERNING THE FIFTH SUBPROBLEM

The Fifth Subproblem: Does the level of cognitive flexibility differ by gender?

In this subproblem with which the question of whether there is a different between gender in terms of level of cognitive flexibility is researched, independent t-test analysis is done using percentage of success that participants achieved in cognitive flexibility test however it is concluded that there is not a significant difference between gender ($p>.05$). As a result it can be deduced that the correlation between gender and cognitive flexibility at level of $p<0.05$ is statistically insignificant. The results concerning the analysis carried out is shown at Table 4.5.

Table 4.5 : Independent samples t-test results of cognitive flexibility according to the genders

	gender	N	Mean	Std. Deviation	p
PS	1	49	90.937	11.1400	.205
	0	26	94.369	5.8078	

4.6 FINDINGS CONCERNING THE SIXTH SUBPROBLEM

The Sixth Subproblem: Does the level of cognitive flexibility differ by class groups?

In this subproblem with which the question of whether there is a different between class groups in terms of level of cognitive flexibility is researched, independent t-test analysis is done using percentage of success that participants achieved in cognitive flexibility test. However it is concluded that there is not a significant difference between class groups ($p>.05$). As a result it can be deduced that the correlation between class groups and cognitive flexibility at level of $p<0.05$ is statistically insignificant.The results concerning the analysis carried out is shown at Table 4.6.

Table 4.6 : Independent samples t-test results of cognitive flexibility according to the class groups

Sections	N	Mean	Std. Deviation	F	p	Levene
1	15	88.933	15.0490	.557	.695	.299
2	14	92.807	5.1585			
3	14	91.950	7.1100			
4	14	93.800	11.1150			
5	18	93.094	7.6868			
Total	75	92.127	9.7261			

4.7 FINDINGS CONCERNING THE SEVENTH SUBPROBLEM

The Seventh Subproblem: Is there any difference between class groups in terms of subdimensions of self regulation skills towards web based education?

In order to find whether there is a significant difference between class groups in terms of subdimensions of self regulation skills towards web based education (Learning Strategies, Learning Skills, Self-efficacy), the total points that are achieved from each subdimension are used as dependent variable and class groups are used as factor. Average value and standard deviation value that are concerning students' opinion about subdimensions of different self regulation skills in one-way analysis of variance carried

out are shown at Table 4.7. It can be inferred from the table that self-efficacy approach has the highest average, learning strategies approach is following the self-efficacy approach that is having the highest average and learning skills approach has the lowest average.

Table 4.7 : One-way analysis of class

	Mean	Std. Deviation	N
Self-Efficacy	2,56	,683	75
Learning Strategies	2,51	,529	75
Learning Skills	2,43	,619	75

When we take a look at Table 4.8 to define whether the differences observed as a result of comparisons at Table 4.7 are significant, it can be deduced from the values at significancy column ($p=0.032$, $p<0.05$) that the difference between averages of aforementioned variables is statistically significant.

Tablo 4.8 : Tests of Within-Subjects Contrasts

Source	factor	Type III Sum of Squares	df	Mean Square	F	Sig.
factor	Linear	.667	1	.667	4.774	.032
	Quadratic	.009	1	.009	.094	.760
Error(factor)	Linear	10.333	74	.140		
	Quadratic	6.991	74	.094		

In order to find whether there is a significant difference between class groups in terms of subdimensions of self regulation skills towards web based education, a significant difference between the dimensions could not be ascertained as a result of MANOVA analysis carried out. (Table 4.9)

The fact that correlations ($p=0.00$, $p<0.01$) in the section of “factor” shown at Tablo 4.9

are significant, prove that the differences between the measurements performed at different periods are statistically significant. However when we analyze the correlation in “factor *section” which is indicating differentiation on sections of subdimensions of self regulation, it is understood that aforementioned correlation (p>0.05) is insignificant.

