LEARNING STRATEGIES OF STUDENTS WITH DIFFERENT COGNITIVE STYLES IN A HYPERMEDIA ENVIRONMENT

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

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ABSTRACT

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The use of hypermedia for educational purposes gained a great deal of importance for educators. There are many opportunities provided to learners by these environments such as independence from time and place, availability and accessability of the course material, non-linear interaction that provides the learner to regulate his/ her own learning and so on.

Although many advantages of hypermedia environment are suggested in the literature, there are also many studies concerning with learning in hypermedia environment concluding that many learners face with problems on these settings.

This qualitative study aimed to investigate the affects of three important factors in terms of learning with hypermedia revealed by the literature; cognitive styles, computer competency levels, and domain knowledge levels of the students. To the purpose of the study, participants from a web-enhanced course were selected considering these factors, and interviews and observations were conducted to reveal their learning strategies. Results indicated some differences among the different cognitive style groups of students in terms of their preferred learning strategies.

Computer competency levels of the students were also found to be quite important in terms of their patterns to use the hypermedia program. Students' prior knowledge levels were also important in this study, since different needs and expectations were revealed related to the domain knowledge levels of the participants.

Furthermore, a deep understanding about the behaviors, experiences, feelings, and expectations of the students in an instructional hypermedia environment related to suggested different characteristics were gained at the end of the study.

Keywords: Hypermedia, learning with hypermedia, individual differences, individual differences in hypermedia environment, cognitive styles, learning strategies, domain knowledge, computer competency.

ÖZ

FARKLI BİLİŞSEL STİLE SAHİP ÖĞRENCİLERİN HİPERMEDYA ORTAMDAKİ ÖĞRENME STRATEJİLERİ

Yecan, Esra

Yüksek Lisans, Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü

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Hipermedyanın eğitim amaçlı kullanımı, eğitimciler arasında gün geçtikçe önem kazanmaktadır. Hipermedya ortamının öğrencilere sağladığı bir çok avantaj bulunmaktadır: Zamandan ve mekandan bağımsız olma, ders materyallerinin her an hazır ve ulaşılabilir olması, öğrenciye kendi öğrenmesini kontrol etme imkanı sağlayan doğrusal olmayan etkileşim imkanı sunması gibi.

Literatürde hipermedyanın öğrenciye sağladığı birçok avantajdan bahsedilmesine rağmen, bu konuda yürütülen birçok araştırma pek çok kullanıcının bu tip ortamlarda sorunlarla karşılaşabildiğini ortaya çıkarmıştır. Çalışmanın amacına yönelik olarak, web-destekli bir ders alan öğrenciler arasından bahsedilen üç faktör dikkate alınarak farklı özelliklere sahip öğrenciler seçilmiş ve bu öğrencilerle öğrenme stratejilerini ortaya çıkarmaya yönelik gözlem ve görüşmeler düzenlenmiştir. Bulgular, öğrenme stratejileri açısından bilişsel gruplarlar arasında farklılıklar ortaya çıkarmıştır. Bilgisayar yeterlilik düzeylerinin de, öğrencilerin hipermedya kullanım yöntemleri açısından oldukça önemli olduğu ortaya çıkmıştır. Diğer bir faktör olan alan bilgisi düzeyine bağlı olarak da öğrencilerin farklı ihtiyaç ve beklentilerinin olabileceği sonucuna varılmıştır.

Ayrıca araştırma sonucunda, öngörülen bireysel farklılıklara bağlı olarak hipermedya ortamda öğrencilerin davranışları, deneyimleri, duyguları ve beklentileri hakkında derinlemesine veriler elde edilmiştir.

Anahtar kelimeler: Hipermedya, hipermedya ile öğrenme, bireysel farklılıklar, hipermedya ortamlarda bireysel farklılıklar, bilişsel stil, öğrenme stratejileri, alan bilgisi, bilgisayar yeterliliği.

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CHAPTER 1

INTRODUCTION

With the emergence of the Information Age, the need for information and demand on education increased relatively in society. Technological developments in this age also were helpful to cope with the increased demand on education, and people's expectation on being independent from time and place limitations. Especially in the 1990s, after the Internet began to be used widely at homes, the use of WWW for educational purposes became inevitable. Since 1999 in Turkey, like many other countries all over the world, distance education based on communication and information technologies has been supported by the Higher Education Council as one of the valid ways of providing instruction; online courses are starting to be credited (The Higher Education Council , 2004). Many studies are being conducted to discover the effects of the web environment on learner's achievement and/or satisfaction, so to improve the fertility of this new medium. Although some factors were found to be important, a deeper understanding from the learners' perspective still needs to be explored.

1.1. Background of the Problem

The belief that individuals learn differently is one of the main considerations of the modern theories in education. John Dewey has identified the learner as an individual, many educators also considered that everybody learns in their own way. Especially during the years of 1940 to 1970, the cognition-centered approach focused on individual differences in cognition and perception, and as a result the researchers

identified several styles, abilities, and dimensions of cognitive processing (Cano-Garcia, Francisco, Hughes & Elaine, 2000).

Cognitivist and constructivist theorists have considered learning and instruction related to individual differences. Bruner (1969) defines the optimum learning as depending on a variety of factors, like past learning, stage of development, nature of the material, and individual differences. So, individualized learning is strongly associated with the characteristics of the learners, but it is difficult to provide an instructional environment in traditional settings with the ability of coping with all kinds of individuals.

The technological development in last few decades has made the use of computers available for educational purposes. Computers are found to be effective by educators since they combine all of the technologies like texts, graphics, audios, videos, and interactive applications. Especially with the help of instructional and pedagogical developments, the use of the WWW for educational purposes became more popular at the end of '90s. Khan (2001) states that corporations, government agencies, and universities worldwide are increasingly using the web to deliver instruction and training. The advantage of this medium as explained by Bates (2000) is that it provides the opportunity to access more people, increase the flexibility to cover all types of learners, and improve higher levels of learning.

The basic rationale of the hypermedia form of the educational material in a Web-based educational system is that learners have many opportunities to learn according to their individual needs (Laurillard, 1993). Chen and Paul (2003) explain its main advantage as reflected in its non-linear interaction. Gauss and Urbas (2003) also stated that the constructivist view sees the non-linearity and interactivity of hypermedia as its major advantages compared to other educational media. Hypermedia seems to be appropriate for active and self-regulated learning activities. However, empirical studies indicate some problems about the efficiency and effectiveness of learning with hypermedia (Triantafillou et al., 2003). Although the

freedom given to learner for navigation and construction of the learning path is considered an advantage, it is cleared by the empirical studies that some learners have problems dealing with this non-linear interaction of hypermedia systems (Chen, 2002).

Many studies were conducted to find out the effects of individual differences on learning and satisfaction in the web environment. The effects of gender differences, computer competency levels, prior knowledge, and cognitive styles were found to be significant for students' learning.

However, the structure of content and navigation in current hypermedia based programs are provided in the same way, without considering the background knowledge, age, experiences, cultural backgrounds, professions, motivations and goals of the learners (Papanikolau, Grigoriadou, Magoulas & Kornilakis, 2002). Among the all characteristics of the different users, cognitive styles are especially related to the way of organizing and processing information (Chen, 2002). Many studies were conducted by cognitive and educational psychologists in the area of learning styles, cognitive styles and multiple intelligences to provide educators with insights about how to work with diverse population of learners (Snyder, 2000).

There are many different cognitive style definitions and labels determined by many researchers. All of the studies have mainly dealt with two dimensions of cognitive processing including wholistic-analytic and verbal-imagery dimensions (Riding, 2001). The cognitive style of field dependence that is developed by Witkin (1971) is one of the most researched individual characteristics and found to affect the achievement and attitude while learning. Many studies indicate that the field-independent users perform better than field-dependents in unstructured learning situations which is the nature of hypermedia.

According to Ford (2000), the hypermedia programs can be designed to accommodate the field-dependent users as much as the field-independents. As considering the needs of all individuals, and the main idea of the cognitive-construct

theories that individuals learn on their own way, the learning environments are designed by focusing on the individual differences. One of the innovations is the Adaptive Educational Hypermedia Systems (AEHSs) which were defined as "an alternative to the traditional one-size-fits-all approach in the development of hypermedia systems" by Brusilovsky (2003, p.487).

The importance of individual differences and the truth that everybody can learn in specific instructional conditions force the researchers to find the most appropriate instructional conditions covering all kinds of learners. Many factors were investigated whether they are affecting the learning or not. The instructional variables, demographics, student related issues including personality, learning style, or cognitive style etc., environmental, social, and psychosocial factors were the main considerations of researches about the learning outcomes in specific instructional environments.

Karuppan (2001) emphasizes the truth that abstract learners have the ability or experience to discover the rules and structures intrinsic to new software programs. He claims that since the Web-based materials are abstract, the abstract learners are likely to have the cognitive traits to foster the use of the materials on web.

Recent studies into individual differences in web environment have shifted the focus on examining how web-based instruction is used by learners with different backgrounds and characteristics, rather than asking how web-based instruction affects student learning (Chen & Paul, 2003). The questions under investigation are about how different learners are using the hypermedia program, or which individual differences result in different patterns for interaction etc.

1.2. Purpose of the Study

This study deals with the process of learning in a hypermedia program rather than the outcomes of the learning process in this environment. The main purpose of this study is to investigate the learning strategies of the learners with different characteristics in

a hypermedia program. Cognitive style is the main consideration among the all characteristics of learners since it is especially related to the way of organizing and processing information (Chen, 2002). The way how the learners interact with the hypermedia program, and the methods they prefer while learning with hypermedia are aimed to be investigated. A deep understanding of the behaviors, experiences, feelings, and expectations of the students with different characteristics like the computer competency, prior knowledge about the subject, and cognitive styles in an online course were gained at the end of the study, besides the learning strategies of the students.

1.3. Significance of the Study

After having a brief look at the related literature, it becomes clear that the importance of individual differences and the truth that everybody learn or satisfy differently in different instructional conditions force the researchers to find the most appropriate instructional conditions to cover all kinds of learners. Students with diverse characteristics are acting, satisfying, and achieving differently in web environment. Some of them are benefiting more than the others within this medium. Chen et al.(2000) claim that the majority of the user interfaces in web environment are designed as considering only a generic, ideal user in mind is helpful to explain the reason for the situation.

Although hypermedia is considered as a suitable medium to support the new constructivist way of active and self-regulated learning, empirical studies indicate some opposite results about the efficiency and effectiveness of learning with hypermedia (Triantafillou, 2003). Researches indicated that students with certain characteristics are achieving better than some others, or being satisfied more than the students with different characteristics.

It is clear from the literature that there is a problem related to individual differences in web environments. The affects of these factors on learning and satisfaction are studied by many researchers, but the process of learning in these environments still needs to be discovered. As Gauss and Urbas (2003) claim that now it is too early to derive general guidelines from research on individual differences in hypermedia learning, so there is a need about deeper understanding about the learning processes of different learners in this environment.

The results of this study are expected to contribute to the individual differences perspective in hypermedia environments by providing a deep insight about the learning and studying processes of the students with different characteristics. Data gathered from the learners with different characteristics will also be helpful for the designers who aim to design hypermedia programs which accommodate individual differences.

Moreover, the results are expected to contribute to the literature in terms of providing a small section from Turkey. Since there are a few researches that studied the individual differences aspect in hypermedia environment, this study will be helpful in reflecting a case from Turkey even limited.

1.4. Research Questions

To achieve the purpose of the study, the following research question, and sub questions are posed. They are also helpful in guiding the study and setting the boundaries of the research.

Research Question

What are the preffered learning strategies of the students with different cognitive styles in a hypermedia program in considering their computer competency levels and prior domain knowledge levels?

Subquestions

- How do the cognitive style preferences affect the students' learning strategies in an instructional hypermedia environment?
- In what ways do the computer competency levels of the students affect their learning strategies in an instructional hypermedia environment?
- In what ways do the prior knowledge levels of the students affect their learning strategies in an instructional hypermedia environment?

1.5. Definition of Terms

Various resources are reviewed to find different definitions of the terms used in this study. The operational meanings of the terms that best fit in with the context of this study are defined by the researcher as following:

Web-based Instruction (WBI): WBI is the instruction that is presented to the learner primarily asynchronously by the use of computers.

Hypermedia: Hypermedia is an application which uses nonlinear representations and random access to information presented by graphics, sounds, animations, or any other forms. It is an interactive network requiring a high degree of learner control to navigate. In hypermedia there are many types of information structures, and associative relationships between elements of information.

Learning Strategy: Learning strategies are organized plans of action for learning; the steps an individual take to learn something. Learning strategies focus on efficient ways to use specific techniques for organizing, interacting with material, memorizing, and monitoring any content or subject.

Cognitive Style (CS): CS is an individual's consistent and characteristic approach to organising and processing information, and is one of the most stable user characteristics overtime. The term Cognitive style is defined with different labels by

many researchers. Witkin's definiton of the cognitive style which is field-dependence is used in this research.

Field-Dependent Cognitive Style: Field-dependent CS tends to retain a global or overall view of information. Field dependent people favor situations that bring them in contact with others, they seek physical closeness and have the ability to get along with others.

Field-Independent Cognitive Style: Field-independent CS tends to deconstruct information to its component parts. Field independent people tend to be more autonomous; and show initiative, responsibility-taking, self-reliance, and the ability to think for themselves

CHAPTER 2

LITERATURE REVIEW

Web-Based Instruction is a new and challenging medium for education. The main advantage of this medium is the non-linear interaction opportunity, which leaves the control and the sequence of the instruction to the learner. Although the freedom given to learner for navigation and construction of learning path is considered as an advantage, some learners may have difficulties in making their own way to learn, in practice. Research into individual differences suggests some variables that may affect the learning or the interaction patterns of the students within a web-based instruction program. As one of these variables, cognitive styles are studied by many researchers (Dufresne & Turcotte, 1997; Riding & Sadler-Smith, 1997; Ford & Chen, 2001; Chen, 2002; Triantafillou, Pomportsis & Demetriadis, 2003). In this chapter, a review of literature related to the individual differences perspective in hypermedia learning environments is given. Although the main consideration is the cognitive styles as mentioned above, some other factors which are important for this research are also presented in the chapter.

2.1. Individual Differences in WBI

Several studies were conducted to find out how the individuals cope with the non-linear interaction in web-based instruction programs. Individual differences like gender (Felix, 2001), computer competency (Hong, 2002; Gauss & Urbas, 2003), prior knowledge (Hörlscherl & Strubel, 2000), learning styles (Karuppan, 2001), and

cognitive styles (Kim, 2001) were found to be effective in terms of either students' learning or satisfaction in WBI.

Many researchers examined the use of hypermedia programs and the effects of students' characteristics on learning with these systems. Karuppan (2001) aimed to draw the profile of the heaviest users of a course Web site. Results indicated that males access to the site more often than females. Higher GPA was also found to be related to the heavier use. There was also a relationship between the learning style and frequency of use. Assimilator type of the students which indicate to abstract learners visited the site more frequently than the accommodators which indicate to concrete learners according to Kolb's (1985) learning style categorization.

Gülbahar (2002) conducted a study that focuses on individual differences in web environment. She concluded that the individual differences of the students seem to affect the usage of the media provided in an online course. She suggests that all possible formats of media and materials should be provided in online courses, so both the choices and the individual differences of the students can be addressed.

Felix (2001) indicated significant differences for age and gender related to clarity of objectives, number of hours worked, mode of delivery, perception of comfort and appreciation of graphics. Especially the younger students felt more comfortable than the older ones in the environment, and appreciated the use of graphics. The differences related to gender were about the number of hours worked, mode of delivery, and clarity of objectives. Males found to be spending more time than females on the web site, they preferred to have more face-to-face class hours, and found the objectives of the lessons to be clear more than the females found.

2.2. Computer Competency and Prior Knowledge Levels in Hypermedia Learning

In their experimental study, Hörlscherl and Strubel (2000) compared four groups of users which were classified according to their levels of web expertise in web-search tasks and that of domain knowledge in subject matter. Twenty four users were given five Web-based information-seeking tasks about a specific subject, and four types of data were analyzed, which one of them was about the rate of success. Although the rates of success were low for all of three groups, the fourth group including subjects who were experts both on the use of web and domain knowledge showed a better rate of success.

Chen and Paul (2003) suggest that many researches examined the effects of prior knowledge in instructional hypermedia environments. Disorientation problems and additional support were stated to be important in terms of prior knowledge levels of students in hypermedia.

Palmquist and Kim (2000) designed a research in which they sought for the effects of cognitive style on users' performance in web search. Results indicated that the cognitive style significantly affect the web search performance of novice internet users, while there was no difference related to cognitive styles among the expert internet users.

Gauss and Urbas (2003) also conducted an experimental study and dealt with the relations among individual differences in learner characteristics, navigation, and learning outcome. Navigations of the 18 subjects were tracked for 40 minutes while they were interacting with a learning module, and logs were recorded. Individual differences in learning outcome were affected by individual differences in intrinsic motivation, computer experience and navigation behavior. Interaction with the module was found to have a strong positive effect on learning outcome. Gauss and Urbas (2003) emphasized the importance of intrinsic motivation and interest in self-

directed hypermedia learning scenarios, and specifically the need for stronger motivational design to improve their learning module. Moreover, they explained the difficulty of interpreting navigation measures from the log files without the existence of any qualitative data, and suggested that the log file analysis should be combined with methods like think aloud protocols.

Hong (2002) studied the effects of students' and instructional variables on satisfaction and achievement in a Web-based course. The results indicated that gender, age, learning styles, time spent on the course, and perceptions of student-student interactions, course activities, and asynchronous Web-based conferences were not related to satisfaction and learning outcomes. Students with better CGPA scores achieved higher final grades in the course, but did not express more satisfaction with the learning environment. Computer experience did not influence achievement, but experienced computer users were more satisfied with the course.

Computer competencies of the students in instructional hypermedia environments, and prior domain knowledge levels were found to be important by researchers as explained above. Considering the literature, it would be suggested that these two factors could be important in terms of the hypermedia using patterns of the students and satisfaction in these environments, besides their cognitive style preferences.

2.3. Style Constructs of the Learning Process

The relevance of an individual's cognitive style and learning style to the performance in various learning situations has been explored by many authors over the years including Kolb (1985); Riding & Sadler-Smith (1997); Laurillard (1993); Ford (2000). Before talking about the effects of the styles on learning, constructs of these styles which were suggested by different researchers are explained at the following paragraphs.

In most situations, the terms cognitive style and learning style are used interchangeably. However, a distinction is made by some researchers. An individual's cognitive style is defined as the tendency to process the information holistically or analytically, while at the same time mentally presenting information using imagery or verbally (Rayner, 2001). On the other hand, learning style is defined as an individual's preferred method for assimilating information, in an active learning cycle (Kolb, 1984). Riding and Sadler-Smith (1997) made a distinction between the cognitive style and learning style. They defined the cognitive style as a core characteristic of the individual, while learning styles are seen as strategies and ways of adapting the material to use it as effectively as possible. *Cognitive style* is frequently included under the broader term of *learning style*.

There are many models defining cognitive styles and learning styles, and each researcher use one of these models in their studies. It would be better, if we present the current cognitive and learning style models, before selecting one of them for this study. For this purpose, Curry's (1983) categorization of the research about learning styles is useful. She divided the models into three levels like the layers of an "onion", but this onion was divided into four levels recently:

- *Instructional & Environmental Preferences* are describing the outermost layers of the onion, which are usually observable traits. Models of Dunn and Dunn, and Reichmann and Grasha are based on this preference.

- *Social Interaction Models* consider ways in which the interaction between the individual and social context will result in certain strategies. William Perry, Mary Belenky, and Marcia Baxter Magolda developed learning style models as based on this model.

- *Information Processing Models* describe the middle layer in the onion, and try to understand the processes by which information is obtained, sorted, stored,

and used. Kolb's, Howard Gardner's, and Gregoric's studies are based on this model.

- *Personality Models* describe the innermost layer of the onion, the level at which our personality traits shape the orientations. Myers-Briggs' and Witkin's studies are based on this model.

According to this categorization, cognitive style is the innermost layer of the onion, and considered as the most stable one for people. While passing outwards from the center, the constructs (cognitive style, learning style, and learning preferences) become open to introspection, more context-dependent and less-fixed (Sadler-Smith, 2001). Cunningham-Atkins et al. (2004) defines the cognitive style as the underlying aspect of an individual's style and as being most likely to influence their approach to learning. Cognitive style is considered as the most stable preference related to information processing and is regarded as a narrower concept than the concept of learning style.

Another categorization of the learning style was done by Riding and Rayner (1998, as cited by Grandfield Henry-Vega, 2002). Their description of the individual differences is based on two models. One of the models deals with four basic cognitive modes derived from the intersection of a wholist-analytic dimension and verbaliser-imager dimensions similar to the work of Riding and Cheema (1991). In their book, they also claim that this classification solves the problem researcher face with while labeling cognitive styles phenomena. Their second model proposes a four-level categorization of students' learning preferences including learning processes based on experiential learning, learning processes based on orientation to study, instructional preferences, and development of cognitive skills and learning strategies. This categorization is overlapping with Curry's (1983) in terms of suggesting two models which one of them is dealing with core characteristics like wholist-analytic dimension, and the other one is dealing with learning processes similar to the outer layers of Curry's model.

Riding and Sadler-Smith's (1997) differentiation between the learning style and cognitive style is overlapping with the categorization of Curry (1983). Both of them consider the learning style as an umbrella term associating with many factors like the personality, environment, the nature of the subject to be learned etc. On the other hand, cognitive style -as a component of the broader term learning style- is seen as a psychological process and usually defined as a part of personality, so is not affected easily by external factors. The distinction between these terms are meaningful to the aim of this study and cognitive style is taken into consideration because of it's stability in various conditions, besides being more specific than the learning style preference.