Tablo 4.9 : MANOVA analysis of class groups in terms of subdimensions of self regulation skills

Effect		Value	F	Hypothesis df	Error df	Sig.
factor	Pillai's Trace	..074	2.746[a]	2.000	69.000	.000
	Wilks' Lambda	.926	2.746[a]	2.000	69.000	.000
	Hotelling's Trace	.080	2.746[a]	2.000	69.000	.000
	Roy's Largest Root	.080	2.746[a]	2.000	69.000	.000
factor * SECTION	Pillai's Trace	.088	.802	8.000	140.000	.602
	Wilks' Lambda	.914	.797[a]	8.000	138.000	.606
	Hotelling's Trace	.093	.791	8.000	136.000	.612
	Roy's Largest Root	.073	1.279[b]	4.000	70.000	.287
a. Exact statistic						
b. The statistic is an upper bound on F that yields a lower bound on the significance level.						
c. Design: Intercept + SECTION Within Subjects Design: factor						

4.8 FINDINGS CONCERNING THE EIGHTH SUBPROBLEM

The Eighth Subproblem: Are the quality of the steps that needs to be taken and the algorithm logic that is followed for solving the problem during application of problem based learning that students with high cognitive flexility performed are more comprehensive than the students with low cognitive flexibility?

Table 4.10 : Correlation between students' level of cognitive flexility towards algorithm logic

			Flexibility
1	Giving Proper Control Names	Pearson Correlation	.387**
		P	.001
		N	75
2	Writing the properties of MessageList Class	Pearson Correlation	.396**
		P	.000
		N	75
3	Writing the Constructors of MessageList Class	Pearson Correlation	.507**
		P	.000
		N	75
4	Writing the ToString() and the MessageInfo() function in MessageList Class	Pearson Correlation	.507**
		P	.000
		N	75
5	Writing the properties of Contact Class	Pearson Correlation	.144
		P	.219
		N	75
6	Writing the Constructors of Contact Class	Pearson Correlation	.144
		P	.219
		N	75
7	Writing the ContactInfo() function in Contact Class	Pearson Correlation	.045
		P	.700
		N	75
8	Writing the ReturnMessages() function in Contact Class	Pearson Correlation	.620**
		P	.000
		N	75
9	Writing the Form_Load Event	Pearson Correlation	.[a]
		P	.
		N	75

Table 4.10 : Correlation between students' level of cognitive flexility towards algorithm logic (continued)

10	Fill Add Contact Button Click Event	Pearson Correlation	.041
		P	.727
		N	75
11	Increase Contact Counter Automatically	Pearson Correlation	-.026
		P	.827
		N	75
12	Fill Send Message Button Click Event	Pearson Correlation	.734**
		P	.000
		N	75
13	Fill Selected Index Change Event	Pearson Correlation	.746**
		P	.000
		N	75
14	Fill Delete Button Click Event	Pearson Correlation	.608**
		P	.000
		N	75
15	Fill ContactInfo Button Click Event	Pearson Correlation	.443**
		P	.000
		N	75
***. Correlation is significant at the 0.05 level (2-tailed).**			
****. Correlation is significant at the 0.01 level (2-tailed).**			
a. Cannot be computed because at least one of the variables is constant.			

In the web-based problem that is made up for students to solve, students are supposed to write a phonebook software. Students send the code that they have written regarding to the problem to their lecturer via web environment. The lecturer prepares a template so as to evaluate the problem and defines the total score summing up the points that each student achieved from each step. In terms of determining to what extend efficient is students' cognitive flexibility in solving problem, the results of cognitive flexibility test and the points that students achieved in each step of a sample problem which they solved are compared. When the Table 4.10 is examined, it is seen that there is a positive

linear relationship (.000; p<.01) at 0.01 level of significance in steps 2, 3, 4, 8, 12, 13, 14 and 15 (Writing the properties of MessageList Class, Writing the Constructors of MessageList Class, Writing the ToString() and the MessageInfo() function in MessageList Class, Writing the ReturnMessages() function in Contact Class, Fill Send Message Button Click Event, Fill Selected Index Change Event, Fill Delete Button Click Event, Fill ContactInfo Button Click Event) and also there are positive linear relationship (.001; p<.01) in order in both cases at 0.01 level of significance in 1. Step (Giving Proper Control Names).

According to Table 4.10, it can be said that there is a positive linear relationship between cognitive flexibility and writing properties and constructors dependent to classes.

When we look at the steps that have positive linear relationship, we can say that students who have higher cognitive flexibility level also have advanced problem solving skills. Students who are successfull through the necessary algorithm steps to solve the problem, are more successful than other students in the flexibility test and it is seen that they fulfill successfully the underlying programming steps.

5. CONCLUSION

5.1 RESULTS AND DISCUSSION

The aim of this study is the comparison of the self regulation skills towards web based learning and cognitive flexibility level of students which are taking course C# that is lectured as web assisted problem based education and also is the analyse of whether there is a significant difference by class groups and gender.

Through the analyses carried out, 6 subproblem sentences are tried to be answered. As a result there is no difference between class goups in terms of the self regulation skills towards web based learning and level of cognitive flexibility. Similarly there is also not significant difference between gender in terms of self regulation skills towards web based learning and level of cognitive flexibility.

When the literature is reviewed, it is seen that there are also other researches reaching to similar results. Successfull students have an active role in learning which means they process new information more actively, correlate given and new information, organize the material presented, define an aim for themselves, plan their strategies and ask for help when required. In other words succesfull students arrange their own learning activities themselves (Bland, 2005), regularly adapt their own efforts that are based on their learning outcomes (Zimmerman and others, 1996). It is also indicated that there is also difference between overachieveing and underachieving students in terms of degree of motivation (Ruban and Reis, 2006).

Studies towards analysing the affect of teaching self regulatory learning skills declare that students participating in such a training, exhibit more reflective behavior and their skill in attributing success and failure is developed (Masui and De Corte, 2005). Despite the fact that it is possible to develop self regulation skills by experience, it is time consuming and its efficiency is limited. Therefore it will be useful to support students' self regulatory learning skills and to provide students with learning guidance throughout the studies and practices on developing these skills at higher education(Turan and Demirel, 2010).

Alper and Deryakulu (2008) asserted in the research they did that as a result of analysis they carried out, there is a significant difference between students' scores achieved from pretest-posttest and pretest-retention test in web mediated problem based learning application. In other words they proved that experimental procedure significantly increases the student success and learning retention. On the other hand there could not be specified a significant difference in terms of students' success, students' attitute and learning retention of cognitive flexibility variable.

According to Jonassen and Grabowski (1993) there is an expectation towards cognitively flexible students that they gain the control and autonomy of their own learning and they also prefer deductive learning. Consequently, a requirement for determining impacts of cognitive flexibility on students' success, students' attitude and learning retention, which is individual difference in student directed problem based learning that will be realised in web environment, creates the basic problem of this research. As a result of analyses carried out, it is concluded that there is not a significant difference between cognitive flexibility and skill of problem solving in programming course.

There is no difference between groups and gender in terms of self regulation skills toward web based programming language education. It is concluded that there is difference between thinking of students which are studying in Bahçeşehir University about self efficacy, learning skills and learning strategies dimensions that are subdimensions of self regulation skills.

5.2 SUGGESTIONS

i. The impact of problem based education on student success can be analyzed grouping participants into two that are receiving web based education and that are not receiveing web based education.

ii. The correlation between cognitive flexibility and different approaches, educational environment in different schools can be analyzed.

iii. The correlation between self regulation skills and different approaches, educational environment in different schools can be analyzed.

iv. A web based environment can be developed to increase cognitive flexibility and also contribution of this web based environment into increasing cognitive flexibility can be analyzed.

v. Effects of cognitive flexibility levels on interface design with web based environment can be analyzed.

vi. In programming language teaching, analysis and design of software interfaces depending on the age ranges of the process of cognitive flexibility can be searched.

vii. Different scientific field studies which analysis the relationship between self regulation recovery and cognitive flexibility level can be planned.

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APPENDICES

APPENDIX 1 – Survey A.1 : Self Regulation Skills Scale

5 : Strongly Agree, 4 : Agree, 3 : Neither Agree Nor Disagree, 2 : Disagree, 1 : Strongly Disagree