2.4. Cognitive Style

Cognitive style as one of the individual differences is studied by many researchers. Since it is related to a person's psychological and educational preferences and is a part of the individual's personality, it is considered as an important factor in education because of it's influence on the student performance (Saracho, 1997). Morgan (1997) describes the cognitive style as the psychological dimensions that indicate the individual differences in preferred ways of organizing and processing information. Cognitive styles include stable attitudes, preferences, or habitual strategies that distinguish the individual styles of perceiving, remembering, thinking, and solving problems (Saracho, 1997).

Cognitive style is seen to be defined in process terms by Saracho (1997) who sees it as a natural consequence of the origin of cognitive style dimensions that took place in laboratory studies where the process was the main concern. Morgan (1997) also emphasizes the emergence of several theories in education and psychology about various strategies in processing information during classroom experiences.

A cognitive style theory depending on a person's dependency on his/her organization of the surrounding perceptual field was developed by Herman Witkin (1981) whom Saracho (1997) considers as having a valuable effect on social science because of his existence among the most cited authors in Social Sciences Citation Index. However, another cognitive style model developed by Riding (1992) is a quite popular one among the European universities and organizations though it is not well known in North American Institutions (Rezaei & Katz, 2003).

Many different labels are used by many researchers to identify the cognitive styles. Riding and Cheema (1991) classified all of the labels into two categories after reviewing descriptions, correlations, assessment methods, and effects on behavior of more than 30 labels. The categories they identified are the wholistic-analytic dimension, and the verbal-imagery dimension.

Wholistic-analytic dimension is dealing with the structure and organization of the content (Riding & Sadler-Smith, 1992), while the verbal-imagery dimension was dealing with the mode of presentation (Riding & Douglas, 1993). Wholists see a situation as a whole and have the ability to see the overall picture, while the analytics are seeing a situation as a combination of small parts and focusing on one part of the whole picture at a time (See Figure 2.1). Studies about field dependency, leveling-sharpening, and impulsivity-reflectivity are reflecting the wholistic-analytic dimension of cognitive style (Riding, 2001). The verbalisers on the verbal-imagery dimension consider the information in words or verbal presentations, while the imagers are associating the information with mental pictures.

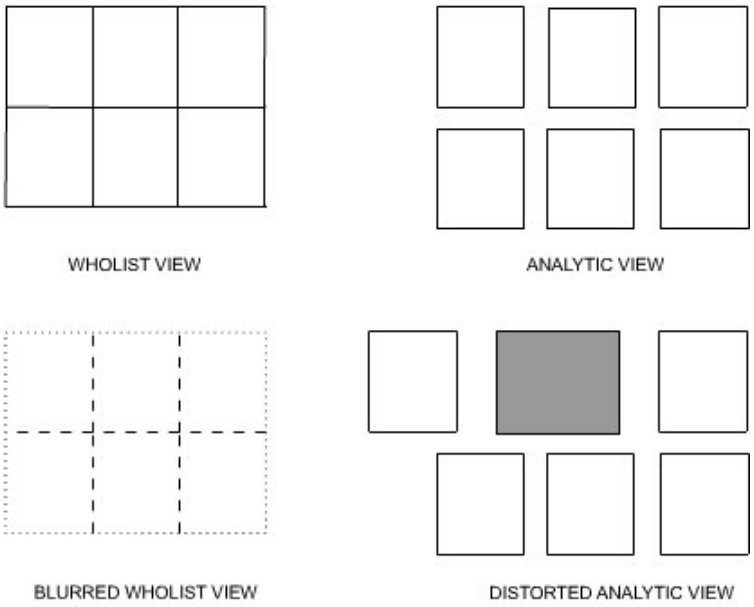


Figure 2.1 Wholist and Analytic Views (Riding, 2001)

2.5. Cognitive Style of Field Dependency

Over the past five decades researchers, educators, and psychologists have investigated various aspects of cognitive style. Field Dependency is one of the most researched cognitive styles and is used widely in educational problems (Tang, 2003). The cognitive style of field dependency which was introduced by Witkin is based on individual's tendency of perception the surroundings.

According to Witkin and Goodenough (1981), cognitive style is the mode of self consistency of cognitive restructuring competence, and is bipolar in nature and stable over time. The bipolar nature of field dependency is a continuum in which people are at different points of two extremes (Morgan, 1997).

The concept of Field dependency which is developed by Witkin and his colleagues in the 1940s is considered under the wholistic-analytic dimension of cognitive processing (Riding & Cheema, 1991). Witkin and Goodenough (1981, p.13) determined that the individual differences they observed during the laboratory studies were about "the tendency to use external visual field or the body itself as a primary

referent for perception of the upright". As a result of their laboratory works, they developed the Group Embedded Figures Test (GEFT) to determine the cognitive styles of people.

Witkin (1977) suggested that there are individual differences in perception and the extent of differentiation is related to the degree of field dependency. Besides the perceptual differences, their later studies about the Field Dependency were also covering the intellectual functioning which is related to analytical ability and modes of thinking.

From Witkin and his collegues' studies it is cleared that field dependent people use external referents to guide them in processing information, while the field-independent people use internal referents. Saracho (1997) summarizes the characteristics of the Field-dependent and independent people in Table-2.1:

Table-2.1 Characteristics of the field-dependent and field-independent people (Saracho,1997)

	Field Dependent People	**Field Independent People**
1	tend to be global;	tend to be more analytical;
2	take longer to solve the same kinds of problems;	can solve problems whose materials require structuring;
3	are guided by the organization of the field as a whole;	can abstract an item from the surrounding field;
4	use global defenses, such as repression and denial;	employ specialized defenses such as intellectualization and isolation;
5	are influenced by authority figures or by peers;	are independent of authority;
6	use external sources of information for self-definition;	are dependent on their on values and standards;
7	have a strong interest in people, respond to people's emotional expressions, and like to have people around them;	are impersonal and socially detached;
8	prefer occupations which require involvement with others, such as elementary school teaching, selling, or rehabilitation counseling;	favor occupation in which working with others is not essential, such as astronomy or physics;
9	are oriented to subject areas which relate most directly to people, such as social sciences.	favor impersonal abstract subjects, such as mathematics and the physical sciences.

As clear now, a field-dependent person is holistic, uncertain, and dependent upon others, while a field-independent person is analytic, confident, and self-reliant. The final work of Witkin suggests that Field Dependency covers three major constructs: (1) reliance on internal vs. external referents; (2) cognitive restructuring skills; and (3) interpersonal competencies (Witkin & Goodenough, 1981).

Many studies were conducted to find out the influences of certain factors on cognitive styles. Cross-cultural, socio-economical, gender-related differences were found to be affective in terms of field-dependency scores of people (Çakan, 2003). A study conducted by Çakan (2003) examined the cognitive styles of 534 undergraduate

students in Turkey through the GEFT. Results did not indicate any relationship of the field-dependency scores of the students with their genders and socio-economic statuses. However, the Turkish students were found to be more field-dependent than the students in western societies as supporting the results of previous research which examines the cross-cultural differences in cognitive styles of people.

The effect of cognitive style on student performance is also examined by many researchers, especially in the field of psychology. Dwyer and Moore (2002) conducted an experimental study in which they aimed to discover the relationship of field dependence and differentially color-coded learning materials with academic achievements of the students. The statistical analysis showed that the field independent people scored significantly better than the field dependent subjects. Moreover the field dependent people who viewed the black and white materials scored better than other field dependent subjects who viewed the color-coded materials.

Pi-Sui-Hsu and Dwyer (2004) mention research results into field dependency, which claim that the field dependent learners are less receptive to instructional materials that are structure-less like the hypermedia programs. Witkin et al. (1977) remark that it is difficult for field dependent learners to learn the materials that require higher order thinking when cues are not provided. On the other hand, field-independent learners perform better with non-structured aids.

These characteristics, shown by field dependent and independent people in different intellectual tasks, lead us to expect a greater disposition by the latter group to use learning strategies, an idea previously proposed by Witkin et al. (1977), and formulated as the greater use of ‘mediators in learning’ by field independent subjects. It may also be expected with regard to the characteristics that have been described, that subjects with different cognitive styles will show different preferences for specific strategies. These preferences could correspond to differences in the efficiency of their use (Tinajero & Paramo, 1998)

2.6. Criticisms toward Cognitive Style Constructs

There are also some debates about the cognitive style measurement of Witkin's model. Sternberg and Grigorenko (2001) claim that anybody can be suspicious when one of two complementary styles always seems to be better. They suggested that being field-independent almost always seems to be the preferable style, so it could be an ability rather than being a style. Actually, being field-independent would not be the preferable style for everybody, since the field-dependency also covers some personality characteristics. It is suggested that the field-dependent people have better communication skills, and have a strong interest in people, respond to people's emotional expressions etc, while the field-independent people tend to be impersonal and socially detached.

Riding (2001) criticizes Witkin's assessment model of cognitive style because of the absence of any subtests in which the field-dependent individuals were likely to perform better than the field-independent individuals. He also claims that it may be objected that the GEFT assesses intelligence rather than style since the overall performance is also affected by general ability or 'intelligence. Actually there is not any alternative cognitive style test except of the CSA (Riding, 1991) to determine the cognitive styles. However Razei (2003) found that the validity of the CSA was doubted and that the reports prepared by Riding about the CSA test fail to provide validity scores for CSA.

2.7. Cognitive Style and Hypermedia

Since the cognitive style of Field Dependency is one of the most studied individual characteristics and found to be effective in terms of achievement and attitudes of the students, it is also studied by many researchers who are interested in hypermedia learning.

Rouet (2000) says that the effectiveness of the hypermedia systems depends on their compatibility with students' perception, understanding, and learning from complex information resources. However, Chen (2002) emphasizes the existence of some problems unique to the organization of hypermedia. Some learners who are not sure about how to deal with non-linear learning programs may have disorientation problems. She found the cognitive styles of the users to be important in hypermedia environments because they are especially related to the manner how the information is acquired and processed.

In their study, Dufresne and Turcotte (1997) aimed to investigate the differences between the Field-dependent and Field-independent users in terms of using an educational hypermedia program. They designed a hypermedia program to teach Microsoft Excel to the students with two different versions of user interface. The statistical analyses showed that the Field-dependent users who have used the free (non-linear) format of the program spent more time to complete the test than the Field-dependent users who used the constrained (linear) format. This result supports the definition of the characteristics of Field-dependent and Field-independent people, in which Field-independents are defined as self-reliant, while Field-dependents are depending upon others.

Leader and Klein (1996) conducted an experimental study to investigate the effects of search tools and learners' cognitive styles on performance in searching information within a hypermedia database. They concluded that there is a significant interaction

between search tool and cognitive style. Field-independent learners in their study performed better than the field dependent learners on using *find* and *map* tools. Furthermore, the cognitive style found to be related to achievement, tool use, and attitude.

An experimental study was conducted by Graff (2003) to investigate whether segmentation of information and providing the overview of the web-based instructional system facilitated the students with different cognitive styles differentially. Fifty participants were assigned to one of two web-based instructional systems for a course. In one system, the information was segmented into smaller parts than the information in the other system. One of the systems was providing an overview of the system, while the other was not. Results showed that there was a significant difference in terms of segmentation of information, namely the analytics scored lower than the wholists in short-page presentation mode. It is explained by Graff that the provision of an overview doesn't indicate any difference between the wholists and analytics.

The effect of adjunct questions on achievement of field-dependent and field independent students in a hypermedia environment is studied by Pi-Sui-Hsu and Dwyer (2004). In their study, they provided different levels of adjunct questions to students within the hypermedia program and assessed their achievement on criterion tests measuring understanding. They concluded that the achievement of field-independent learners improves when they are given higher order questions and the achievement of field-dependent learners improves as related to the depth of processing caused by the adjunct question.

Ghinea and Chen (2003) conducted a study to examine the effects of cognitive styles on users' subjective perceptions of multimedia quality. The relationships among the users' cognitive styles, the multimedia quality of service, and quality of perception were investigated. 132 users participated in an experiment in which they watched multimedia video clips with different frame rates and color depths (quality of

service). Results indicated that the frame rates and color depths do not have any effect on quality of perception, but the content and dynamism levels of the multimedia influenced the user understanding and enjoyment components of the quality of perception.

The role of cognitive style in educational computer conferencing is examined by Cunningham-Atkins et al. (2004). The results of this empirical study do not suggest that cognitive style has a strong influence on student participation in the conference. However they suggest that there is a possible link between the cognitive style and course completion. According to the results of the study, the verbalisers and the younger students were less likely to complete the course.

Triantafillou et al. (2003) conducted a study in which a hypermedia system is developed as considering the student characteristics. The system was adapting itself according to the knowledge levels and cognitive styles of the students. After the system was evaluated summatively (2004), they concluded that students studying through the adaptable hypermedia system performed significantly better than the students studying through the traditional hypermedia system. Indeed, the students whose individual characteristics were accommodated by the hypermedia program have performed better than other students.

2.8. Summary of Related Literature

Since the importance of individual differences is revealed by previous studies, many researchers are now emphasizing the necessity of designing hypermedia systems as considering student characteristics. Chen (2002) suggests that learners need to find their paths for navigation in these information-rich and interconnected programs. However, each student is different in terms of his/her knowledge, experiences, cultural backgrounds, personalities, motivations and goals etc.

Learners' patterns to use the instructional hypermedia program, their achievement and satisfaction were tried to be explained in the light of individual differences. Cognitive styles- as one of these differences had usually got great deal of importance by the researchers who study on individual differences in hypermedia. Many studies found an interaction between the cognitive style preferences of the students and their use of hypermedia for educational purposes, while some others found them to be irrelevant. As conclusion, it could be suggested that the effect of individual differences on learning with hypermedia is a recent trend which needs a substantial amount of further research.

CHAPTER 3

METHODOLOGY

In this chapter, the research methodology of the study is discussed. The rationale for selecting the qualitative case study and the methods of collection, analysis, and management of the data are reviewed.

In the literature, it was found that there exist many factors including cognitive styles, computer competency levels, and domain knowledge levels of the students to influence learning with hypermedia. Therefore, the purpose of this study is to examine the processes of learning from hypermedia environment while considering these factors aforementioned. Most of the researches exploring individual differences in hypermedia environment dealt with cognitive style preference because of its relation to the manner in which the information is acquired and processed. In this study, cognitive style is the main consideration because of the importance given to this issue; however the domain knowledge levels and computer competency levels of the students are also examined to provide a wider perspective.

Since the study focuses on the process rather than the product, "how" questions are tried to be answered, so case study becomes the main strategy for the research (Merriam, 1998). Yin (1994, p.13) considers the case studies as the "preferred strategies when 'how' or 'why' questions are being posed, when the investigator has little control on events, and when the focus is on a contemporary phenomenon within some real-life context."

To explore the ways how the students with diverse characteristics use an educational hypermedia program, a qualitative research study is designed. As mentioned by Bogdan and Biklen (1998), the aim of the qualitative study is to better understand human behavior and experience. The goal of the qualitative researcher as overlapped with the aim of this study is to grasp the processes by which people construct meaning and define these meanings. (Bogdan & Biklen, 1998).

Merriam (1998) emphasizes the suitability of the case study design, if the interest of the study is the process rather than the outcome. She classifies the case studies into three categories according to the intent of the study. The interpretive case studies are used to develop conceptual categories through the data collected, or to illustrate, support, or challenge the theory that is considered before the data is collected. On the other hand, the descriptive case studies aim to present a detailed account of the phenomena like a historical case study that chronicles the events, while evaluative case studies involve judgments in addition to description, and explanation of the phenomenon. Since the current study is based on the evidence provided by the literature and aims to expose the process by categorizing and interpreting the data collected, the interpretive case study design is fitting well the aim of the research.

3.1. Context and Participants

3.1.1. First Aid Course

Participants of the study were selected from a group of 124 students of a semi-online course (PES339) given at Middle East Technical University (METU) during the 2004-Spring semester. The First Aid (PES339) course is given as an elective course that is available for all of the senior students at METU.

The aim of the First Aid course is to improve the students' as first aid providing skills. Face to face classes are conducted during the first six weeks, and the rest of the course is conducted as web-based through the use of a Learning Management System

(LMS) provided by METU. Asynchronous delivery methods are used in the system. Facilities provided by the LMS are the syllabus, electronic forum, course announcements part, lecture notes, and a gradebook (see Appendix F). Lecture notes of the course are designed by a team consisting of the course instructors and graduate students from the Computer Education and Instructional Technology department. Content of the course is divided into four parts including four or five chapters in each part, and subheadings in each chapter. This structure is provided by a tree type menu on the left side of the interface. Three type menu items representing content structure are placed left side of the web page.. The right side of the page is reserved for explanation of each subheading with text, images and videos. At the beginning of each chapter, students are provided with objectives and thinking questions, and the major points and a self evaluation test are given at the end of the chapter (see Appendix F).

The PES339 course was the case of the current research under investigation. In case studies, as mentioned by Merriam (1998), the case to be studied should be determined at first, and then the sample within the case should be selected. The convenience sampling strategy was used while selecting the educational hypermedia program to be studied. Sample selection within the case is explained at the *Subject Selection* section.

One of the reasons for selecting this course for the study is that the website was prepared as a standard medium with a menu on the left and content presentation on the right. It could be an instance of the "traditional one size fits all approach in the development of hypermedia systems" as explained by Brusilovsky (2003). Another reason which is important to the aim of the study is that there is a great variety of students in terms of their backgrounds and personality characteristics.

3.1.2. Subject Selection

At the beginning of the study, the related literature indicated that the differentiation of the students in terms of their cognitive styles, level of computer competency, and domain knowledge was important in hypermedia learning. Therefore, it was important to have a representative group of subjects in order to see in comparison how these characteristics are affecting the students while learning with hypermedia. Subject selection of the study has a great deal of importance, so a detailed sampling strategy is used to the aim of the research problem.

This study is conducted in two phases. At the first phase, three tests were administered at the beginning of the semester to realize the sampling criteria. For the second phase, data were collected from selected subjects by interviews, observations, and review of student logs, which are explained under the Data Collection heading of this chapter.

Since the qualitative inquiry focuses on small samples in depth, it is important to select information-rich cases from which one can get a great deal of information for the purpose of the research. (Patton,1990). In considering this issue, the purposeful sampling strategies were used in the study. The sample within the case was selected by considering some criteria that were important to the study. Purpose of the sampling was to have a representative group with diverse characteristics which is named as *maximum variation* strategy by Patton (1990). Being based on the related literature, the criteria for the maximum variation sampling are the following:

- *domain knowledge levels* of the students about the subject matter (First Aid),
- *computer competency levels of the students*, and
- *cognitive styles* of the students.

111 students from 124 in total have been administered three tests (cognitive style, computer competency, and domain knowledge) which are explained below in detail.

16 students are selected after conducting some basic statistical analyses on test results. This procedure is explained in detail in following paragraphs.

3.1.3. Instruments

Measure of Prior Knowledge. A test developed by the Education Department of the Turkish Red Crescent in 2000 was used to measure the domain knowledge of the students at the beginning of the semester. In regular First Aid courses, which are provided by Turkish Red Crescent, the current test is being applied at the beginning and at the end of the course, and the trainer who takes at least 85 points over 100 gains the right to have the First Aid provider certificate. Although there is not any published validity or reliability studies about the instrument, it is documented by Turkish Red Crescent that in Turkey nearly 10000 people have earned the First Aid Provider certificate by being evaluated through this test.

In this test, there are 35 questions to measure students' first aid domain knowledge. Students' scores are determined by assigning one point for each correct answer. The classification of the students into three groups namely subjects with domain knowledge at low-level, middle-level, and high-levels is conducted as based on the mean and standard deviation of the group scores. After the basic statistical analysis, the mean of the group was found to be 15.13 with a standard deviation of 3.90. Students who scored one-half standard deviation below the mean were considered as having low-level domain knowledge and students who scored one-half standard deviation above the mean were considered as having high-level domain knowledge. Students with one standard deviation around the mean were considered as having middle-level domain knowledge.

Measure of Computer Competency Level. A test developed by Yildirim and Dusick (1997) was used to measure the students' perceived computer competency levels on the use of word processor, databases, spreadsheets, Internet applications, presentation software, operating systems and on the maintenance of computers. The internal

consistency reliability of the Turkish version of the questionnaire were found to be 0,98 by Çınar (2002) which is acceptable in social science.

The original version of the test was including eight headings, namely word processor, database management, spreadsheet, Internet applications, use of presentation software and educational software, operating systems and maintenance of computers with 4 to 11 items under each heading. Since the original test was prepared to measure the computer competency levels of teachers, the heading about the educational software was removed from the test for the aim of this study. Considering the possible high computer competencies of the students studying at a technical university, 3 items which indicate to more complex competencies as compared to the current items were added to ensure a wide variety. Moreover, the labels of the scale were replaced with numbers ranging from 1 to 4 instead of phrases ranging from *not familiar* to *very familiar*. (See Appendix B)

After conducting the reliability analysis on SPSS, the coefficient alpha was found to be .97 which indicates to a high reliability in social sciences. The results of item analysis showed a range of correlation values between .28 and .82 which are acceptable in social sciences.

The classification of the students into three groups namely students with computer competency at low-level, middle-level, and high-level is conducted as based on the mean and standard deviation of the group scores. The mean of the group was 2.78 with a standard deviation of .76. Students who scored one-half standard deviation below the mean considered as having low-level computer competency, and students who scored one-half standard deviation above the mean considered as having high-level computer competency. Students with one standard deviation around the mean were considered as having middle-level computer competency.

Measure of Cognitive Style. The cognitive styles of the students are measured through the Groups Embedded Figures Test (GEFT) which was developed by Witkin,

Oltman, Raskin and Karp (1971) and translated and adapted into Turkish by Çakan (2003). The reliability analysis of the Turkish version of GEFT was conducted by Çakan (2003) and the coefficient alpha was found to be .82, so an acceptable reliability for the Turkish version of the GEFT is assured. (See Appendix A)

GEFT is one of the most popular tests used to determine the cognitive styles of people. The test consists of 18 questions in which individuals are asked to find a simple line figure imposed within a complex one. People who tend to be field-independent find the hidden figure more easily than the people who tend to be field-dependent.

For this study, classification of the students according to their cognitive styles namely field-dependents and field-independents is based on the mean and standard deviation of the group scores. The mean of the group was 14.91 with a standard deviation of 3.70. Students who scored one-half standard deviation below the mean grouped as field dependents, and students who scored one-half standard deviation above the mean grouped as field-independents. Students with one standard deviation around the mean were considered as field neutral.

After conducting basic statistical analyses on the group scores on three tests, students were divided into three classes. Since the information-rich cases are important while selecting subjects in qualitative research, the first and the third groups were included, and represented equally in sampling. The middle groups were excluded, so the participants representing specific characteristics were selected because of the high probability about providing broader information for the research.

At the beginning of the study, sampling was proposed by the researcher as shown in Table 3.1. There were eight groups of subjects with two participants in each. Representation of all characteristics was important and groups were determined by considering this issue.

Table 3.1 – Intended sampling at the beginning of the study

CS& Pri.know. / C.competency	Field Dependents		Field Independents		Total
	Domain knowledge		Domain knowledge		
	Low	*High*	*Low*	*High*	
Low	2 (Group8)	2 (Group6)	2 (Group7)	2 (Group5)	8
High	2 (Group4)	2 (Group2)	2 (Group3)	2 (Group1)	8
Total	4	4	4	4	16

However the initial design of the sampling as shown in Table 3.1 could not be realized because the subjects for each group were not available according to the test results. For instance, in Group6 there was no subject who is field dependent, and has a high level of domain knowledge and low level of computer competency. In Group2 and Group4, there was only one subject available. Subjects who were available for each group and the total numbers of the subjects are shown in Table 3.2.

Table 3.2 – Subjects who were available for selection according to the test results.

CS& Pri.know. / C.competency	Field Dependents		Field Independents		Total
	Domain knowledge		Domain knowledge		
	Low	*High*	*Low*	*High*	
Low	3 (Group8)	0 (Group6)	8 (Group7)	2 (Group5)	13
High	1 (Group4)	1 (Group2)	6 (Group3)	8 (Group1)	16
Total	4	1	14	10	29

- In group1, there were 8 subjects who are field independent, and have high level of domain knowledge and high level of computer competency.
- In group2, there was 1 subject who is field dependent, and has high level of domain knowledge and high level of computer competency.
- In group3, there were 6 subjects who are field independent, and have low level of domain knowledge and high level of computer competency.
- In group4, there was 1 subject who is field dependent, and has low level of domain knowledge and high level of computer competency.
- In group5, there were 2 subjects who are field independent, and have high level of domain knowledge and low level of computer competency.
- In group6, there was not any subject who is field dependent, and has a high level of domain knowledge and low level of computer competency.

- In group7, there were 8 subjects who are field independent, and have low level of domain knowledge and low level of computer competency.
- In group8, there were 3 subjects who are field dependent, and have low level of domain knowledge and low level of computer competency.

For each group, two subjects were selected if possible. Since the study deals with the individual differences, the gender and major differences were also considered while selecting the subjects. Sample was as much as representative in terms of cognitive styles, levels of domain knowledge, and levels of computer competency, gender, and major of the students.

Since the main consideration of the study was the cognitive styles, the exception of four subjects at the field dependents column was completed by selecting subjects without taking the domain knowledge or the computer competency levels into consideration. Therefore, four more subjects were selected among the field-dependents considering their gender and majors. As a final point, the sampling was including 16 subjects; 12 of them were selected according to the table given above, and 4 were selected among the field-dependents as ignoring their levels on domain knowledge and computer competency. Subjects who were selected for each group and the total numbers of the subjects are shown in Table3.3 which indicates the last version of the sampling.

Table 3.3 – Subjects who were selected among the available students according to the test results

CS& Pri.know. / **C.competency**	**Field Dependents**		**Field Independents**		**Total**
	Domain knowledge		Domain knowledge		
	Low	*High*	*Low*	*High*	
Low	2 (Group8)	0 (Group6)	2 (Group7)	2 (Group5)	6
High	1 (Group4)	1 (Group2)	2 (Group3)	2 (Group1)	6
Total	3	1	4	4	12+4*

* 4 Field dependent subjects were added as considering their gender and majors:

- 1 male: Field dependent, high level of computer competency,and middle level of prior knowledge
- 1 female: Field dependent, low level of computer competency, and middle level of prior knowledge
- 1 female: Field dependent, middle level of computer competency, and high level of prior knowledge
- 1 male: Field dependent, middle level of computer competency, and high level of prior knowledge

3.2. Qualitative Data Collection

According to Marshall and Rossman (1999), there are four primary methods for gathering data in qualitative research. They consider the participation, observation, in-depth interviewing, and review of documents as the commonly used strategies for qualitative researchers. For the current study, participant observations, in-depth interviewing, and students' logs gathered by the LMS were the sources of data collected during the study. Instrumentation and the procedures for the data collection of the study are presented at the following paragraphs in detail.

3.2.1. Observations

Marshall and Rossman (1999) emphasize the importance given to observation in qualitative inquiry. Participant observation in which the researcher participate in the situation or setting "allows the researcher to hear, see, and begin to experience the reality as the participants do" (Marshall & Rossman, 1999, p.106). Moreover, observations can help in triangulating the emergent findings (Merriam ,1998). In this study the participant observation method is used to monitor the way how the individuals are interacting with and navigating within an educational hypermedia program, in addition to be used in conjunction with interview data. To this aim, an observation schedule was prepared to more focus on navigational patterns, interaction patterns, and favored and not favored components of the site (see Appendix D).

Observations were conducted only once for each student and provided information for a limited time. As Patton (1990, p. 278) says,

> "We cannot observe feelings, thoughts, and intentions. We cannot observe behaviors that took place at some previous point in time. We cannot observe situations that preclude the presence of an

> observer. We cannot observe how people have organized the world and the meanings they attach to what goes on in the world. We have to ask people questions about those things."

Observations allowed the researcher to hear, see, and begin to experience the participants' point of view as stated by Marshall and Rossman (1999), however they were not enough to elicit their feelings, thoughts, interpretations, reactions and intentions which are difficult to observe as stated by Yildirim and Simsek (2000). As stated by Merriam (1998), interviews are necessary for obtaining unobservable parts of people's behaviors, feelings, and interpretations of the phenomenon.

3.2.1. Interviews

Interviews provide data in the subjects' own words, and allow the researcher to see how they interpret the things (Bogdan & Biklen, 1998). In this study, students' interpretations, thoughts, and feelings about the hypermedia program were important, and they cannot be grasped by observations, so in-depth interviews were conducted as proposed by Patton (1990).

A semi-structured interview schedule was prepared and a pilot study was conducted with 10 subjects in previous semester. The pilot study was helpful in terms of providing experience for the researcher and improvements on the interview schedule.

Semi-structured interviews were conducted to this aim and explored what the learners experience while using the site, how they study from the site, what their preferred ways to study are, the problems they face with and their suggestions about the web site of a course. Semi-structured interview allowed the researcher to respond to the emerging point of view, and new ideas of the respondents as stated by Merriam (1999). Interviews with the students provided data about the invisible dimensions of the learning process, like the feelings, and/or complaints and suggestions about the

learning environment, and they were helpful in terms of getting information about their learning strategies.

Questions of the interviews were as much as challenging to make the subjects think critically about their problems, needs, and expectations considering the underlying reasons. Interview questions are process-based, and opinion-based. The reasons for their responses are quite important for the study, so *why* questions were an inevitable part of the interview schedule (see Appendix C).

3.2.1. Student Logs

At the end of the semester, students' frequencies of use of the web site were also taken from the Learning Management System through which the course is being delivered. This data was used as supplement to the data gathered by observations and interviews. The relationship between the frequency of use and some characteristics of the students if any could be grasped by this way.

Students' visits of the web site were kept by the LMS by counting the visited pages. For instance, if a student logs in and visits five pages of a chapter, five points are added by the program to the numbers of visit for this student. Frequencies for visiting the web site were gathered for 111 students. The mean was 423.85 with a standard deviation of 319.98. According to these values, students were divided into three categories in terms of the frequency in using the web site: most frequent users, least frequent users, and the middle group.

3.2.2. Procedure

After the subjects were selected, the second step was qualitative data collection. Since the researcher has been known by the students at the beginning of the semester, while

the tests were being applied, it was not difficult to get response from the students for the later phases of the study. By emails, the selected students were notified about the aim and the remaining phases of the study in detail, and asked to participate in. A schedule was prepared for observations and interviews as considering the schedules of the students. Since the observation and interview were planned to be done at the same day for each student, one and an half hour was reserved for each subject. Since the participants would be influenced by the category they were settled, and may tend to give their responses as considering these categories, the results of the tests were not announced until the data collection procedure is finished. The categories to which the subjects belong to were not known even by the researcher during the qualitative data collection process. Since the researcher had conducted a literature review before the study begins, and had read a lot especially about the affects of cognitive styles on hypermedia learning, she was not aware about the groups of the subjects to avoid guiding the students even unconsciously.

Participants were invited to a faculty building to participate in observations and interviews as scheduled in advance by emails. Observations were planned to be done like demonstrations of the students regular studies. In terms of duration, the observations took 7 to 35 minutes.

Each student was observed individually while they were studying a certain chapter from the course's web site, so was an overt participant observation in nature, in which subjects knew that they were being observed. There was not any time restriction for studying the chapter. The same chapter that is the *Soft Tissue Injuries* was used for each student, and explained them that they would study in a similar way as their usual studies. Observation of the students during their study of a chapter provided evidence about their behaviors and strategies during a usual study.

Both the observations and interviews were conducted at a meeting room that is known by the researcher, but it was a new place for the participants. Since students

were not familiar with this environment and were expected to think loudly which is not easy to do, it was important to make them feel comfortable in the setting. Therefore, short conversations about their daily life were made with the participants before the observation process begins. It was helpful for establishing rapport with the participants and forming a friendly climate. Moreover, the effects of observer's presence, and possible other-than-normal behaviors of the participants could be reduced by the help of this warm climate.

Think aloud method was a part of the observations to have a deeper understanding about the experiences of the students. They were encouraged to tell what they think while studying without worrying about whether it's related or not. Students' navigation behaviors, justifications for the behaviors, the difficulties they face with, and commonly used parts of the site are observed and noted by the researcher. Think aloud method provided a deeper understanding about the behaviors of the students.

After the observations were finished, students were notified about the interview that is prepared to get information about their general thoughts, problems, appreciations, expectations, and suggestions of this hypermedia program specifically and online courses in broad terms.

The interviews that are conducted after participant observations are often like a conversation in a friendly climate (Bogdan & Biklen, 1998). It was clear that the subjects were more relaxed and more open to express their thoughts during interviews because of the interaction between the researcher and the subjects after the observation process.

3.3. Analysis of Data

Strauss and Corbin (1990) claimed that science cannot exist without concepts. We can understand and think about the concepts after naming them, so we can ask questions about them, and examine and relate them to other concepts. This idea is emphasizing the inductive nature of the qualitative inquiry. Considering Strauss and Corbin's idea as the main principle, analysis phase of the current study could be explained in a simpler statement; concepts were found and named and then examined and related to other concepts.

The collected data were analyzed through the way which is explained by Patton (1990) as gathering the answers of different people on central questions, and analyzing different perspectives on certain issues. Analysis of data includes ordering, structuring, and interpreting the mass of collected data, as explained by Marshall and Rossman (1999). The six steps while analyzing the data are followed as suggested by them: 1) Organizing the data; 2) generating categories, and themes; 3) coding the data; 4) testing the emergent understandings as considering students' individual differences; 5) searching for alternative explanations; and 6) writing the report.

At the beginning of the analysis phase, all the transcriptions of interviews, and observations were read by the researcher. This phase helped in organizing the descriptive data which were collected through the background questions at the beginning of the interviews. Moreover, it was a preparation for the next phase which is the generation of categories, themes, and patterns. Since a pilot study was conducted at the previous semester, there were some initial codes and categories in mind.

After reading all of the interviews at once and having a general appearance of the data, researcher started the coding process at the second read. Data on paper were started to be coded without any categorization, but the main themes began to appear

after several interviews are coded. However, this first coding process of interviews were not conducted as considering the categories, so there were the codes on interviews as being independent from any classification and some possible categories written on a paper. At this phase, the codes are not categorized, since the researcher preferred to code the data again after the categories and subcategories are determined exactly.

Later, all coded interviews were scanned by the researcher again and the main categories were determined in accordance with the codes. There were four main categories including students' characteristics, subject matter characteristics, learning strategies, and patterns to use the hypermedia program with many subcategories in each. Since the study is based on the comparison of different groups of participants, it was quite important not to miss any code within the data. So researcher decided on covering all of the interviews again for each main category, and coded them again by focusing just on specific categories. The second coding process is conducted computer-based by adding comments on MS Word.

The steps of generating the themes and categories, and coding the data were conducted as associated processes. Data on transcriptions of interviews and observations were coded and categorized according to the same procedure. However, before this process began, a list of learning strategies was prepared to give a general idea about the possible learning strategies. An amount of literature about the learning strategies including Senemoglu's (2001), Sankaran and Bui's (2001), Riding and Sadler-Smith's (1997), McLeod, et al.'s (1998), Bajraktarevic et al. (2003) are covered by the researcher to be aware about the possible learning strategies.

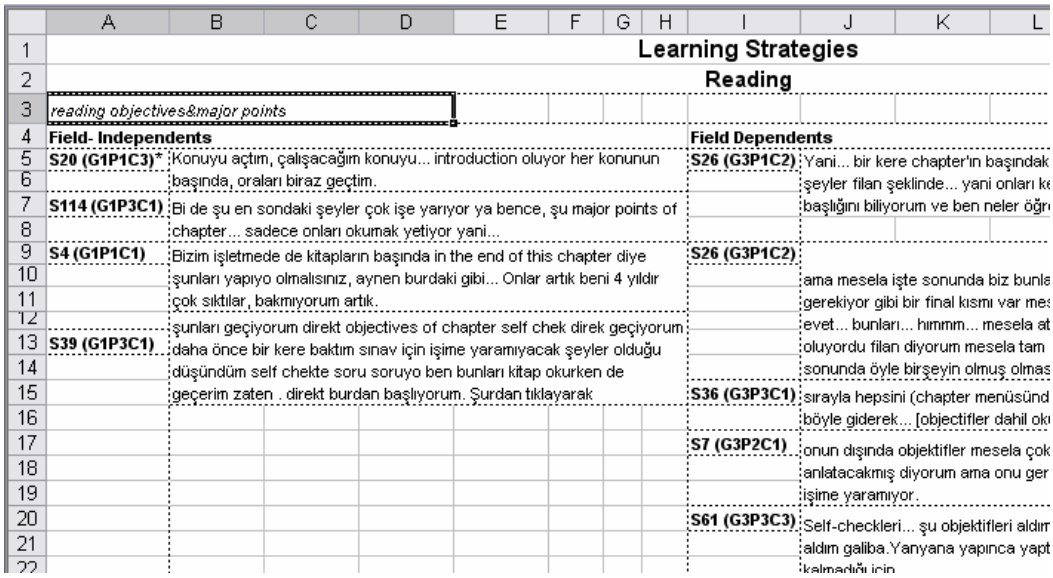
The important point was that these items were used only as guidance and did not limit the scope of the codes and categories. Moreover, there were already some codes and categories which were constructed during the pilot study, as mentioned above. As explained by Marshall and Rossman (1999), the researcher begins with initial concepts in mind, but they are modified during the analysis process. Although the

main consideration of the study was the learning strategies, the available data about other related issues like perceptions of the students on an online course revealed as a separate category while coding the data.

Bogdan and Biklen (1998) see the coding categories process like sorting the descriptive data that is collected. The following steps were searching for emerging ideas, and alternative explanations and participants' explanations on each code or category are summarized through Microsoft Excel. Each code was sought in all of the interview transcriptions and summarized under the code with an ID number of each participant.

An important point here was to indicate the characteristics of the students which were the main considerations of this study. Showing the categories to which the students belonged was important, because the report was to be based on the differences and similarities within and between the individual characteristics.

Since the study is based on comparison of the students as based on certain characteristics of them, data is grouped according to the categories to which the students belong. Namely, for each category, data were divided into two columns consisting of field dependents and field independents (See Figure 3.1).



	A	B	C	D	E	F	G	H	I	J	K	L
1	Learning Strategies											
2	Reading											
3	*reading objectives&major points*											
4	**Field- Independents**								**Field Dependents**			
5	**S20 (G1P1C3)***	Konuyu açtım, çalişacağim konuyu... introduction oluyor her konunun							**S26 (G3P1C2)**	Yani... bir kere chapter'ın başındak		
6		başında, oraları biraz geçtim.								şeyler filan şeklinde... yani onları k		
7	**S114 (G1P3C1)**	Bi de şu en sondaki şeyler çok işe yarıyor ya bence, şu major points of								başlığını biliyorum ve ben neler öğr		
8		chapter... sadece onları okumak yetiyor yani...										
9	**S4 (G1P1C1)**	Bizim işletmede de kitapların başında in the end of this chapter diye							**S26 (G3P1C2)**			
10		şunları yapıyo olmalısınız, aynen burdaki gibi... Onlar artık beni 4 yıldır								ama mesela işte sonunda biz bunla		
11		çok sıktılar, bakmıyorum artık.								gerekiyor gibi bir final kısmı var me		
12										evet... bunları... hmmm... mesela at		
13	**S39 (G1P3C1)**	şunları geçiyorum direkt objectives of chapter self chek direk geçiyorum								oluyordu filan diyorum mesela tam		
14		daha önce bir kere baktım sınav için işime yaramıyacak şeyler olduğu								sonunda öyle birşeyin olmuş olmas		
15		düşündüm self chekte soru soruyo ben bunları kitap okurken de							**S36 (G3P3C1)**	sırayla hepsini (chapter menüsünd		
16		geçerim zaten . direkt burdan başlıyorum. Şurdan tıklayarak								böyle giderek... [objectifler dahil ok		
17									**S7 (G3P2C1)**	onun dışında objektifler mesela çok		
18										anlatacakmış diyorum ama onu ger		
19										işime yaramıyor.		
20									**S61 (G3P3C3)**	Self-checkleri... şu objektifleri aldır		
21										aldım galiba.Yanyana yapınca yapt		
22										kalmadığı için		

Figure 3.1 – Categorized codes and categories according to field dependence.

* S20 indicates the ID number of the student, which is given at the beginning of the study.

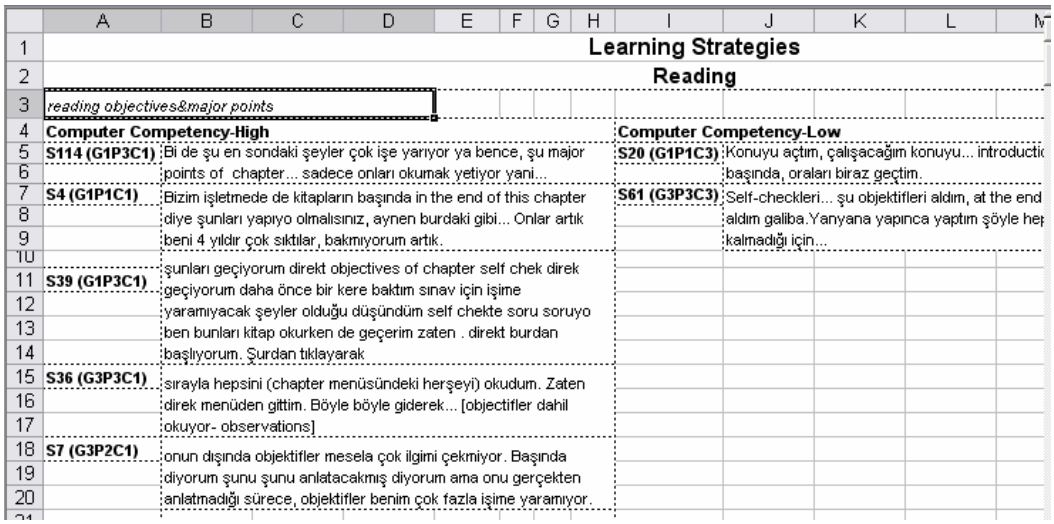
The explanation in parentheses indicates the categories to which the student belongs:

- "P" refers to prior knowledge
  P1: high level,
  P2: middle level,
  P3: low level of domain knowledge.
- "C" refers to computer competency
  C1: high level,
  C2: middle level,
  C3: low level of computer competency.
- "G" refers to cognitive style
  G1: field independets,
  G2: neutral group,
  G3: field dependents.

After organizing the data, researcher first looked at the similarities and then the differentiations in the data from participants within the same group. Similarities of data were found for field dependent participants at first, and then the differentiations within this group were captured. The similarities and differentiations within the field independent group were also found and findings were presented as organized around

the themes that are determined previously. The same procedure is conducted for both the computer competency level groups and the prior knowledge level groups.

Cognitive styles were not the only consideration of the study, so data were grouped also according to other variables including computer competency levels and prior knowledge levels. The same organization of data as showed in Figure 3.1 was conducted also for computer competency level as shown in Figure 3.2.



	A	B	I	J
1		Learning Strategies		
2		Reading		
3	*reading objectives&major points*			
4	**Computer Competency-High**		**Computer Competency-Low**	
5	**S114 (G1P3C1)**	Bi de şu en sondaki şeyler çok işe yarıyor ya bence, şu major points of chapter... sadece onları okumak yetiyor yani...	**S20 (G1P1C3)**	Konuyu açtım, çalışacağım konuyu... introductio başında, oraları biraz geçtim.
7	**S4 (G1P1C1)**	Bizim işletmede de kitapların başında in the end of this chapter diye şunları yapıyo olmalısınız, aynen burdaki gibi... Onlar artık beni 4 yıldır çok sıktılar, bakmıyorum artık.	**S61 (G3P3C3)**	Self-checkleri... şu objektifleri aldım, at the end aldım galiba.Yanyana yapınca yaptım şöyle hep kalmadığı için...
11	**S39 (G1P3C1)**	şunları geçiyorum direkt objectives of chapter self chek direk geçiyorum daha önce bir kere baktım sınav için işime yaramıyacak şeyler olduğu düşündüm self chekte soru soruyo ben bunları kitap okurken de geçerim zaten . direkt burdan başlıyorum. Şurdan tıklayarak		
15	**S36 (G3P3C1)**	sırayla hepsini (chapter menüsündeki herşeyi) okudum. Zaten direk menüden gittim. Böyle böyle giderek... [objectifler dahil okuyor- observations]		
18	**S7 (G3P2C1)**	onun dışında objektifler mesela çok ilgimi çekmiyor. Başında diyorum şunu şunu anlatacakmış diyorum ama onu gerçekten anlatmadığı sürece, objektifler benim çok fazla işime yaramıyor.		