	QUESTIONS	1	2	3	4	5
1	At web based education, I can easily overcome the problem I face.					
2	At web based education, if the subject does not attract my attention, I become occupied in different applications (web, game etc.).					
3	At web based education, I define important concepts about subject and focus on them.					
4	At web based education, before starting to a new subject/activity, I assess whether I achieved the aims of previos subject.					
5	At web based education, I revise what I have learned for consolidation.					
6	At web based education, I receive help from responsible instructor when I have difficulty.					
7	I use time that I spent on web efficiently in the scope of web based education.					
8	At web based education, I analyse the learning process I experienced.					
9	At web based education, I receive help from students when I have difficulty.					
10	At web based education, I stick to my working plan.					
11	At web based education, no matter how much I have difficulty I believe that I will achieve the aim.					
12	At web based education, I find a way of overcoming the obstacles that I face in order to achieve the aim/ complete the activity.					
13	At web based education, I inquire how much and what I learned after I have completed an activity/subject.					
14	At web based education, I make a summery of what I have studied.					
15	At web based education, I prefer playing computer game even if it does not attrack my attention to complete activity I have started.					
16	At web based education, I develop strategy so as to use time efficiently.					
17	At web based education, I do not have difficulty in being motivated in order to complete the study even if it does not attrack my attention.					

	QUESTIONS	1	2	3	4	5
18	At web based education, I think about topics argued and form my own claim in order support or refute the argument.					
19	At web based education, I do not have difficulty in receiving help.					
20	At web based education, I join online arguments about the subject I have learned and ask questions.					
21	At web based education, I can successfully complete the activities about subject.					
22	At web based education, I revise the subject that I did not understand.					
23	At web based education, I frequently turn back to subject I had difficulty.					
24	At web based education, I prefer surfing in the web even if does not attrack my attention rather that completing the activity I have started.					
25	At web based education, I examine the consistency of new information I obtained with given information.					
26	At web based education, I try to do my best even if I do not like the subject I study or read.					
27	During web based education, I get bored quickly and leave the study uncomplete.					
28	At web based education, I may limit the time for activities that I will make.					
29	At web based education, I try to remember what I know about the subject mentioned.					
30	At web based education, I try to correlate given and new information I obtained.					
31	I inquire realibity of the information I obtained from web.					
32	At web based education, I define the way that I will follow before starting to study a new subject.					
33	At web based education, I think over I have learned and I try to understand what I really learned.					
34	Project-based learning encourages students to do research and improves creativity.					
35	Self assessment of what I learned is important for me.					
36	At web based education , I review the subject/activity that I have completed and I check whether I have learned or not.					
37	At web based education , when I obtain a new information I revise previous subject and I relate the new information and previous subject.					
38	At web based education, when I complete a subject, I review what kind of a way did I followed from the beginning.					

	QUESTIONS	1	2	3	4	5
39	At web based education, I can easily reach the help I need.					
40	At web based education, I believe that I will be successfull.					
41	At web based education, I do my best to overcome the obstacle that I face about course.					
42	At web based education, when I obtain a new information, I review my knowledge about the subject. I try to combine them both.					
43	At web based education, I am insisted on understanding the subject that I had difficulty in understanding.					
44	At web based education, I make a working plan for me.					
45	At web based education, I can estimate how much time will I spare for an activity that I will make before I start the activity.					
46	Computer applications such as computer game and web are not factors that would cause me give up the activity about subject.					
47	At web based education, I consider the possibility that the information I obtained can be wrong or imperfect.					
48	At web based education, I try to specify outline of the text that I will read.					
49	At web based education, I insist on completing the activity.					
50	At web based education, I take notes of subject when I think that it is important.					
51	It is important for me to correlate given and new information.					
52	At web based education, I think I have opportunity for self-assessment to define how much I have learned.					
53	I can make use of web based education fit for my own learning style.					
54	At web based education, I know to whom/where I will ask for help.					
55	At web based education , I use different learning styles in order to be more successfull					
56	I can use web based education fitting well with my own learning style.					
57	At web based education, I can work in cooperation with other students thaing the course.					
58	At web based education, I read texts a couple of times in order to learn more efficiently I believe that any information is absolutely accurate.					
59	At web based education, I develep learning styles fitting well with my own learning style					
60	At web based education , I go over some activities about subject I learned for a more efficient learning.					

	QUESTIONS	1	2	3	4	5
61	At web based education, I review literature on web using key words about subject.					
62	At web based education, I search for methods on how to enhance my performance.					
63	At web based education, it is easy for me to make activities.					
64	At web based education, I receive help from sources on the web when I have difficulty.					

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