Figure 3.2 - Categorized codes and categories according to field dependence.

Analysis of the observational data was also conducted by considering the categories of the students. Since the data collected during the observations were limited in amount, it did not take as much time as the analysis of interview data.

Writing the report was a part of the analysis, as suggested by Marshall and Rossman (1999). The similarities and differences in ideas were sought for, and were reflected in the report from the individual differences perspective. The interpretation of the observations and student logs were also embedded and blended in the report.

3.4. Validity and Reliability

The trustworthiness of a research is related to the efforts made for validity and reliability concerns (Merriam, 1998) which are named as *verification* by Creswell (1998), and *credibility* by Patton (1990). Verification is seen as a process that goes on during the data collection, analysis, and report writing phases (Creswell,1998; Merriam,1998).

Reliability refers to the replicability of the research findings (Merriam, 1998), and requires that a researcher using the same methods can obtain the same results as a prior study (LeCompte&Goetz, 1982). Kirk and Miller (1986) explained the relationship between the validity and reliability, and suggested that it is easy to obtain perfect reliability without validity, however perfect validity would assure perfect reliability. Moreover, Yıldırım and Şimşek (2000) also emphasized especially the importance of validity issues in qualitative research because of the nature of qualitative inquiry. The current study also followed the methods to overcome the validity threads, so the reliability would be assured.

Validity refers to the degree to which findings are interpreted in a correct way, so it is concerned with the accuracy of scientific findings (LeCompte & Goetz, 1982). The methods to overcome the possible validity and reliability threats are triangulation in data sources, peer debriefing, and member check.

Triangulation means combining different ways of looking at a situation. Triangulation of data sources including students, and logs gathered by the LMS, and data collection methods including interviews and observations were provided. As mentioned at the data collection part of this chapter, data is collected through different ways including interviews, observations, and student logs, so the researcher has got the opportunity to see the inconsistency between the data collected through

different methods. Triangulation of data is considered by Merriam (1998) as improving the reliability as well as the internal validity of the study.

Member checking is suggested as a validity strategy by Creswell and Miller (2000). With member checking, the validity procedure shifted from the researcher to the participants of the study. After the transcriptions of the interviews were made, they are sent via emails to the participants to make them see the overall conversation, so that they could confirm the credibility of the information. Moreover, they had the opportunity to make changes or additions to their conversations. All of the participants approved the written format of the interviews without any change, while a small group needed to make small changes on the transcriptions.

Peer examination or debriefing is defined as a process to ensure the internal validity of the study (Merriam, 1998; Creswell, 1998). It necessitates the review of data by someone who is familiar with the research being explored. The whole research process was discussed by a Ph.D candidate at the Curriculum and Instruction field. She had conducted qualitative researches before, so was experienced about the qualitative methods of research design and analysis. On the other hand she was qualified about the learning theories and processes which were important to the aim of this study dealing with learning strategies. The raw data, codes, and categories are offered to her, and the method of the study is explained, and the process of the research including the results of the analysis is discussed together.

Moreover, since the raw data were coded twice by the researcher at different times, it provided the opportunity to compare the codes in terms of their consistency. The codes committed by both processes emerged to be parallel, but the second attempt of coding by focusing on categories were more detailed than the first one in which all of the data were coded at once.

An important point to indicate is about the external validity which is about the generalizability of the results (Merriam, 1998). Since generalizability is not the aim

of qualitative research and usually even impossible, the points that are typical to the case of this study are emphasized while reporting the results, so that the readers can compare their situations with the case of the current study (Merriam, 1998).

3.5. Limitations of the Study

The results of this study must be interpreted by considering the following limitations:

- The validity and reliability of the data gathered may be limited by participants' honesty and willingness.
- Observer effect and location effect should be taken into consideration for observations.
- Computer competency levels of the participants were measured as based on their self perceptions, so were not objective competency levels.
- Conclusions of the study are limited by the inherent nature of the qualitative research. Since the scope of the study is limited to a case, the results are tightly tied to the context of this case, so are not widely generalizable.
- Data gathered through the test developed by Turkish Red Crescent assumed to be valid and reliable in order to test the achievement of the participants.
- Since the current study suggested some categories in terms of individual differences at the beginning of the study, the participants were selected and data were analyzed according to these characteristics. Actually there would be some other differences among the participants affecting the results, but they were not included while the research problem was being defined.

CHAPTER 4

RESULTS

In this chapter, the findings of the research are presented. Since the aim of the study is to explore the possible effects of cognitive styles, computer competency levels, and domain knowledge levels of the students on their learning strategies in hypermedia environment, these factors are taken into consideration and the results were presented from the individual differences perspective. There are three main themes emerged throughout the coding categories process: Students' interaction patterns with the hypermedia, their preferred learning strategies, and some additional factors which may be important in terms of preferred learning strategies.

In this chapter, descriptive data which were acquired through the background questions are given as first. Internet access opportunities of the participants, their experience in using www in previous courses, interest in subject matter, and participants' beliefs and thoughts on online learning will be given under the "Background of the Participants" heading. Although this information might not be directly related to the learning strategies concept, they found to be valuable by the researcher in terms of complementing the pieces of the whole picture.

The learning strategies students used while studying are presented under the "Strategies for Learning with the Hypermedia Program" heading. Seven subtitles are provided under this title including the most commonly used strategies.

In addition to the suggested individual differences of the research question - cognitive styles, prior knowledge about the subject matter, and computer competency levels- , some other factors were also found to be important in terms of preferred learning strategies. These factors including subject-matter characteristics, students' background, habits to study, and self perceptions on learning were coded under the student characteristics category during the analysis process. However, these characteristics are not presented as a separate heading in this chapter; instead they are embedded within the "learning strategies" findings.

Data gathered through both the interviews and observations are analyzed, and the results are presented from the individual differences perspective. Since the study is based on differences among the participants, presentation of the findings is mainly based on grouping the data according to suggested individual differences. Concepts which are commonly stated within the same group are presented as grouped. The cognitive style group or the categories of computer competency or domain knowledge levels of the participants are stated, if there is a common pattern in terms of these suggested categories. However, the data which didn't indicate a common pattern are also presented here without stating the group distinctions, since these data are found to be important in terms of the general concept of learning with hypermedia beyond the individual differences perspective.

The main categories which were emerged during the analysis process were followed to present the data. Since there are many common points between the groups besides the differentiations, data were presented as a whole and the differences between the cognitive style groups, computer competency groups, and prior knowledge level groups were emphasized within the data.

4.1. Background of the Participants

As mentioned in chapter3, participants of the study were selected among the students of First Aid course given by the Physical Education and Sports Department at METU on 2004 spring semester. Since the course is offered to seniors from all departments

at METU, students have different backgrounds including their majors, internet access opportunities, experience in using www in previous courses, studying habits and interest in subject matter (First Aid), in addition to the suggested individual differences of this study.

Participants usually mentioned their background-related characteristics, while explaining their thoughts and experiences, and associated them to these characteristics, so the background-related data were found to be important by the researcher in terms of getting the justifications of thoughts and behaviors, and coded during the data analysis process. Major of the students, internet access opportunities, and studying habits were considered as the background information of the participants and explained at the following paragraphs.

4.1.1. Major of the student

To the aim of the study, participants were selected from different departments including faculties of engineering, education, arts and sciences, and business and administration. For their departmental courses, students usually developed their own strategies to study as related to the context of the major. Participants from the faculties of engineering, and natural sciences stated that they always used to dealing with problems, and calculations for their departmental courses, but the content of First Aid course was a completely new one for them.

Table 4.1 – Major of the field-dependent and field-independent participants

Faculty of / Cognitive S.	Arts&Sciences	Education	Engineering	Business&Administration
Field-dependent	2	4	2	0
Field-independent	4	0	2	2
Total	6	4	4	2

Moreover, participants' beliefs on learning with hypermedia were differentiated among the departments of the students. Actually students studying at the engineering

faculty usually have positive thoughts on online courses, while the students from the faculty of arts & sciences usually had negative opinions on learning with hypermedia.

One of the field-independent participants' statements from the faculty of engineering appreciating the online courses is given below:

> "I think it's beneficial that the course is provided through the website, otherwise the students will not understand and will have to study by themselves again even if there will be face-to-face classes for five hours a week." **[S50 (G1P1C1)]**

As opposite to the previous statement, there is a field-independent participant's statement who is studying at a natural sciences department at the faculty of arts & sciences:

> "Actually I'm against the Internet. I'm against providing the courses through this way. Think that we took the course for one and a half month and we will do nothing for the rest of the semester. It means nothing. Nothing about First Aid… We should follow the website. Why should we do it?" **[S116 (G1P3C3)]**

4.1.2. Internet Access Opportunities

Participants' opportunities of access to the Internet whenever they want were important in terms of explaining their patterns to use the hypermedia program. Internet access opportunities of the students are given here to provide the general appearance of the participants. This data is used while explaining their experiences in using the hypermedia program.

Half of the 16 participants have their own computers and internet connections at their home and the rest are connecting to internet from the laboratories at their departments or dormitories. In terms of having a computer; 11 of the 16 students have their own computers at home without an internet connection, and 5 of them have access to a computer from the laboratories at departments or dormitories.

However, the internet access opportunity was not found to be important in terms of using the hypermedia program for learning. Actually students with no internet access at home also visited the web site and used the hypermedia program for learning. Only two of these 8 participants stated that they didn't study through the hypermedia program, since they didn't have internet access. On the other hand, some of the students who had access to internet at home have also preferred to study on the printed material instead of studying on hypermedia program. This issue is also explained under the *Strategies for Learning with the Hypermedia Program* title of this chapter.

4.1.3. Habits to Study

Students' habits to study for their usual courses were usually different from First Aid course because of the different characteristics of the subject matters. Especially students from the faculties of engineering, and arts and sciences expressed the difficulty in understanding verbal information of the First Aid course, because they usually used to study on problem-solving, and calculation. On the other hand, the relation of the First-Aid content to the real life was considered as an advantage by the participants, since it was about the human body, and so was easy to understand.

Participants differentiated in terms of their study management strategies. Some of them were considering the courses important and usually tend to study periodically and more detailed, while the others prefer to use more practical ways to study. For instance they usually study just before the exams, and used to study in a more

superficial manner. In this study, besides the studying habits, participants' prior knowledge level on subject matter was found to be important in terms of their study management strategies. Actually students with high level of domain knowledge mentioned and exposed more practical ways to study than the others who were not at high level of prior knowledge. Again, this issue is explained under the following headings about the study management.

Another important thing in terms of studying habits was reading on paper. Some of the participants stated the difficulty in reading on computer screen, since they always used to read on paper and want to have the reading material on hand and writing or drawing on it. Moreover, it was difficult to print out the online material because of the technical infrastructure of the LMS, so some of the students faced with serious problems about this issue.

4.1.4. Beliefs and Thoughts on Learning with Hypermedia

Participants' thoughts on online learning were important in terms of explaining their approach to learn through this medium. First of all, participants' prejudices about online courses are explained here, and then will be continued with thoughts related to the certain hypermedia program at the following paragraphs.

As explained under the *major of the student* heading, some participants believe in the face-to-face interaction between the instructor and the students, and have negative thoughts on online learning, while another group strongly emphasize the benefits of online courses without talking about the benefits of face-to-face courses. Actually there was one more group who has neither opposite thoughts nor in favor of online learning. They appreciated some features of learning with hypermedia, besides the negative effects of the lack of face-to-face interaction in these environments. Another prejudice about the online courses was that they were considered as easy by some of

the participants. A participant stated as similar to some others that online courses were not regarded as important as the face-to-face courses:

> "There is a common belief among the students that the online courses are less important than other courses, so should be studied less than other courses. I don't think so, but there is such a belief, so students are studying less for these courses." **[S14 (G3P2C3)]**

As second, participants' thoughts on online learning related to the certain hypermedia program are explained at this and the following paragraphs. The opportunities for time and place independency, and material availability were the most appreciated characteristics of online courses. Actually almost all of the participants were satisfied since they shouldn't go to a classroom for specific days and hours during the last half of the semester.

The availability of the course material for anytime at anywhere was also appreciated by the majority of the students. They usually stated that some important points could be missed in face-to-face classes, but the material and other things related to the course were always accessible on the web site, and were easy to get. On the other hand, three female participants had opposite thoughts about the accessibility of the online material. They stated their need for studying as independent from a certain place, but it was impossible because of the necessity of a computer. One of these participants explained her thoughts about the accessibility of the material:

> "You can carry a hardcopy material with you, so you have the opportunity to study everywhere. But we had to spend our time in front of a computer to study through the Internet." **[S20 (G1P1C3)]**

As similar, the necessity of a computer for studying was pointed out by many participants as a negative feature of online learning environments. Some of the students complained about the lack of access to internet at their home, while some others mentioned about the physical discomfort of sitting down and looking at computer screen for long hours.

Majority of the participants were displeased because of the need for self regulation in online learning environments. Especially the field-dependent students stated that they didn't feel the responsibility which felt in face-to-face courses, and they always should study by themselves without being aware about the important points.

Some features which are unique to hypermedia environments were appreciated by some of the participants. One participant stated that it was nice to guide the flow of the study by her own, while some others found the online environment as the best medium for providing visuals or quizzes on the learning material. Moreover the availability of the material even before the class hours was appreciated, since the participants could prepare themselves for coming classes.

In terms of communication in online learning environments, most of the students thought on communication with the instructor. Although the majority of the participants usually talked about the communication with instructor, three of the field-dependent students mentioned the communication with peers and complained about the lack of the interaction with them.

Actually most of the participants stated positive thoughts on communication with the instructor in this course. There were three reasons stated by the participants who find the communication to be adequate in First-Aid course. One of the reasons was that the first six weeks of the First Aid course was given face-to-face, and then the rest of the course was conducted as online, so students had the chance to interact with the instructor and with their peers during the face-to-face classes. Another reason was

that the students usually didn't regard the communication as an indispensable part of courses.

Only two field-independent participants strongly believed in face-to-face communication with the instructor, and the rest of the participants stated that there is usually not a firm communication between the students and instructors at METU, so they emphasized that there is not any difference in terms of communication between the face-to-face courses and online courses. The last reason was that this course was not heavy in content, so the students usually don't need to interact neither with the instructor nor the peers during the online period. Moreover, the instructor was regarded to be available in campus and accessible by the students, so they thought that they can interact with whenever they want.

4.2. Patterns to Use the Hypermedia Program

If the data related to the patterns of using the hypermedia were analyzed, it was revealed that it is closely associated with the computer competency levels of the students. Namely, participants belonging to different groups of computer competency levels indicated different patterns in using the hypermedia. Table 4.2 shows the differences among the student groups in terms of hypermedia using patterns, and the number of participants for each finding and the source of data.

Table 4.2 – Participants' common patterns in terms of patterns to use the hypermedia, and sources of data.

	Cognitive Styles		**Data Source**		
	FD	**FI**	**Interview**	**Observ.**	**S. Logs**
Overcoming with Unknown terms	Need to use dictionary	Reading explanations& reasoning	✓	✓	
	Computer Competency				
	Non-competent	**Competent**	**Interview**	**Observ.**	**S. Logs**
Visiting Frequency	Less	More	✓		✓
Materials to Study	Print-out	HM program	✓		
Use of Student Tools	Like the automatic announcements	No specific interest in any tool	✓		
Approach to Disused Student Tools	Confused with	No confusion stated	✓		
Printable version	Needed for	No need	✓	✓	
Navigation within the content	Usually using *Back&Next*	Using menu for turn backs within content		✓	
Using the menu	Having difficulty	No difficulty	✓	✓	

4.2.1. Frequency of Visiting the Web Site

Almost all of the students noted that they were visiting the web site once or twice a week to be aware about the assignments and announcements of the instructor. S4 explained when she needed to visit the web site:

> "Actually… I visited the site only before the exam. In addition, I visited if the instructor sent us e-mails to notify that we should look at the announcements. I looked at the web site if there is something like that…" **[S4(G1P1C1)]**

As similar to her, S20 also stated that she needed to visit the site to control the announcements until the exam date was close:

> "When the exam was closer- last two weeks before the exam, I started to look at the lecture notes. Rest of the time, I used to visit the web site only to control whether there is an assignment or an announcement or something like that. Later I visited for the exam... I visited and read just before the first exam..." **[S18 (G1P1C3)]**

However two of them visited more seldom, so passed some announcements and assignments. S20 explained why she missed some points on the web site as similar to S114:

> "Since I didn't visit the web site frequently, I got some messages as delayed. I was being notified as delayed about some issues. For instance, there was an assignment. I saw it later. If the course was not online, I would learn it in the classroom." **[S20 (G1P1C3)]**

Since the aim of visiting the web site was usually to get the announcements, most of the participants did not look at the lecture notes on the web site until the examination week. Almost all of the participants stated similar things with respect to visiting the web site.

Another common point stated by almost all of the participants was related to the simplicity of the web site. Especially the participants who before took online courses compared them with the First Aid course. S68 was reasoning why he visited the website of this course more frequently than the website of another previously taken course:

> "Our [First Aid] instructor was usually putting announcements and assignments on the site... And they were important for us... But for the history course, the site was not used to these aims. We were usually being notified by people about the given assignments or exam dates etc. So I didn't need to visit the web site of online history course "**[S68 (G1P3C3)]**

In addition to the aim of controlling the announcements, 4 of the 16 participants stated that they have rarely visited the web site to look at the chapters of the week before participating to face-to-face classes. They aimed to be aware about the subject of the week before the class, so the class hours become more efficient. On the other hand, one of these participants stated an assessment-oriented goal for which he was looking at the chapter before the face-to-face class, because he wanted to response the instructor's questions to get points.

Quantitative data were helpful in understanding the frequencies of visiting the web site. The data provided by LMS indicated that 39% of the non-computer competent participants were among the frequent users of the web site, while 41% of them are among the less-frequent users. Although the percentages were close to each other, most of the non-computer competent participants were among the less frequent visitors. On the other hand 32% of the computer competent participants were among the frequent users, while the 27% of them were visiting the web site less-frequently. So, most of the computer competent users were among the most frequent users (See Figure 4.1)

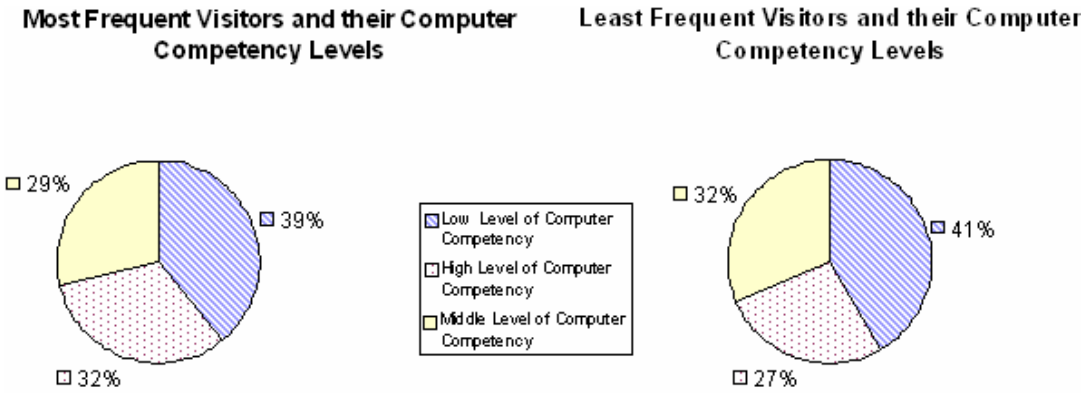


Figure 4.1 – Frequency for Web site visits of the students with different levels of computer competency

4.2.2. Use of Tools

The hypermedia program was providing some facilities as mentioned at the previous chapter. There are a syllabus, a general electronic forum, an electronic course forum, a course announcements part, and a gradebook, in addition to lecture notes on the web site. Almost all of the students expressed positive thoughts on these tools, although some of them have never been used by them.

The analysis of the students' frequency on using the web site indicated that the course forum has been used neither by the students nor the instructor. Actually there was a one-way communication through the *Announcements* part and emails between the students and the instructor. Announcements on the web site were updated by the course instructor by giving assignments, notifying the students about the dates, places and scope of the exams, and certificate-related information. S68 considered this feature as the most beneficial one of the hypermedia program:

> "Actually the best thing for us related to the web site was the automatically opening announcements, if there was an update since your last visit to the site. I think it was the most efficient feature of the web site, since we may skip to control the announcements while visiting the site, but here it opens

automatically. It was efficient according to me...“ **[S68 (G1P3C3)]**

S41 also stated that the announcements were beneficial as similar to S14’s and S26’s thoughts:

> “What I especially appreciated in this web site was the announcements part. The new announcements were opening in that window, and we can see what is new. On the other hand, we may miss the points which are stated by the instructor.” **[S41 (G3P1C2)]**

The interview data indicated that participants, especially who were not at high level of computer competency usually liked the opening popup of the new announcements, when the students log in to the system.

In addition to the syllabus, electronic forum, gradebook, and course announcements part, there were also some other facilities which are standard tools of the certain LMS, but not used by the instructor of the First Aid course – like the *online exams*, or *Tips* etc. However, it was clear through the interviews that the participants with low level of computer competency (3 of 7) usually confused about these disused tools, and worried about whether they should access to these tools or not. Moreover, the use of the general forum part was not clear to them, since students of the LMS taking other courses were sending messages to this forum. Students were confused about for whom this forum was created, despite a general information about the use of the hypermedia program was given at the beginning of the semester.

There was an alternative idea about the tools on the site. One of the participants suggested that the tools on the web site should be accessible from everywhere. She talked about the difficulty she faced with throughout her visits on the site since she couldn’t open the syllabus, or other tools in a new window without right-clicking on

the syllabus link and “open in new window”. She complained about forgetting to click “open in new window”, so opening the syllabus, and writing the syllabus items on a paper, and then turning back to the lecture notes (content) pages.

A commonly stated suggestion of the non-computer competent students (3 of 7) on tools was about the need for a printable version of the whole content. Both the statements in observations and especially the interviews proved this need of the students. As stated at the beginning of this chapter, all of the participants who were not at high level of computer competency either printed out the material or tried to do so. Especially one of them strongly emphasized the need for a printable version. Actually, she stated that she will feel better, if there is a file containing the whole content even if she would not print out it. Some of them also claimed about the difficulty on printing out the whole material page by page.

An important problem students faced with while studying was the unknown terms related to the First-Aid content. Actually there was not a glossary on the web site and students usually needed to use dictionary. Although most of the participants emphasized the need for a glossary on the site, the analysis of interviews and especially observational data indicated that the field-independent students usually didn’t used to look at a dictionary for unknown terms. Namely, they tried to make out the meanings of the unknown terms by reading the explanations, and/or looking at images on the page. Actually guessing the unknown terms was preferred instead of looking at the dictionary. On the other hand, the field-dependent participants stated that they used dictionary while studying, and also the observational data indicated that field-dependent students were extensively using dictionary. Looking at the dictionary was considered by them to decreasing the motivation.

4.2.3. Navigation within the Content

Before starting to represent the navigation patterns of the participants, it would be better to give a brief explanation about the navigation tools of the hypermedia program. The whole content consisted of 18 chapters and they were divided into four parts in each including 4 or 5 chapters. All chapters were following the same sequence including objectives, thinking questions, subtopics of the chapter, major points of the chapter, and self evaluation test. The menu only showed the four parts as named Part1, Part2, Part3, Part4, and the chapters of each part were opening by clicking on the part name. As similar, the topics of each chapter were opening by clicking on the chapter name. If a part is opened, the other parts become closed, and as similar other chapters become closed, if a chapter is opened. Clicking on a part name or a chapter name only opens or closes the menu items, and doesn't make a difference on the right side of the interface in which the content is presented. Only clicking on the subtopics of chapters changes the content on the right side. Each subtopic of the chapters was presented on a single page, so some pages were less loaded than the others. Besides the menu, there were Back and Next buttons at the bottom of each page, and they permit to progress within the subtopics and chapters. (See Figure F.4)

Analysis of the observations and interviews showed that 6 of the 9 participants whose perceived computer competency levels were not high had difficulties in using the menu, since the content on the right side was not changing, despite a chapter name is clicked on the menu. Students usually wanted to see a new content on the right side, after clicking on a chapter. S61 stated the difficulty of using the menu:

> "For instance, I'm opening the chapter2, but chapter2 doesn't seem here [on the content presentation page]… Only after clicking on something within the chapter2… I always assume that the content will be changed when I click on chapter2, but it doesn't… There is still the Introduction… If I click on Part2,

> it is closed… I have to click on the Chapter1, then the subtopics of the chapter1 will be opened, and then I need to choose something from there… That's the only way to do it… Chapter2 doesn't appear, if you click on chapter2." **[S61 (G1P3C3)]**

S80 also expressed the difficulties he faced with while using the menu:

> "The design was good in general, but there was something strange at the *parts* section. I'm clicking on the parts [on menu], but something strange appears there. Eventually you realize it, but you're in trouble until that time." **[S80 (G3P3C3)]**

Students who were not at high level of computer competency were usually confused about this issue, and even their trust in the material was affected negatively. On the other hand, none of the computer-competent users stated any negative thought about the use of menu.

Another difficulty about the unusual organization of the menu was stated by a participant who was field-dependent, and doesn't perceive himself as a computer competent. It was difficult for him to understand the organization of the chapters, because it was different than the usual organizations of books. Contents are usually divided into chapters in books, but there were parts here, and he considered this situation as confusion.

For navigating within the content, participants usually used the back and next buttons at the bottom of each page. The three-type menu provided at the left side of the interface was usually used as the table of content, rather than a navigational tool. Moreover, opportunities for random access to the content and structured list of the topics were the appreciated features of the menu according to the participants.

As mentioned at the previous paragraph, the menu was usually used as a table of content, rather than a navigational tool. Although the data gathered especially through the observations indicated that participants usually used to navigate through the back and next buttons. S41 explained his way of navigating within the site:

> "I didn't use the menu of course… I chosed something from the menu, and then go on by the Next buttons" **[S41 (G3P1C2)]**

In terms of the use of menu, the analysis of the interviews and observational data indicated that all of the participants except one were using the menu to find the chapter to be studied at the beginning of their study, and then they used the Back and Next buttons to progress within the chapters.

The tree-type menu providing the whole content with hyperlinks was appreciated by almost all of the participants. S4 emphasized the usefulness of the table of content on the web site as compared to books:

> "Actually that is good… If you are reading a book, it is difficult to find the specific topics… Where is this issue? Where was it mentioned? Here, I can easily see the topics after clicking on the chapter name… "**[S4 (G1P1C1)]**

> S114 stated how useful the menu was:
> "This part [menu] is good. Everything is written there. The subject you are looking for is shown here. If the subtopics are not written here for example for part2, it would be bad. Everything is written under this chapter." **[S114 (G1P3C1)]**

Analysis of both the interviews and the observations indicated that the menu helped the students to be aware about the whole content and to see the chapters as a list. Participants usually mentioned that it was nice to see all of the topics there, and to access them easily.

Two of the 8 field-dependent participants emphasized that the menu was useful since it was providing a structured list of the content. S14's statement on this issue is presented as below:

> "If this [menu] part would not be here, so if there would be only this [content presentation] part, it will be confused... there would be a disorder about which one is covered under what. Or... Only I might be confused about it... I don't know... But it's more clear, if it [the menu] is there." **[S14 (G3P2C3)]**

The hierarchical order of the topics and subtopics were helpful to them, since their relationships were figured there, as explained by S14 as similar to S36.

Random access to any chapter or any topic was one of the most appreciated features of the menu as explained by the participants:

> "I think that the accessibility is nice, since there is a direct connection to the content through the menu on the left side… You can access anywhere…" **[S50 (G1P1C1)]**

> "With the help [of menu], I can easily find where I made a mistake. The content… This part was good… Everything is written there so the subject you are looking for becomes clear." **[S114 (G1P3C1)]**

> "It [the menu] shows all of the topics. For instance, you're at the third chapter, and worried about something on the first chapter. You can easily find that point by turning back. You don't use the Back and Next buttons… It's easy to access through the outline, if you remember the place of it." **[S7 (G3P2C1)]**

The menu was usually used for accessing any chapter randomly, rather than reading the chapters sequentially. Students liked the opportunity to access whatever they wanted to study, and the opportunity to turn back to the unclear points easily.

According to the interview data, some of the participants who were at high level of domain knowledge (2 of 5) wanted to skip some known chapters or topics with which they were familiar, and it was easy to do that through the menu:

> "I'm looking at the left side. Rather than passing the pages one by one, I only look at the parts which I don't know like the *foreign bodies* – I have never heard it. I was only looking at that part, and reading it…" **[S9 (G3P1C1)]**

Although most of the participants appreciated the random access opportunity provided by the menu, so they could access to any topic which was not clear to them etc., some of the students who were at low level of computer competency didn't use the menu for turn backs to any topic during the observations. Instead, they preferred to click on the back buttons to go back within the chapter even if it was four pages ago, and it is observed that it was a bit complicated for them to come to the last studied part again with *Next* buttons, after looking at the previous pages.

As stated at the previous paragraphs, the Next and Back buttons at the bottom of each page were usually used while studying sequentially. Two of the participants stated that it was nice to control the flow of the content by these back and next buttons:

> "The presence of these next buttons... This is something under my own control. I mean I'm not scrolling down to read, I'm just clicking on the next buttons." **[S4 (G1P1C1)]**

Two of the participants stated that the place of the buttons - on the bottom of each page- was nice. They appreciated the urgency of looking at the whole content on the page to pass it, since the navigation buttons were at the bottom of each page. On the contrary, one participant who was at high level of domain knowledge suggested that it would be better if these buttons would be at the top of the page, since he knows some topics, so wants to skip them without looking at.

4.3. Strategies for Learning with the Hypermedia Program

If the data related to the learning strategies in hypermedia environment were analyzed, it was revealed that the learning strategies were associated with all of three categories including prior knowledge levels, computer competency levels, and especially cognitive styles. Table 4.3 shows the differences among the student groups in terms of preferred learning strategies, and the number of participants for each finding and the source of data.

Table 4.3 Participants' common patterns in terms of learning strategies, and sources of data.

	Cognitive Styles		**Data Source**		
	FD	**FI**	**Interview**	**Observ.**	**S. Logs**
Aim of studying	Considering others' expectations	Considering their own decisions	✓	✓	
Aim of Reading	Influenced by external forces	Influenced by internal forces	✓	✓	
Detail of Reading	Once overall, then detailed as second	Reading only once	✓	✓	
Sequence to Study	Confused about inconsistency with syllabus	Like the current sequence	✓		
Use of Visuals	Interest in figures on images	No special interest	✓		
	Computer Competency				
	Non-competent	**Competent**	**Interview**	**Observ.**	**S. Logs**
Content Segmentation	Prefer long-page presentation	Prefer short page presentation	✓		
	Prior Knowledge				
	Low-level	**High-level**	**Interview**	**Observ.**	**S. Logs**
Depth of Studying	Reading more than once, Taking notes, Turning back to previous topics.	Reading once, Skim&Scan No detail in studying	✓	✓	
Time spent	more	less		✓	
Taking Notes	Detailed, longer notes	Undetailed, smaller notes	✓	✓	
Navigation Tools	No special need	Need a design to skip easily	✓		

4.3.1. Study Management

Participants' study management strategies are presented including the time management strategies, general approach to study and detail of studying. Participants usually had different study management strategies which are mostly determined by their backgrounds and habits. The characteristics of the subject matter –First Aid- was also found to be important in terms of the study management strategies of the students.

First of all, it was cleared through the data that participants usually don't need to study, if the exam date was not close. Students usually compared the online courses and face-to-face courses, and almost all of them stated that there wasn't any force available to make them study during the semester, so they always postponed the work. Actually this feature of the online courses was widely criticized by the participants, and some of them made some suggestions like periodical quizzes, or obligation to visit the web site frequently etc. For the usual weeks, their effort for the course was limited to visiting the web site to be aware about the announcements of the instructor. If the exam date became closer, a small group of the participants started to study a couple days before the exam, while the rest preferred to study on the exam date.

It is important to say that some characteristics of the First Aid course were also important in terms of the students' study management strategies. It was an elective course, and considered by the students as being not so heavy in content. These points were important, since participants usually stated these preferences of the course, while explaining how they studied. One of the participants was comparing the ways to study for the First Aid course, and other courses he has taken:

> "For my regular courses which are not online, I'm usually starting to study one week before the exams since this period is just enough to accomplish. For this course, I visited the web

> site and read the content and took notes just two days before the exam, because the subjects were easy to understand." **[S36 (G3P3C1)]**

Aim of studying indicated important distinction among the participants. As stated at the previous paragraphs of this chapter, there were different justifications for reading among the cognitive style groups. The same distinction appeared while the participants' aims to study were sought through the data. 6 of the 8 field-independent students stated more life–oriented aims to study, while all of the field-dependents emphasized the possible expectations of the exams or the instructor. Some of the statements of the field-independent participants are presented below indicating their aim to study or to read the specific content:

> "When I will face with a situation at future... Let me think of burn. I can understand what caused to this burn or the severity of it. Then, there is something I have to do according to this situation. I mean the treatment is more important." **[S20 (G1P1C3)]**

> "I read everything on the first chapter, since it was related to CPR. I read it very carefully because I believed that it [CPR] should be conducted perfectly. Yes… since I'm worried about it…" **[S4 (G1P1C1)]**

> "I didn't look at some points, for example the symptoms… I could understand the burn without knowing the symptoms… so I didn't look at such things." **[S18 (G1P1C3)]**

Most of the field-independent participants stated similar things like S20, S4, and S18. The common point was that they decided on reading the specific content because of their personal beliefs considering real life situations.

On the other hand, some of the justifications for field-dependent participants are given below:

> "The symptoms... Treatments... Such important things... I thought that they could be asked. Actually these are the common exam questions. I mean they are usually not very detailed information... The points which could be asked are usually evident." **[S7 (G3P2C1)]**

> "I tried to understand some details through the web site, which could be asked in exam. For example there are 4-5 pulses for babies, a bit more for adults… Actually I studied for the exam rather than for learning." **[S80 (G3P3C3)]**

> [in F2F courses] the important points could be realized through the instructor's explanations. You can understand what s/he is emphasizing… I'm studying as considering these points. But there is not the same for this course. Everything stand there [for First Aid course]. What is important, and what is not? You should determine… **[S14 (G3P2C3)]**

The field-dependent participants usually studied as considering the expectations of the instructor or the exams, while the field-independents delibareted the points which are important to them if they think of real-life situations.

The depth of the approach to study was differentiated among the participants. Although the habits of the students to study were important in terms of understanding their approaches to study, it was clear from the data that the students with higher level of domain knowledge used a more practical way of studying. On the other hand, the students with lower level of domain knowledge explained a more

detailed way like reading the content more than once, taking detailed notes while reading from the hypermedia and/or frequent turn-backs to the previously studied topics etc.

In terms of time management, the majority of the participants stated that they spent not as much time as they spent for their usual courses. Some of the students pointed out the common belief that online courses are not overrated as much as the face-to-face courses. It was one of the reasons for spending less time for studying. Moreover, the content of the course was found not to be heavy, so the students didn't need to study hard and to spend large amount of time.

Although 14 of the 16 participants expressed that they spent less time as compared to face-to-face courses, two participants who were field-dependent stated that they had to spend large amount of time to study for this course. One of them who perceived himself as computer competent stated that the online courses will take much more time, since there would be some problems related to technology. The other student emphasized the complexity of the way that he followed to study, and stated that it takes longer to study with his way to follow. He read the whole content on the hypermedia program, and then printed out the whole material to read them again.

If the time spent were compared among the participants during the observations, it was revealed that the students who were not at high level of domain knowledge spent more time than the others who were aware about the subject matter before the course begins. As mentioned at the previous paragraphs, participants who were not at high level of domain knowledge usually tend to take detailed notes while studying, while skim-and-scan method was enough for others. However, among these participants with low level of domain knowledge- some of them who are computer competent had also spent less time than the others.

4.3.2. Sequence to Study

Participants have different thoughts on the organization of the chapters to study. Some of them appreciated the current organization because of its' logical sequence, while some others proposed a more life-related sequence for chapters. Moreover, there were considerable amount of students who were disappointed about the inconsistency between the hypermedia program and face-to-face classes in terms of the content sequence.

10 of the 16 participants appreciated the order of the content presentation and the segmentation of the whole content into the topics and subtopics on the hypermedia program. Three participants suggested that it would be better, if the chapters which were closely related to real life should be placed at the beginning of the content. According to them, the situations which would be more probably faced with in real life should be covered at the beginning of the content, since they are more significant.

However, although it was not asked by the researcher, five of the eight field-dependent participants complained about the order of the chapters which does not follow the sequence of the face-to-face classes, so the students were to study without following the sequence of the chapters on hypermedia program. They were bothered about having to cover the subjects without any sequential order. Students emphasized the disturbance they felt because of covering some chapters without following their sequence on the hypermedia program:

> "That is okay, I can understand that the chapters should be arranged in this manner. But if the topics are organized according to this order, then they should also be covered according to it... I felt disturbed about skipping chapter 3 for instance... Did we purposely skip that chapter? Why do we delay it?" **[S26 (G3P1C2)]**

It was notable that three of the field-dependent participants who were at high level of perceived computer competency did not complain about not following the content sequence of the hypermedia program.

On the other hand, one of the field-independent participants, who perceives herself as computer competent mentioned this issue and stated that she was in trouble because of being lost within the chapters when she is not following the given content sequence of the hypermedia program. The rest of the participants (9 of 16 students) stated that they found the sequence of the chapters as being logical, and they appreciated the association within the topics and subtopics.

Actually there were two field-independent participants who were not aware about the skipped chapters for the first exam, so studied the whole content. However their approach was notable claiming that they will study the whole content anyway, if they had been aware about the skipped chapters.

4.3.3. Reading to Learn

The main strategy of all of the participants to learn is usually reading the content even through the web site or the print-outs. However, ways of reading were different among the students. They were varied in terms of how to read, what to read, and why to read.

The choice of the material for reading varied among the participants. While the majority of the participants used to read from the hypermedia program, others either preferred to read on printed material or used to read on both printed material and hypermedia program (See Figure 4.2).

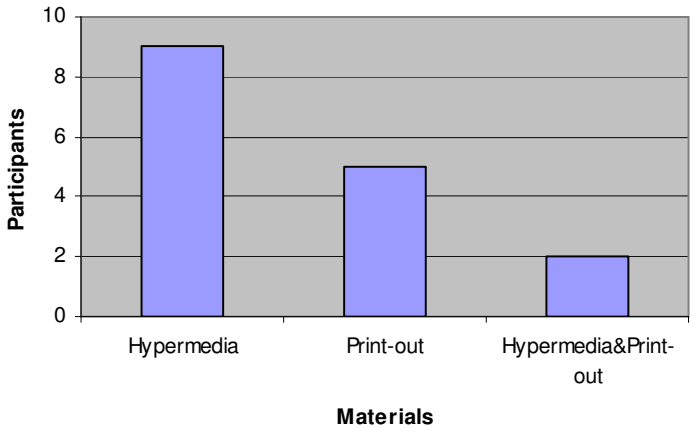


Figure 4.2- Participants' Preferred Materials to Study

After grouping the participants according to their certain characteristics, it was clear that students with low level of perceived computer competency tend to print out the content, and read through the printed material. As seen on the Table 4.2, all of the students who preferred to print out the material were at low level of perceived computer competency in comparison with their peers.

Table 4.4 – Preferred Materials to Study and Computer Competency Levels of the participants

Preferred Material / Computer Competency Levels	Hypermedia	Print-out	Hypermedia & Print-out	Total
Low Level	2	5	-	7
Medium Level	1	-	1	2
High Level	6	-	1	7
Total	9	5	2	16

However, two participants whose level of perceived computer competency were not high and used to read through the hypermedia program, but it is stated that they tried to print out the material at the beginning, but gave up later because of the complexity of this process:

> "I first used to print out [the online material]. But I gave up, because it would be 50 pages... I thought that it will be so much to

> print out... Instead, I saved them on a disc and read a bit from the file on disc. However, this method was also difficult since the images were distorted." **[S80 (G3P3C3)]**

Actually the learning management system does not permit to copy and paste the content easily, so users usually stated that they had to expend great effort to print out the online content.

6 of the 7 participants who printed out the material or at least tried to print out the material stated that it was difficult for them to focus on the content which is on screen instead of paper.

> "I had print-outs, because I'm drawing them with colors etc. I think that I cannot communicate with the subject. I even cannot understand if I read so [on screen], namely I cannot go into the content deeply. I cannot control the subject..." **[S14 (G3P2C3)]**

They usually said that it is difficult to change their habits that are being used for years. What they feel while reading something on screen is explained by a participant as similar to others' explanations:

> "I can easily access to Internet… Actually, I was thinking to study through the web site, but the printed material was on my hand anyway… Moreover, there is a habit; I don't used to read on computer screen up to now. Consequently, I read through the print-outs." **[S20 (G1P1C3)]**

As opposed to the findings above, one participant with high level of computer competency also stated that she tried to print-out the material, but she gave up since it

was difficult and time-consuming. She explained that she wanted to print out the material, since she always likes to read on paper:

> "I'm a kind of person who likes to read books.... presence of paper... I like this..." **[S4 (G1P1C1)]**

Participants' internet access opportunities were sought by the researcher whether it was important in terms of printing out the reading material or not. Although 2 of the students who studied on printed material emphasized the lack of the internet connection at home and explained that it was difficult for them to go to the laboratory for studying, most of them strongly emphasized their habits and beliefs for reading on paper instead of reading on computer screen. Table 4.3 presents the internet access opportunities of the students and their preferred materials to read.

Table 4.5 - Preferred Materials to Study and Internet Access Opportunities of the participants

Preferred Material / Internet Access Opportunties	Hypermedia	Print-out	Hypermedia & Print-out	Total
Internet access at home	5	2	1	8
No Internet access at home	4	3	1	8
Total	9	5	2	16

The ways of reading are differentiated among the participants. Data gathered through the observations and interviews indicated that six of the eight field-dependent participants usually need to scan once the whole content at the beginning of the study, and then read some parts in detail:

> "I'm just printing out after studying. For instance, I read once or twice, and then print out some parts which are important for me. I'm not only taking the bold phrases, and going on... Instead… I'm reading everything there…" **[S7 (G3P2C1)]**

These participants were usually getting the important points after scanning the whole content. They prefer to print out the important parts of the chapters or to take notes about them, or underlining the important points on the printed material to look at them again. Namely they usually mentioned a second look at the important points of the content. The observational data showed that most of the field-dependent participants needed to take detailed notes while studying, while the field-independent students tend to just read and pass.

On the other hand, most of the field-independent students do used to read the content not more than once. They usually indicated and talked about a more practical way of reading. Most of them stated that they once read the content by mainly focusing on some important points:

> "It was enough to only learn the terms… So I didn't need to read again." **[S18 (G1P1C3)]**

Analysis of the observations and interviews showed that the objectives of the chapters were usually skipped by the majority of the participants. Actually they found them to be unnecessary and unbeneficial to read. One of the participants' statements was important in terms of reflecting the others' thoughts:

> "Our books – at the department- always start with such things saying 'you should have learned these things at the end of this chapter'... I'm quite bored to see them for four years, so I don't look at them anymore." **[S4 (G1P1C1)]**

One participant stated that he was reading the objectives since he was reading the content by following the sequence of the hypermedia program and the objectives were the first topic of the each chapter. However, three of the sixteen participants were interested in the objectives of the chapters. They were reading the objectives to

be aware about the subject and about the new terms of the topic to be studied before starting.

As opposed to the objectives, major points which are given at the end of each chapter were appreciated by almost all of the participants. Especially the participants who used to study practically have benefited from these short summaries of the chapters. The observational data also indicated that participants usually deliberated the major points of the chapter. They tend to read them more detailed as compared to other parts of the content.

Participants have deliberated different points while reading the content. Some of them deliberated the definitions, while the other were especially interested in treatments or symptoms etc. after the data were grouped according to three categories of the study, it was cleared that the participants with high level of domain knowledge usually tend to study more practically, and prefer to scan the texts rather than reading in detail. They were scanning the content and reading only the parts which are unfamiliar with them. A participant explained how he used his prior knowledge while studying- as similar to other participants with high level of domain knowledge:

> "The subjects were commonly known... I had had some knowledge about first aid when I got my driving license, so I didn't look at basic knowledge. But the instructor informed us that there is continuously updated information on some subjects. I looked at subjects whether they were changed or not. If there is not any change, I didn't read it." **[S7 (G3P2C1)]**

The ways of reading are differentiated among the participants. Two different approaches were appeared after the reading-related data were analyzed. Some of the participants tend to read all of the content without any distinction, while the others tend to decide individually on some topics to read. Some of these students considered the assessment demands while selecting things to read, and tend to read the parts that

probably will be asked on exams, while the others considered the needs of a first aid provider and tend to read the important parts more detailed.

On the other hand, participants who were not at high level of domain knowledge tend to read more detailed than the others. They usually read the content, but preferred to read some parts more detailed because of the importance given to these special parts. The data which are grouped according to the cognitive styles of the participants indicated that most of the field-independent participants tend to think about the importance of the chapters through the first-aid provider perspective. Six of the eight field-independent participants stated that they are reading some chapters more intensely, since they think that a first aid provider should know it, and may easily face with such problems in real life. Most of them stated similar justifications about deliberating certain topics, as similar to this participant explaining why S4 read the CPR topic in detail:

> I read everything on the first chapter, since it was related to CPR. I read it very carefully because I believed that it [CPR] should be conducted perfectly. Yes… since I'm worried about it… **[S4 (G1P1C1)]**

However, there was a field-independent participant who didn't make a relation to real life, and stated a very practical way to study. Demands of the exams were the most determining factors for him to study. He also stated that he was not highly interested in the subject matter- First Aid.

On the other hand, most of the field-dependent students stated that they usually read the whole content and then read it again by focusing on important points which were determined through a more course-oriented perspective. Demands of the instructor, and the exams were the criteria for selecting the important parts to study. The following statement was reflecting a student's thought about printing out the important points to study again:

> "I later printed out the sections which I expected to be asked. Then, I read them again 1-2 hours before taking the exam. Then I took the exam." **[S7 (G3P2C1)]**

Participants usually appreciated the bulleted texts of the reading material. Most of the students stated that it was easy to read the bulleted texts, since they were regarded as summaries and preferred rather than the long sentence paragraphs. The observational data also showed that especially the students who studied practically skipped the long-sentence paragraphs and read the bulleted texts carefully.

The bold phrases within the reading material, and the explanations in boxes were also found to be beneficial by the students, since they found these emphasized phrases to be attracting their attention. Students usually thought that those points are important and deliberated these points while studying.

4.3.4. Segmentation of the Reading Material

Ten of the participants mentioned about the density of the content presented on each page. It was notable that only three of these ten students were field-independent, namely the field-independent students usually didn't prefer to talk about this issue. Seven of the ten participants appreciated the small-page presentation of the hypermedia program. While some of them stated that they felt themselves good because of their control on the content flow through the small page presentations and back and next buttons, some others emphasized their increased motivation while reading short pages. One of the participants obviously expressed his positive thoughts on small page presentation:

> "I found it very meaningful, because a large text usually disturbs the motivation. If you look here, you immediately see the thing: There are the symptoms given, then the treatments… They kept

them short, and it helps in maintaining the motivation, I think. You don't loose your interest."

Other two students stated that it was easy to access any topic randomly, since the pages were divided into small parts according to the titles.

> "If the content on each page would be long, we would need to find any specific subject within the page. I mean, for instance I studied this and this… Then I forget something later and need to remember. Now, I would want to see only this… Here I can see because of this title. Instead of a single long page…" **[S61 (G3P3C3)]**

Three of the ten participants stated that they preferred to see long page presentations. All of them were at low level of computer competency, and at different groups in terms of their cognitive styles. Two of them mentioned about the technical problems, and said that it disturbed them to click always on next buttons. One of the participants expressed the negative effect of small page presentation on his study:

> "For instance, to find something which is two pages before, you should go back two times, and then it is complicated… as I said before, if there would be long pages here, you can easily see the thing you don't remember just by going up instead of turning back." **[S80 (G3P3C3)]**

However, these three students stated that they mainly studied on print-outs and it could be easier for them to print out the long pages. One of these participants stated that she could compare different things given on the same page, in addition to her thoughts on printing out the long-page presentation easier:

> "I realized it since there were so much print outs- 110 pages. Each subject might be written as compressed. I'm so much clicking on Nexts. It might be better, if I wouldn't need to click on Nexts so much. It could be more things on each page, so it would be better." **[S20 (G1P1C3)]**

4.3.5. Using Visual Aids for Learning

Participants extensively benefited from the visual aids for learning on the web site. Analysis of both the interviews and observations indicated that half of the participants (8 of 16) regarded the visual aids including the images and movies as the most appreciated features of the hypermedia program for the majority of the participants. Even some of the students preferred to look at the pictures rather than reading the content on the page in detail. One of the participants expressed how he was using the images for learning:

> "Actually... Sometimes when I'm reading, I look at the image for example if there is available and see how it should be done. Sometimes I even don't read... I look at the picture and go on..." **[S36 (G3P3C1)]**

One of the mostly stated benefits of the images was their help in understanding the unknown terms. As stated at the previous paragraphs, students usually faced with difficulties related to the terms which are unfamiliar to them. However, images related to the procedures were used by many students instead of looking at the dictionary for the unknown terms. The following quotation is reflecting the thoughts of many students on the use of images to understand the unknown terms:

> "I especially use the pictures since I probably don't know the written information. I don't know the things which are unique to first aid course like the arm, leg,

> calf, shoulder, ridge etc. I don't know such things, so it becomes more understandable if explained with pictures." **[S7 (G3P2C1)]**

Besides the images, the movies on the hypermedia program were also appreciated by many participants, since they were enriching the monotonous climate of the course environment. Participants usually emphasized that they remember the things better if they see, and movies helped them in that way. They were found to be instructional, as much as they are funny.

Especially two of the field-dependent participants strongly emphasized how much they liked to use the movies that were limited on the web site. Although there were only two movies, students were really impressed by one of them which seemed like a scene from the real life:

> "There is a maneuver related to a drowned person. There is a video about it and I waited to download the video just to watch it in spite of low internet connection speed. It is because it was funny and I can still visualize it...It is really retainable." **[S26 (G3P1C2)]**

Although all of the participants stated positive thoughts on visual aids of the hypermedia program, it was notable that only the field-dependent students emphasized a different point which helped them to remember the procedures. Actually the main character on the images and movies was the instructor of the course. While talking about the visual aids on the hypermedia program, most of the field-dependent participants (5 of 8) stated that the images and the movies were very beneficial to them, and they helped in remembering the face-to-face classes, since the instructor was figured on these visual aids. On the other hand, the field-independent students didn't mention this detail while talking about this issue.

The common belief on the visual aids including the images and the movies was that they helped in remembering easily the procedures which are important to the context of First Aid. Another common belief was about the need for more images and movies. Two of the students who printed out the material without taking the images stated that they faced with many difficulties while studying, and the lack of images reasonably affected them in a negative way. Another student stated that she went to the computer laboratory to look at the images with the print-outs on her hand.

However, some technical problems were faced with related to the visuals on the web site. Since the internet connection speeds were not so good, and the image sizes were large, students sometimes couldn't wait the images to be opened. They sometimes read the texts, and passed without looking at the images since they were not opened immediately.

4.3.6. Simple Examination for Learning

Simple examination was used by almost all of the participants. The self evaluation tests at the end of each chapter were used to this aim, and usually stated as one of the most appreciated features of the hypermedia program. However, two of the participants who printed out the material were not aware about the self evaluation tests, and expressed the regret they felt since there were similar questions in exams.

Although some of the students did not mention anything about the self evaluation tests, others (11 of the 16) stated that they were useful in terms of indicating the points which were not understood by them exactly. Since the evaluation tests were giving the results with their correct answers, participants had the opportunity to turn back to the unclear point, and cover it again. One participant stated how the self evaluation tests were useful to her:

> "After the correct and incorrect answers are shown, I make a repeat according to them. What would it mean, or how would they be etc... I used it to turn back after realizing the points which I didn't understand." **[S14 (G3P2C3)]**

Moreover, two of the participants who were field-independent appreciated the self evaluation tests, since the results of were indicating their progress. Besides being assessed by the tests, the participants also stated that they felt themselves good after seeing the correct answers they have given.

One of the students from the faculty of engineering who was field-independent, and computer competent expressed a quite different strategy for studying. His main materials used for learning were the self-evaluation tests in that he was taking the tests at the beginning of the study, and then looking only at certain points on the content to which he couldn't give correct answers. Moreover, he suggested that the whole material should be consisted of questions and answers, and the students would only look at the related topic if they couldn't answer any question correctly.

There were differences among the participants in terms of the sequence to take the evaluation tests. However there was not any common pattern among the sampling categories. Some of the participants preferred to take the tests after the certain chapter is studied, while the others preferred to take all of the tests after studying all of the chapters. Despite the differences among the participants about how and why to take the tests, common thought on this issue was that these tests should include more questions than the current version.

4.3.7. Taking Notes for Learning

Although note taking is one of the commonly used strategies by the participants for learning in their traditional courses, for this course they used this strategy in a bit

different way than normal. First of all, both the interviews and especially the observations indicated that most of the participants tend to take notes about the important points of the reading material on the web site, since they couldn't underline these points as they did when reading on paper. A participant stated why he took notes while studying for the first aid exam:

> "What I couldn't do here was underlining. Therefore, I took notes. So I can say that there was nothing that I couldn't do here." **[S39 (G1P3C1)]**

Analysis of the observations indicated that students with high level of domain knowledge (4 of 5) usually took smaller and non-detailed notes. They explained that numbers, important terms etc. were important to them, since they could be forgotten easily. On the other hand, students with low level of domain knowledge (5 of 7) tended to take more detailed notes including the titles and main structure of the studied subject.

Two of the participants stated that it was difficult to take notes while reading through the computer screen. One of them stated that the physical discomfort caused by sitting in front of a computer compelled her to take smaller notes. Another participant considered the computers to be technological tools which don't allow using other additional tools. She stated that it is not sensible to use a dictionary or paper and pencil while reading on computer screen. It was seemed as a tool that should supply all needs of the users.

Two of the field-dependent students used to copy and paste the important points into a word document and print out them to read again before the exam. It was used instead of taking notes or underlining the important points. Actually their aim was to remember the important points before the exam. However there were also some participants who took notes not for remembering, instead they took notes because they thought that taking notes help them in understanding better.

4.4. Summary of the Findings

Analysis of the interviews, observational data and student logs indicated some differences in terms of learning strategies among the suggested groups of participants. Cognitive styles usually seemed to be important in terms of general study management strategies of the students. Field-dependent learners' statements indicated that they are faced with some difficulties because of not following the content sequence of the hypermedia program. Moreover, participants' decisions on what to focus on while studying were differentiated among the cognitive style groups.

On the other hand, different groups of computer competency levels showed different patterns in using hypermedia, while prior knowledge levels indicated little influence on participants' learning strategies or patterns to use hypermedia. Actually most of the data associated with interaction with hypermedia revealed to be related to the computer competency levels of the learners. Domain knowledge levels of the students were also important in terms of detail of study and navigational patterns.

CHAPTER 5

DISCUSSION AND CONCLUSION

In this chapter, findings of the study are discussed and their relation to the current literature is presented. Implications for practice and recommendations for further research are proposed.

5.1. Discussion and Conclusion

Individual differences -as a term- cover many variables ranging from the differences in personality characteristics to background-related diversities. Learning – as a phenomenon- has been sought through individual differences perspective by many researchers (Cano-Garcia, Francisco, Hughes & Elaine, 2000). The current research also pursued the individual differences point of view for understanding learning with hypermedia.

Cognitive styles – as a personality characteristic, and perceived computer competency levels and prior domain knowledge levels – as background related differences were the suggested individual differences among the participants of this study. Learning strategies of the students were sought in a hypermedia environment, and findings of the study indicated some differences among the learning strategies of the participants related to the individual differences. Moreover, some other factors related to subject-matter or participants' backgrounds were emerged during the analysis process. Findings are discussed in this chapter as based on the suggested individual difference

categories; so the *cognitive style* perspective, *perceived computer competency level* perspective, and *prior domain knowledge level* perspective are provided in order.

5.1.1. Learning with Hypermedia -Cognitive Style Perspective

Findings of the study suggest that cognitive styles of the students may affect the learning strategies while learning with hypermedia as accordance with many studies which emphasized the importance of cognitive style in learning with hypermedia including Dufresne and Turcotte, (1997), Riding and Sadler-Smith (1997), Ford and Chen, (2001), Chen (2002), and Triantafillou et al. (2003). The differences among the statements and experiences of participants from different cognitive style groups may indicate some differentiations between them.

First of all, it should be noted that findings of this study suggest that learners' cognitive styles may influence their learning strategies on a general manner. Actually, the study management strategies of the students for learning were found to be associated with their cognitive styles.

In this study, differences among the cognitive style groups were usually found to be related to their dependence on internal or external factors (Witkin & Goodenough, 1981; Saracho, 1997). This characteristic might be the most important characteristic of cognitive style preference influencing the learners' learning strategies in hypermedia environment. Actually, findings of the current study are strongly pointed out this issue.

Field-independent learners usually tend to be self-regulated in general. Their overall approach to learning is based on their own regulations and decisions. Laurillard (1993) suggests that students can control the pace and sequence of instruction in hypermedia environment and make their choices which should help in developing their cognitive structure. Although it seems to be easy for field-independent learners

to control the pace and sequence of learning, the field-dependent learners could fail in doing the same thing. For the current study, deciding on the specific parts to focus on within the content can be considered as controlling the pace and sequence of learning. Actually all of the students tend to determine on the importance of specific subjects in content or special subtopics within the subjects. Learners usually need to focus on these important parts of the whole content rather than trying to learn everything as much as detailed. However, the field-independent learners focus on things which they found to be important according to their own beliefs and feelings. They think of real life situations and decide on the important points according to their own criteria. On the other hand, the field-dependent learners are guided by the instructor's and exam's demands, so they prefer to focus on the subjects or topics which are important to the instructor or would be demanded by the exams.

Another finding related to controlling the pace and sequence of the learning is about the sequence to study. Many researchers claim that field-dependent learners prefer to follow a given sequence to study, while field-independents like to study randomly (Saracho, 1997; Chen, 2002).Findings of this study emerged in accordance with the current literature suggesting that the field-dependent learners usually confused about not following the sequence given on the hypermedia program. However, it is usually not a problem for field-independents to study by ignoring the sequence of the material given.

Another differentiation between the cognitive style groups was about reasoning. Although many learners faced with problems related to unknown terms while reading the course material, the field-dependent learners usually needed to use a dictionary while the field-dependents tend to elicit the meanings of the terms by reading the material and reasoning. It is suggested by Saracho (1997) that field-dependent people use external sources of information for self definition. Field-dependent learners' frequent use of dictionary to understand the term rather than reading the current material and thinking about the meaning might be explained by their dependence on external sources of information for self-definition. Moreover, using any external

resource – like a dictionary - was not appreciated by learners, since it resulted in loosing motivation.

Reading the content is one the most commonly used strategy for learning. However, the way of reading may differentiate among the field-dependent and field-independent learners. The field-dependent learners usually need to read the whole content more than once, while the field-independents usually don't need to read again. Actually this finding might be related to the field-dependent learners' need for external guidance. As claimed by Witkin et al. (1977), field-dependent learners face with difficulties if the cues are not provided on the materials which require higher order thinking. Actually hypermedia environment can be thought as a medium which usually provides the content without any cues, namely there is the content to be studied, and learners are left alone with this medium. The field-dependent learners in this environment may need to read more than once, since they wouldn't decide on the important points of the chapters, so may need to read the content in detail, while the field-independent students can easily determine on the importance of the topics and focus on them without reading again. This situation exposes a more practical way of studying for field-independent learners compared to field-dependents.

Visuals are the most appreciated features of the current hypermedia program. Actually the characteristics of the subject matter are important, since the first aid context necessitates extensive use of visuals embedded within the content. Visuals are suggested to help in increasing the motivation of the students by Heinich et al. (2002). Considering that the field-dependent people are usually motivated extrinsically (Witkin & Goodenough, 1981; Morgan, 1997; Saracho, 1997), one can understand their high interest in visuals compared to field-independents. So the quality of the visuals, or figures and people on instructional images are viewed on a more detailed way by field-dependent learners. On the other hand, the field-independent learners are suggested to be motivated intrinsically (Witkin & Goodenough, 1981; Morgan, 1997; Saracho, 1997), and external components might not be as much important as for the field-dependents.

For example presence of the course instructor on visuals can help in attracting the field-dependent learners' attention, and may help in overcoming the problem related to the lack of intrinsic motivation. Field-dependent learners' dependence on external sources and the claim that they are usually motivated extrinsically may help to understand their attention given to visuals on the hypermedia program

Summarizing the findings of this study related to cognitive style preferences, we can say that the main difference between the cognitive style groups affecting students' learning strategies is about learners' dependence on internal vs. external sources. Since the field-independent learners usually move on according to their intrinsic feelings and decisions, it is not difficult to regulate their own learning in hypermedia environment which doesn't provide guidance like an instructor in traditional learning environments. Moreover it provides them with the opportunity for reasoning and self-regulation. McIsaac and Gunawardena (1996) emphasized that the independent students who are autonomous and prefer to control their own learning tend to be more successful in distance learning courses. Actually the findings of this study indicated that field-dependent learners usually face with problems related to control of learning in hypermedia environment in that everything is presented, and learners are allowed to construct their own paths to learn as stated by Chen (2002). Lack of guidance about what to focus on, which sequence to follow etc., have affected the field-dependent learners negatively.

5.1.2. Learning with Hypermedia - Computer Competency Perspective

Learners with different levels of computer competency may act differently in a hypermedia environment. The findings of the study revealed different patterns to use the hypermedia program among different groups of students in terms of computer competency levels. Actually, competency in using computers were found to be important in terms of interaction patterns with hypermedia, while the cognitive style

differentiations appeared to affect the learners in a more general way like regulation of learning.

First of all, learners not perceiving themselves as computer competent visit the web site rarely and usually tend to print out the online reading material. The data that is retrieved through this study indicated that the learners with low level of perceived computer competency didn't use the hypermedia program to study. Instead, they prefer to print out the material and read through these materials. A very little group of these students had to study on the hypermedia program since they couldn't be able to print out the material because of the complexity of the printing out process. It was notable that they wanted to print out; despite they have internet access at home, while some of the computer competent learners preferred to read through the hypermedia program, although they didn't have access to internet at home.

Learners with low level of perceived computer competency - not surprisingly- faced with problems related to the use of hypermedia program. Actually the different levels of computer literacy among students and the lack of confidence in using computers were concluded by Montelpare and Williams (2000) as the common challenges in using Internet in higher education. Components like the disused links might seem not to be important to a designer, however these were usually considered as problems by the participants of this study with low level of computer competency. Since they don't perceive themselves as computer competent, little problems related to design which may not seem to be important to course instructor or designer of the program might result in decrease of confidence toward the hypermedia system.

Some difficulties which were emerged during the research related to computer competency levels of the students are discussed at the following paragraphs. These difficulties may also affect the learners' performances as concluded by Hörlscher and Strube (2000).

One of the problems with which non-computer competent participants face is about the use of the menu in hypermedia program. Since the sub-items of the tree-type menu were invisible until the user clicks on one of four main titles, learners who don't perceive themselves as computer competent faced with problems related to this issue. It was notable that on each case of difficulty they became discouraged to use the hypermedia program.

Most of the participants were satisfied about the presence of a menu, since it was providing the table of content in a structured way and giving the opportunity to access any content randomly. Although the learners with low level of computer competency considered the random access opportunity of the menu as an advantage, they on the contrary used the back and next buttons to go to pages that are even 3 pages before and/or after the current page. Actually the observational and interview data seem to be conflicted here.

As stated under the previous title that most of the field dependent learners were usually displeased about not following the content sequence of the hypermedia program. However, computer competent participants within the field dependent group were also seemed not to be displeased about studying non-orderly, similar to field-independent learners. So the need for following the given sequence of the material would also be related to computer competency levels besides being related to cognitive style preferences of the learners.

The density of the content on each page is an important issue which is sought sometimes by researchers. Almost all of the participants of this study were satisfied about the segmentation of the content into small pages. Learners usually thought that short page presentation is increasing their motivation, since it seems easy to read the less information on short pages. However, three participants who were at low level of perceived computer competency stated that it would be better, if there are more information on each page. Short pages meant much more pages, and so much more problems probable related to computers, or internet connection etc. They suggested

that there would be less technical problems, if there is much more information on each page, and less amount of pages in total. However an experimental study conducted by Gauss and Urbas (2003) concluded that field-dependent people are achieving better in short-page presentation, while the field-independents are more successful with large-page presentation as compared to short-page. Since our study is mainly dealing with the preferred strategies and patterns of the learners in hypermedia environment rather than their achievement, the findings might be conflicted. On the other hand, Gauss and Urbas's (2003) study dealt with only one variable which is cognitive style, so it could be possible to miss the effects of the computer competency levels of the participants on learning with hypermedia.

Palmquist and Kim (2000) also concluded that cognitive styles of the novice users are influencing their search performance in web, while the experienced internet users didn't indicate any difference in terms of their cognitive style category. The findings of the current study also suggested that the effects of computer competency levels of the learners should surely be taken into consideration while discussing the effects of cognitive styles on learning with hypermedia.

Summarizing the findings related to computer competency, it could be suggested that participants' computer competency level is a quite important factor affecting learning activities in hypermedia environment. Actually interaction patterns with the program are found to be strongly related to this preference rather than cognitive style preferences.

5.1.3. Learning with Hypermedia - Prior Knowledge Perspective

The main finding related to prior knowledge levels of the learners is about the detail of studying to learn. Learners with high level of prior knowledge used a more superficial approach to study, while the others maintained a deeper approach. Actually the students who were aware about the subject matter may not consider the course as much important as others.

For the current study, the only important point in terms of interaction with hypermedia program was about the knowledgeable participants' need for skipping the known parts, so they wanted more functional navigational tools so that it becomes easy to skip some parts. Although the random access opportunity provided by the menu was widely appreciated by almost all of the learners, participants with high level of domain knowledge especially appreciated this feature, since they sometimes want to skip some chapters without studying. Moreover, the back and next buttons might be placed allowing the competent learners to skip the pages without reading.

Last et al. (2001) and Hölscher and Strube (2000) concluded in their experimental studies that the domain knowledge of the users may effect their performance on web search task, since the knowledgeable users in their studies performed better than the others. Although this study didn't seek for achievements of the students, less knowledgeable participants didn't indicate any disorientation problem as proposed by Last et al. (2001). Actually some problems related to the use of hypermedia program were faced by less competent computer users as explained at the previous section.

On the other hand, Hölscher and Strube (2000) also emphasized the effect of computer competency level on the performance of the students which is consisting with the results of this study. Moreover searching something on the internet is a bit different then using an instructional hypermedia program. Namely, there are boundaries in hypermedia programs, so navigating within these programs may be less difficult than navigating on the Internet.

Furthermore, the hypermedia system used in this study was found to be quite simple to navigate by almost all of the participants. Actually the medium could also be important in terms of disorientation problems of the users. McDonald and Stevenson (1998) concluded that there are differences in terms of navigation efficiency between the knowledgeable and non-knowledgeable participants on different hypermedia designs. Actually the non-linear and hierarchical designs suggested superior

performance for knowledgeable users, while the mixed design was resulted in no difference between the knowledgeable and non-knowledgeable participants. Actually the hypermedia program used in this study could be regarded as having mixed design, since a hierarchical menu is provided besides the linear flow with navigation buttons. So, there is no difference emerged in terms of interaction patterns of the participants, or disorientation problems.

Learners with high level of prior knowledge used to read the content not more than once, while the other group usually needed to read again. Actually this finding might be confused with the effects of cognitive style preferences of the learners, since the field-independent learners also preferred to read not more than once. The common point might be learner's ability to determine the importance of some chapters or parts while reading. Namely, learners who can easily realize where to focus on with the help of either self regulation or prior knowledge might be executing more practical ways to learn. Related to the depth of the approach, learners with low level of prior knowledge spent less time then the others.

In terms of reading activities, there is also a disparity in detail offered while reading among the groups of learners with different levels of prior knowledge. Students with low level of prior knowledge might tend to read all content in detail, while the other group used to just reading the unfamiliar parts, and mainly scanning the rest of the content.

Learners' note-taking strategies could also be related to their prior knowledge levels. Since taking notes is one of the commonly used strategies by students in conventional courses, most of them also continue to use this strategy even in hypermedia learning environment. However they may need for detailed and structured notes, if the prior knowledge level is not high. On the other hand, learners with high level of prior knowledge may note only some specific terms and numerical data.

5.2. Implications

The current study examined a case regarding individual differences in hypermedia, so the findings cannot be widely generalized. However, the results exposed some suggestions for instructional technologists and designers about how to deal with individual differences while developing an instructional hypermedia system. Besides the individual differences perspective, results helped in understanding learners' point of view in instructional hypermedia environment.

Findings of the current study revealed the importance of learners' dependence on external or internal factors while regulating the learning. Actually learners who are dependent on external factors – field dependents – usually faced with problems related to being alone while learning with hypermedia. It would be better, if the hypermedia programs are designed in a more structured way for the field dependent learners to provide them guidance. Emphases on important points, relation to real life situations, and motivational elements should be used extensively in instructional hypermedia to make them engage in learning.

Field-dependent students are usually confused about not following the sequence of the content on hypermedia program. So the web site designers should provide the content in accordance with the syllabus for field-dependent students.

Since the findings of the current study indicated that field-dependent learners need for external sources to verify any information, while the field-independents used to reasoning, if something is not clear. The information on hypermedia program should be provided so detailed that the field-dependent learners could find everything they need. On the other hand, it could be better for field-independents not to provide all of the information on hypermedia program, so to allow them reasoning.

Positive effects of visuals on students' learning and satisfaction were also exposed by the findings. Without considering the individual differences, all of the participants

strongly emphasized that visuals helped them in understanding the concepts and procedures, besides being enjoyful. Although the characteristics of the current subject matter are also important, it would not be wrong to advise the designers about supporting the hypermedia with visuals if possible. Actually the motivational components are especially important to the field-dependent learners as mentioned at the first paragraph of the *implications* section.

The simplicity of the current hypermedia program was appreciated by almost all of the participants. However, there were also problems with which the students at low level of computer competency faced related to the use of menu. Considering the existence of the learners who are not computer competent, designers should keep the design as simple as possible.

5.3. Suggestions and Recommendations for Further Research

The effect of individual differences on learning with hypermedia is a recent trend which needs a substantial amount of further research. The current study examined a single case which cannot be widely generalized. However, the results exposed some suggestions for instructional designers on how to deal with individual differences while developing an instructional hypermedia system. On the other hand, there is a need for further research in this area at different contexts. Based on the limitations of the current study and findings and methods of previous researches, the following recommendations are made to be investigated by further research.

The study indicated that the backgrounds of the participants and characteristics of the subject matter play an important role in learners' learning strategies and hypermedia using patterns. So, more research regarding individual differences should be conducted in different contexts. Especially the subject matter –First Aid- which is covered by the current study was a very specific one, so the strategies applied by the

learners are probably specific to this situation. A different content might necessitate different strategies to learn.

Cognitive style related findings of the current study mainly indicated differences in terms of regulation of learning; however interaction patterns with the hypermedia were appeared to be related to the computer competency levels of the participants. Cognitive style preference refers to an internal process, so experimental studies could be conducted to elicit the effects of cognitive style on interaction patterns with hypermedia.

The current study suggested that the computer competency level of the learners is a very important factor affecting their use of instructional hypermedia. Any research which aims to investigate the role of cognitive styles in hypermedia learning should definitely consider the computer competency levels of the participants besides the cognitive style preference.

Participants' achievements and overall situation in terms of academic success were not the considerations of this study. However, students' self-expectations and academic accomplishment are usually suggested as important factors in predicting current approach to learning. Namely, the learning strategies in general could be affected by these factors, also in hypermedia environments. Further research investigating learning in hypermedia environment should take these factors into consideration.

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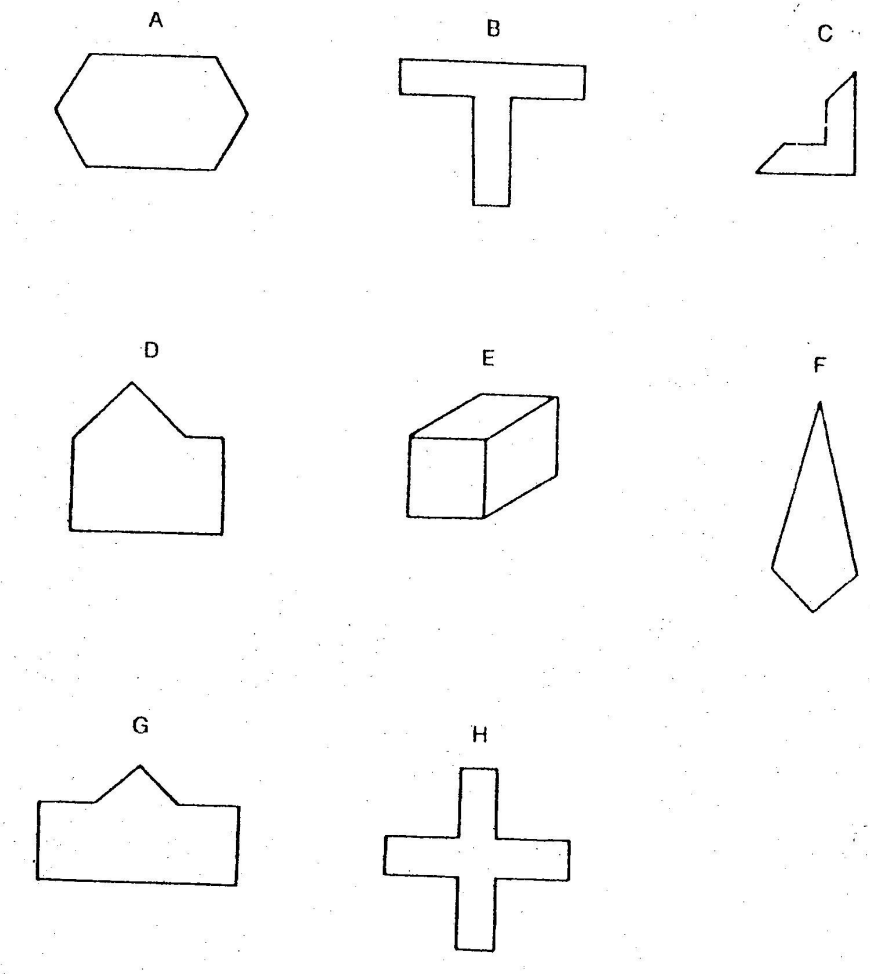
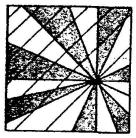
APPENDIX A

GRUP GİZLİ FİGÜRLER TESTİ

BASİT ŞEKİLLER

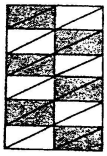


3



"G" isimli basit şekli bulun

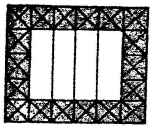
4



"E" isimli basit şekli bulun

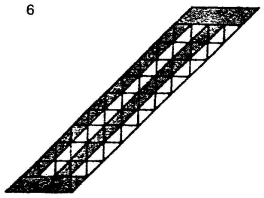
Devam edin

5



"B" isimli basit şekli bulun

6



"C" isimli basit şekli bulun

Devam edin

APPENDIX B

COMPUTER COMPETENCY QUESTIONNAIRE

BİLGİSAYAR BİLGİSİ

YÖNERGE: Lütfen aşağıdaki soruların her birini cevaplayınız. Her bir yeterlik için, yeterlik ile ilgili bilginiz varsa **EVET**'i işaretledikten sonra, söz konusu yeterlikle ilgili tüm soruları cevaplayınız. Yeterlikle ilgili hiçbir bilginiz yoksa **HAYIR**'ı işaretledikten sonra o alandaki soruları boş bırakıp, diğer yeterlik alanına geçiniz.

Her bir yeterlik alanı başlığının altında o alanla ilgili bazı işlemler verilmekte ve her bir işlem için kendi yeterlik derecenizi belirlemeniz istenmektedir.
Yeterlik derecesi 1'den 4'e kadardır ve "1" en az yeterliliğe, "4" ise en çok yeterliliğe karşılık gelmektedir.
Kendinizi her bir işlem için, yeterlik derecelendirmesinin hangi aşamasında görüyorsanız, o sayıyı işaretlemeniz gerekmektedir.
"1": Hiç Yeterli Değilim
"2": Biraz Yeterliyim
"3": Oldukça Yeterliyim
"4": Tam Anlamıyla Yeterliyim

Yeterlik 1A: KELİME İŞLEMCİ PROGRAMLARI (MS Word gibi): Bu programlar elektronik/bilgisayarlı daktilo makineleri gibi çalışır ve dokümanınızı kaydetmeden / basmadan önce düzeltme ve değişiklik yapmanıza izin verir.
Kelime işlemcilere karşı aşinalığınız var mı?
( ) Evet (Birinci soruya devam edin) ( ) Hayır (Bir sonraki bölüme geçin)

	Yeterlilik Dereceniz
1. Bir doküman açabilme veya oluşturabilme.	① ② ③ ④
2. Basit komutları kullanabilme (kes, kopyala, yapıştır vb.)	① ② ③ ④
3. Yazı karakterleri (koyu, italik, altı çizili, yazı karakteri değiştirme, yazı rengini değiştirme vb.) ve hizalama gibi basit formatlama işlemlerini yapabilme.	① ② ③ ④
4. Nesne ekleme nesne boyutunu değiştirme ve nesnenin yerini değiştirme gibi biraz daha karmaşık işlemleri yapabilme.	① ② ③ ④
5. Dosya birleştirme, dosya transfer etme, tablo oluşturma veya düzeltme gibi ileri düzey kelime işlemci fonksiyonlarını kullanabilme.	① ② ③ ④

Yeterlik 1B: VERİTABANI UYGULAMALARI (MS Access gibi): Bu programlar, isimler, adresler, telefon numaraları gibi verileri düzenlemenizi ve bilgiyi çeşitli şekillerde yeniden düzenlemenizi sağlar.
Veritabanı uygulamalarına aşinalığınız var mı?
( ) Evet (Birinci soruya devam edin) ( ) Hayır (Bir sonraki bölüme geçin)

	Yeterlilik Dereceniz
1. Bir veritabanı dosyası açabilme veya oluşturabilme.	① ② ③ ④
2. Veritabanında alan oluşturabilme veya varolan alanda düzeltme yapabilme.	① ② ③ ④
3. Veritabanına veri girebilme.	① ② ③ ④
4. Veritabanı raporu oluşturabilme.	① ② ③ ④
5. Bir tablo işlemci dosyasını veritabanıyla birleştirebilme.	① ② ③ ④

Yeterlik 1C: TABLO İŞLEMCİ UYGULAMALARI (MS Excel gibi): Bu programlar, bir çalışma sayfası oluşturmanız için içine metin, sayı veya formül girebileceğiniz hücreleri oluşturan satır ve sütunlardan oluşacak şekilde tasarlanmıştır.
Tablo işlemci uygulamalarına aşinalığınız var mı?
( ) Evet (Birinci soruya devam edin) ( ) Hayır (Bir sonraki bölüme geçin)

	Yeterlilik Dereceniz
1. Bir çalışma sayfası açabilme veya oluşturabilme.	① ② ③ ④
2. Satır ya da sütunların boyutunu değiştirmek, veya satır ya da sütun ekleyip silmek suretiyle çalışma sayfasının formatını değiştirebilme.	① ② ③ ④
3. Formüller ve ileri düzeyde hesaplama işlevlerini kullanabilme.	① ② ③ ④
4. Verilerin grafiklerini oluşturabilme	① ② ③ ④
5. Rapor oluşturabilme ve çıktı alabilme.	① ② ③ ④

Yeterlik 1D: YAZILIM UYGULAMALARI/INTERNET: Burada, Internet Servis Sağlayıcıları ve arama motorları kullanmak suretiyla WWW üzerinde araştırma yapma veya metinler, görsel, görsel-işitsel, senkronize ya da asenkronize yollarla diğer bilgisayarlarla iletişim kurmanızı sağlayan programları kullanma yeterliği söz konusudur.
Telekomünikasyona aşinalığınız var mı?
( ) Evet (Birinci soruya devam edin) ( ) Hayır (Bir sonraki bölüme geçin)

	Yeterlilik Dereceniz
1. E-posta işlemlerini gerçekleştirebilme. (e-posta alma ve gonderme, e-postayla dosya eklentisi alma ve gonderme vb.)	① ② ③ ④
2. Internetten dosya yükleme ve açma.	① ② ③ ④
3. FTP (Dosya Transfer Protokolü) yoluyla dosya transfer etme.	① ② ③ ④
4. Internet üzerinde etkileşimli görsel veya işitsel iletişim araçlarını kullanma.	① ② ③ ④
5. Bir Internet Servis Sağlayıcının (Ttnet, Superonline vb.) seçimi.	① ② ③ ④
6. Internet erişiminin nasıl yapıldığı.	① ② ③ ④
7. Tartışma siteleri, arama motorları ve benzeri Internet araçlarının kullanımı.	① ② ③ ④
8. Sık kullanılanların (Favorites) oluşturulması ve bunların kullanılması.	① ② ③ ④
9. Göz Gezdirici (Internet Explorer, Netscape Navigator vb.) seçeneklerini değiştirebilme.	① ② ③ ④
10. Görsel veya işitsel plug-in'lerin (Flash animasyonu, video dosyası vb.) yüklenip kullanılabilmesi.	① ② ③ ④

Yeterlik 1F: YAZILIM UYGULAMALARI/SUNUMLAR VE YAYINCILIK: Bu programlar, okul gazeteleri, ilanlar ya da iki boyutlu grafik veya asetatlı sunumlar gibi masaüstü yayıncılık uygulamalarını yürütmek üzere tasarlanmıştır.
Sunum yaratma ve masaüstü yayıncılığa aşinalığınız var mı?
( ) Evet (Birinci soruya devam edin) ( ) Hayır (Bir sonraki bölüme geçin)

	Yeterlilik Dereceniz
1. Powerpoint gibi bir program kullanarak derslerinizle ilgili sunum hazırlayabilme.	① ② ③ ④
2. Kullanımı kolay programlardan biri ile bir Web sayfası hazırlayabilme. (Frontpage, Dreamveawer vb.)	① ② ③ ④
3. Grafik oluşturmak için çizim programları kullanabilme. (Photoshop, Flash, AutoCAD vb.)	① ② ③ ④
4. Photoshop gibi programlar kullanarak resimler üzerinde çalışabilme ve değişiklik yapabilme.	① ② ③ ④
5. Animasyon, ses vb. özellikler içeren ileri seviye bir sunum hazırlayabilme.	① ② ③ ④
6. HTML, Java veya diğer Web dilleri ya da programları kullanarak Web sayfası hazırlayabilme.	① ② ③ ④

Yeterlik 2A: BİLGİSAYAR İŞLETİMİ: Bilgisayar ve kullanıcının nasıl etkileşime gireceğini ve kullanıcının bilgisayarı nasıl kullanacağını belirleyen programları ve yazıcı ve tarayıcı gibi aygıtları kullanma becerisidir.
Herhangi bir işletim sistemine aşinalığınız var mı?
( ) Evet (Birinci soruya devam edin) ( ) Hayır (Bir sonraki bölüme geçin)

	Yeterlilik Dereceniz
1. Bir işletim sistemini (Windows 3.1, Windows 95/98/2000, Mac OS, vb) etkin (bir programı çalıştırma, dosyalama, bir programı silme vb) bir şekilde kullanabilme.	① ② ③ ④
2. Birden fazla işletim sistemini etkin bir biçimde kullanabilme.	① ② ③ ④
3. Çoklu görevleri (iki veya daha fazla pencere veya program arasında çalışabilme) anlama ve kullanabilme.	① ② ③ ④
4. Bilgisayara, CD aracılığıyla yeni program (oyun, hazır paket programlar vb.) kurabilme.	① ② ③ ④
5. Kısayol tuşlarını kullanabilme. (bir komutu yerine getirmek için bir, iki veya daha fazla tuşa basma)	① ② ③ ④
6. Masaüstü (Desktop) kullanabilme ve masaüstü ayarlarını (görev çubuğu, ekran ayarları vb.) yapabilme	① ② ③ ④
7. Dahili faks/modem kullanabilme.	① ② ③ ④
8. Bilgisayarı formatlayarak yeniden işletim sistemi kurabilme.	① ② ③ ④
9. Bir programlama dili kullanabilme (Pascal, C, Visual Basic vb.)	① ② ③ ④

Yeterlik 2B: BAKIM/ONARIM: Bilgisayar üzerinde temel bakım onarım işlemlerini yapabilme, basit donanım ve yazılım problemlerini çözebilme veya bilgisayardan ayrı fakat bilgisayarın kapasitesini artıran yazılım programlarıyla birlikte kullanılan ekipmanları (yazıcı, tarayıcı, kamera gibi) kullanma becerisidir.
Bakım-onarım ve tarayıcı ve yazıcı gibi destekleyici birimleri kullanmaya aşinalığınız var mı?
( ) Evet (Birinci soruya devam edin) ( ) Hayır (Bir sonraki bölüme geçin)

	Yeterlilik Dereceniz
1. Tarayıcı ve yazıcı (printer) kullanabilme.	① ② ③ ④
2. Bilgisayarınızı video kamera ve mikrofon bağlayıp kullanabilme.	① ② ③ ④
3. Dijital kamera ile resim alabilme, bunları bilgisayarınıza kaydedebilme ve sonra bu resimlere erişebilme.	① ② ③ ④
4. Basit yazılım sorunlarını çözebilme.	① ② ③ ④
5. Basit donanım sorunlarını çözebilme. (bilgisayarın modemi veya tarayıcıyı tanımaması ya da kabloların doğru şekilde bağlanması vb.)	① ② ③ ④
6. Bilgisayar yazılımlarını güncelleyebilme.	① ② ③ ④
7. Bilgisayar donanımını güncelleyebilme veya ses kartı veya modem gibi dahili birimleri kurabilme.	① ② ③ ④
8. Bilgisayara USB aracılığıyla harici donanımlar ekleyebilme.	① ② ③ ④

APPENDIX C

INTERVIEW SCHEDULE

Giriş

Merhaba, ben Esra Yecan. Bilgisayar Eğitimi ve Öğretim Teknolojileri alanında yüksek lisans yapıyorum ve yürüttüğümüz araştırma kapsamında Internet üzerinden aldığınız First Aid dersi ile ilgili olarak sizinle görüşmek istiyorum. Bu görüşmede amacım, öğrencilerin online bir ders alırken ne tür deneyimler yaşadıklarını öğrenmek, olumlu ve olumsuz yanlarını ortaya çıkarmaktır. First Aid dersini alan farklı bölümlerden öğrencilerle görüşme yapıyorum. Araştırmanın amacı, öğrencilerin bir dersi internet üzerinden alırken izledikleri çalışma yöntemlerini ortaya çıkarmak ve onların yaşadığı olumlu ve olumsuz deneyimleri öğrenerek online ders tasarımına katkıda bulunacak veri toplamaktır. Bu nedenle sizin, bu online dersi alırken ne tür deneyimler yaşadığınız, bu derse çalışmak için nasıl bir yöntem izlediğiniz, aldığınız bu dersten yola çıkarak, online bir derste olması ve/veya olmaması gerektiğini düşündüğünüz özelliklere yönelik düşüncelerinizi öğrenmek istiyorum. Görüşlerinizi benimle paylaşacağınız için şimdiden teşekkür ederim.

- Görüşmemize başlamadan önce, görüşmemizin ve görüşmemizde konuşulanların gizli olduğunu ve araştırma sonuçlarını yazarken kimliğiniz ile ilgili bilgilerin rapora kesinlikle yansıtılmayacağını belirtmek isterim.
- Benim First Aid dersiyle ve dersin web sitesiyle herhangi bir bağlantım olmadığını, sadece araştırma amacına uygun olması nedeniyle bu dersi seçtiğimizi, dolayısıyla fikirlerinizi objektif bir şekilde belirtme konusunda hiçbir tereddüt yaşamamanız gerektiğini söylemek isterim.
- Görüşmemizin kaydedilmesi için izin verir misiniz?
- Görüşme sonunda istemediğiniz bazı bilgilerin kayıttan çıkarılmasını isteyebilirsiniz.

- Görüşme kayıtlarını yazılı hale dönüştürdükten sonra, metinleri araştırmada kullanmadan once size gönderip sizin onayınızı alacağımı, üzerinde daha sonar değiştirme ve düzeltme şansınız olaacağını belirtmek isterim.
- Başlamadan önce, bu söylediklerimle ilgili belirtmek istediğiniz bir düşünce ya da sormak istediğiniz bir soru var mı?
- Bu görüşmenin yaklaşık 30 dakika süreceğini tahmin ediyorum. İzin verirseniz sorulara başlamak istiyorum.

Başlangıç Soruları

1. Internet erişiminiz var mı? Varsa nereden bağlanıyorsunuz?
2. Aldığınız bilgisayar dersleri veya kursları var mı? Varsa hangileri?
3. Dersin web sayfasını takip ediyor musunuz? Ne kadar sıklıkla?
4. Daha önce online bir ders aldınız mı?
5. Bilgisayar kullanma becerisi yönünden kendini nasıl değerlendirirsiniz?
6. Bu dönem First Aid dersi nasıl işlendi? Kısaca anlatır mısınız?

Sorular

1. Bir dersi internet üzerinden almanın bir öğrenciye etkileri konusunda ne düşünüyorsunuz?

    Prompt:
    - Bilgiye ulaşma açısından
    - Öğrencilerle ve hocayla iletişim açısından
    - Öğrenme açısından

2. Sınıfta hocayla yüzyüze olarak aldığınız bir dersin herhangi bir konusuna çalışmanızla, internet üzerinden aldığınız First Aid dersinin bir konusuna çalışmanızı kıyaslayabilir misiniz? Arada ne gibi farklar görüyorsunuz?

    Prompt:
    - Kullandığınız materyaller açısından
    - Yöntemler açısından
    - Harcadığınız süre açısından

- Değiştirmek zorunda kaldığınız alışkanlıklarınız oldu mu? Bu sizi nasıl etkiledi?

3. Sitenin kullanılabilirliğini nasıl değerlendirirsiniz?

Prompt:

- İçeriğin sıralanışı yönünden
- Sayfa dizaynı yönünden
- Konular ve sayfalar arası geçişler yönünden
- Önerileriniz var mı?

4. First Aid dersinin herhangi bir konusunu web üzerinden çalışırken zorluklarla karşılaştınız mı? Ne tür zorluklar?

Prompt:

- Dersin online olmasından kaynaklanan zorluklar?
- Sitenin tasarımı ve kullanımıyla ilgili zorluklar?
- Bu zorlukların kaynakları ne olabilir sizce?
    - Öğrenci kaynaklı
    - İçerik kaynaklı
    - Tasarım kaynaklı

5. Bu zorlukların giderilmesi için sizce neler yapılabilir?

Prompt:

-Eklenmesi, çıkarılması veya değiştirilmesi gerektiğini düşündüğünüz kısımlar?

6. Web sitesinden herhangi bir konuyu çalışırken, sitede "iyi ki böyle bir özellik var" diye düşündüğünüz kısımlar oldu mu? Neden?

7. Web sitesinden herhangi bir konuyu çalışırken, "keşke şu olsaydı" veya "keşke şöyle olsaydı" dediğiniz kısımlar oldu mu? Neden?

8. Konuyla ilgili eklemek veya görüş bildirmek istediğiniz başka konular var mı?

APPENDIX D

OBSERVATION SCHEDULE

Purpose

The purpose of this observation is to discover students' behaviors while studying a chapter with a hypermedia program. Since the learning process is unclear, observing the students during a usual study by the use of think aloud method will provide information about the process, so the following research questions will be tried to find out to have a deep understanding of studying with hypermedia:

1. What are the navigational patterns of the students?
2. How do the students sequence the content?
3. What are the interaction patterns of the students with verbal-visual aids?
4. Which additional materials are needed while studying from a website?
5. Which parts of the site were preferred to use by the students?

Data Collection

A usual study session of each participant will be observed by the researcher. The subject to be studied will be given by the researcher and participant will be notified to study that special topic as similar to his/her usual works. At the beginning of the observation, participants will be notified about thinking aloud while studying. It will be explained that they would say everything which come to their mind without thinking of its relevance to the context. There is no time limitation for studying, and additional materials like paper, pencil, and dictionary will be provided to make them feel studying at home. The behaviors and explanations of the participants will be

noted by the observer. Data collection will be done as considering the following aspects of the studying process:

1. Computer using patterns: General pattern to use the computer will be observed.
2. Navigational pattern: The pattern for navigating the site and use of navigational aids will be observed during the study.
3. Interaction pattern: The interaction pattern of the student with the content in hypermedia program (textual and visual elements) will be observed.
4. Studying Activities: Activities that the student uses while studying will be observed.
5. Additional materials: The use of additional materials, while studying the chapter will be observed.

Coding System for Field Notes

The following coding categories will be used in order to classify the field notes. Additional coding categories will be added if necessary.

Navigation patterns
Sequencing the content
Use of visual aids
Use of texts
Use of feedback
Problems
Expectations

APPENDIX E

[S50 (G1P1C1)] Burda [internette] olması bence faydalı çünkü yani en azından hızlanıyorsunuz, öbür türlü yani 5 saat ders yapsanız öğrenci gene anlamıycak, sonuçta yine çalışacak.

[S116 (G1P3C3)] Ya ben aslında internete biraz karşıyım. Bu şekilde verilmesine karşıyım..hani ya düşünsenize, 1.5 ay ders gördük, önümüzdeki 1.5 ay yatacaz.Yani sıfır... ilkyardımla ilgili hiçbirşey yok böyle. İnternetten takip edin. Niye edelim ki yani?

[S14 (G3P2C3)] İnternetten olduğu için önemsiz olduğunu, o yüzden daha az ders çalışmak gerektiğiyle ilgili kanı var. Bende o yok ama öyle bi kanı var... daha az çalışıyor insanlar.

[S20 (G1P1C3)] Fotokopiyi..yanınızda taşıyabiliyorsunuz her yerde çalışma olanağınız var. İnternet üzerinden çalışmak için yani bilgisayarın karşısında vakit geçirmemiz gerekiyordu...

[S4 (G1P1C1)] Bu... yani açıkçası sadece sınavdan önce girdim, onun dışında hoca bize mail attığında işte şey diye announcement'a bi gözatın diye... Ancak o zaman girdim yani.

[S18 (G1P1C3)] Sınav yaklaşırken, son 2 haftasında sınavdan önce. Biraz baktım notlara filan... Ondan once sadece assignment var mı, announcement var mı diye bakıyodum. Ondan sonra da sınav için baktım. İlk sınavın hemen öncesinde baktım, okudum.....

[S20 (G1P1C3)] yani bu sadece pek girmediğim için dersin sayfasına sık sık, bazı duyuruları geç alıyordum. Yada geç haberim oluyor bazı şeylerden.. Mesela bi ödev verilmişti, o ödevden bakmadığım için geç haberim oldu. Belki online olmasaydı, ders sırasında öğrenebilirdim ödev olduğunu.

[S68 (G1P3C3)] Sürekli gerek asistan gerek hocamız şeyler veriyodu, duyurular bırakıyordu, ödev olabiliyodu... Ve onları takip etmek hani önemli diye geçiyodu. ama tarihte işte çok fazla bu noktada kullanılmıyordu. Yani birilerinden mutlaka duyuyoduk sınav nerde olacak, ödev verilmişse falan, bunla ilgili... Onları yapmak çok tercihim olmamıştı...

[S68 (G1P3C3)] Yani şey bize en iyi gelen... siteye en son girişinizden sonra hani yinelenen eğer duyurular falan varsa, site açılır açılmaz karşınıza gelmesi falan... en verimli noktası oydu bence yani... çünkü atlanabilir hani bunu sürekli siteden kontrol etmek. ama burda karşımıza çıkınca... yani verimliydi bence...

[S41 (G3P1C2)] Mesela o özellikle bu programda beğendiğim bir şey. Anouncement şeklinde genellikle anonslar şeklinde o sayfalar açılıyor orda görebiliyoruz ne var ne yok diye. Ama bazen hoca söyleyince kaçırabiliyoruz.

[S61 (G1P3C3)] Şimdi mesela chapter2'ye girince direk, chapter2 görünse şurda... görünmüyor... chapter2'nin içindeki bi yere basınca, burası... ben anlıyorum ki, buraya tıkladığım an, şurası 2 olacak, ama olmuyor, 1'in introduction'ında duruyor. Part2'yi tıkladığımda da... geri kapanış var... şöyle... ancak chapter1'i tıklayacağım, böyle chap1'in içi açılacak, ondan sonra chapter1'den bişey seçeceğim... anca o zaman oluyor. Direk 2 diyince 2 gelmiyor yani...

[S80 (G3P3C3)] Ya genel olarak dizaynı falan iyi ama bazı garip şeyler vardı, mesela part kısmında, partlara basıyorum basıyorum, bişey çıkıyor, o şey çıkıyor... yani sonuçta kavrıyorsun ama kavrayana kadar bişey oluyor…

[S41 (G3P1C2)] Yani, [menüyü] kullanmadım tabi. Ama seçenek olarak ordan [menüden] açtım bir tane burdan next yaparak gittim.

[S114 (G1P3C1)] Bu kısmı güzel yani. Ya herşeyi yazıyo.... ne hangi konuyu aradığın belli yani. Yani sadece part 2 şu konuda, işte alt chapterları yazmasaydı kötü olurdu yani. Mesela bu chapterın altında falan yazıyo yani herşey...

[S14 (G3P2C3)] Ya şey... burdan yani burası [menü] olmasa yani sadece bu bölüm olursa, karışıyo birbirine... hangisinin altında hangisi var, ne var ne yok falan filan... birbirine karışıyor... yada ben karıştırıyorum, bilmiyorum... ama bu olunca çok daha açık.

[S4 (G1P1C1)] Ya şey falan güzel mesela .. kitapta bu nerdeydi falan diye bakmak yerine, bilmem kaçıncı ney nerdeydi böyle, bilmem nerden nerde bahsediyordu falan demek yerine burda böyle biraz daha kolay görebiliyorum onları hani chapterların başlıklarına tıkladığımda falan...

[S14 (G3P2C3)] Burdan yani burası [menü] olmasa yani sadece bu [konu anlatılan] bölüm olursa, karışıyo birbirine... hangisinin altında hangisi var, ne var ne yok falan filan... birbirine karışıyor... yada ben karıştırıyorum, bilmiyorum... ama bu olunca çok daha açık.

[S50 (G1P1C1)] Ama erişim olayı da bence iyi çünkü konular falan sol tarafta content menüsünde sıralandığı için, direk erişimimiz... şeyimiz var. Her tarafa erişebiliyorsunuz.

[S114 (G1P3C1)] direk nerde yanlış yaptığımı bulabiliyodum yani bu sayede. işte content.. ya ben direk... bu kısmı güzel yani. Ya herşeyi yazıyo.... ne hangi konuyu aradığın belli yani.

[S7 (G3P2C1)] Bütün konuları gösteriyor. Atıyorum, üçüncü chapterdasınız... bişey aklınıza takıldı birinci chapterdan. Onu çok rahat bulabiliyorsunuz geri dönerek. Onu şey olarak... şu Next, Previous tuşlarıyla değil de, şu baştaki outline'dan çok kolay ulaşabiliyorsunuz, yerini hatırlıyorsanız eğer.

[S9 (G3P1C1)] Burdan bakıyodum sol taraftan. Böyle tek tek sayfa geçmektense... Bilmediğim mesela, foreign bodies hiç duymadım. Sadece buraya gelip bu kısma bakıyodum böyle... şöyle...Burayı okuyodum.

[S4 (G1P1C1)] böyle hani next falan hani böyle biraz daha şey olması... kendi elimle yönlendirdiğim falan böyle hani sürekli aşağı scroll down yapıp okumuyorum yani, next yapıyorum

[S36 (G3P3C1)] Normalde ben işte normal dersler. Online olmayan derslerimde, işte bi hafta çnceden ancak yetebildiği için zaman, bi hafta önceden başlıyorum. Bunda da konular işte rahat bilinen konular olduğu için işte 2 gün öncesinden bi gezdim okudum, notumu aldım.

[S20 (G1P1C3)] İlerde bi durumla karşılaştığımda, mesela en azından bi yanık diyelim... yanığa baktığımda gördüğümde, ne kadar şiddetli olduğunu anlayabilirim veya neyle yanmış olduğunu da bulabilirim. Ona göre benim yapmam gereken birşey var. Yani treatment daha önemli...

[S4 (G1P1C1)] Şimdi bi ilk chapter'ın hepsini tamamını okudum, çünkü CPR'la falan ilgiliydi. Onu yani çok böyle dikkatli okudum çünkü bi de onu hani mükemmel yapmak gerektiğini falan da düşündüğüm için... evet... onu merak ettiğim için.

[S18 (G1P1C3)] ama o mesela şu şeylere bakmadım, işte belirtileri nelerdir... Mesela bir yanığı belirtilerini bilmesem de anlayabilirim. O yüzden fazla bakmadım o tür şeylere…

[S7 (G3P2C1)] ... belirtileri... tedavisi.... bu tarz önemlişeyler... onların sorulabileceği aklıma geldi. Yani genel sınav sorusudur bunlar yani... atıyorum... çok ayrıntı değil de... genelde böyle sorulabilecek şeyler kendini belli ediyor.

[S26 (G3P1C2)] Yani tamam anlıyorum şeye göre böyle sıralanması gerekiyor, notlar olarak böyle sıralanması gerekiyor ama işlemesi de... eğer notlar böyle sıralanıyorsa, dersin işleniş şekli de öyle olmalı. Çünkü ben ne bileyim 3. chapter'ı atlamış olduğum için şey oluyorum, rahatsız oluyorum. Yani onu özellikle mi işlemedik... işlemedik değil de... neden onu daha sonra işliyoruz?

[S80 (G3P3C3)] Ya çıktı alacaktım... 50 sayfa tutar yani o kadar 50 sayfa çok olur diye alamadım çıktı. Vazgeçtim... diskete kaydettim onun yerine... evde disketi taktım, ordan baktım biraz. Ama o bile çok zor oldu yani çünkü fotoğraflar motoğraflar bi sürü kaydı.

[S14 (G3P2C3)] Print-outlarım vardı çünkü ben onları renk renk çizerim... falan yani. Böyle iletişim kuramıyormuşum konuyla gibi geliyor. Ya anlamıyorum da böyle okuduğumda... yani şey yapamıyorum, konunun içine giremiyorum. Konuya hakim olamıyorum.

[S20 (G1P1C3)] Yani internete de kolay girebiliyordum... ya aslında internetten çalışacaktım ama notlar elime gelince... bi de alışkanlık var, buna alışık değilim sonuçta... bilgisayar üzerinden birşey çalışmaya, okumaya pek alışık değilim. O alışkanlıkla yine... o notlardan çalıştım.

[S4 (G1P1C1)] ben hani kitap okumayı falan seven bi insanım, o böyle kağıt olayı falan... onu seviyorum böyle...

[S7 (G3P2C1)] ben şey yaptıktan sonra, ders çalıştıktan sonra çıktı alıyorum zaten. Mesela bir defa okuyorum, iki defa okuyorum. Çok önemli gördüğüm yerleri ondan

sonrasında alıyorum. Yani ben sadece bold olan kısımları alıp geçmiyorum yani. Yine de herşeyine kadar okuyorum.

[S18 (G1P1C3)] Hani zaten sadece terimleri bileyim, ikinci kez okumaya bi daha şey yapmadım, yani gerek duymadım.

[S4 (G1P1C1)] Bizim işletmede de kitapların başında in the end of this chapter diye şunları yapıyo olmalısınız, aynen burdaki gibi... Onlar artık beni 4 yıldır çok sıktılar, bakmıyorum artık.

[S7 (G3P2C1)] genel bildiğimiz şeylerdi. Ehliyet alırken de ilkyardım... ehliyet aldığımda da işte ilkyardımda biraz bilgim olmuştu. o tür temel bilgilere fazla bakmadım. Ama işte hocamız demişti, sürekli değişen bilgiler var falan demişti. Değişip değişmediğine baktım. Aynıysa pek okumadım.

[S4 (G1P1C1)] Şimdi bi ilk chapter'ın hepsini tamamını okudum, çünkü CPR'la falan ilgiliydi. Onu yani çok böyle dikkatli okudum çünkü bi de onu hani mükemmel yapmak gerektiğini falan da düşündüğüm için… evet... onu merak ettiğim için.

[S7 (G3P2C1)] ... sorabilirler dediğim yerleri aldım... çıktısını... onların çıktısını aldım daha sonrasında. Sınava gelmeden önce 1-2 kere daha okudum. O şekilde sınava girdim.

[S80 (G3P3C3)] Sadece ordan [siteden] sınavda çıkabilecek birkaç ayrıntıyı anlamaya çalıştım, o kadar... yani mesela bebeğe 4-5 basıydı, yetişkine daha fazla, birkaç cm. Daha fazla... yoksa ben onu öğrenmek için değil de, daha çok sınava yönelik okudum yani.

[S14 (G3P2C3)] Zaten hocanın anlatımından da neyin önemli olduğu anlaşılıyor. Onun neye önem verdiği anlaşılıyor. Ona göre çalışıyorum. Bunda öyle değil. Bunda herşey orda öyle duruyor. Ne önemli, ne önemsiz? Sen karar vermek zorundasın.

[S36 (G3P3C1)] Bence çok mantıklı. Çünkü bi yazının uzayıp gitmesi motivasyonu zaten düşürür. Yani çünkü şöyle hemen baktın mı, bu konuyla ilgili işte ne bileyim şeyleri vermişler... semptomları vermişler, treatmentları vermişler. Burayı da böyle kısa tutmuşlar. Bunu... yani motivasyonu sağlıyor bence.. yani kopup gitmiyosun...

[S61 (G3P3C3)] Öyle uzun sayfalar olsa arasından bulmak gerekirdi, yani mesela ben şunu çalıştım diyelim, bunu da çalıştım... sonra şuraya gelince bunu unuttum, hatırlamak istedim. Sadece bunu görmek isterim yani böyle... ve görebiliyorum başlığı olduğu için... öyle bi bütün sayfa halinde verilmesindense....

[S80 (G3P3C3)] bi de yani mesela 2 sayfa önceki şeyi bulabilmek için, 2 kere geri gidiyorsun, sonra karışıyor falan... yani dediğim gibi biraz daha uzun olsa, 2 kere geri geri gitmek yerine, biraz daha yukarı çıkarak, o hatırlayamadığın şeyi çok daha rahat görürsün yani...

[S20 (G1P1C3)] Yani mesela... onu da şeyden farkettim. Çok fazla çıktı vardı mesela110 sayfa... bunlar belki daha her bir konu sıkıştırılıp yazılabilirdi. Ne kadar çok şey... mesela next yapıyorum. Yani bu kadar çok Next'e basmam gerekmeseydi belki daha iyi olabilirdi. Yani bi sayfada daha çok şey olabilirdi. Daha iyi olabilirdi...

[S36 (G3P3C1)] Sonuçta... yani mesela okurken bazen şey yapmıyorum ben mesela bakıyorum resme resim olduğu zaman resme bakıyorum ha böyle yapılacakmış. Hatta bazen okumuyorum bile... resme bakarak geçebiliyorum.

[S7 (G3P2C1)] özellikle resimleri kullanıyorum çünkü büyük ihtimalle yazılanların birçoğunu bilmiyorum. O işte ilkyardım dersinde özellikle işte kol, bacak... bilmemne... baldır, omuz, sırt falan... o tarz şeyleri bilmiyorum. Eğer resimle anlatılırsa daha açıklayıcı oluyor.

[S26 (G3P1C2)] bi manevra var işte. Boğulan birisiyle ilgili. Onun mesela videosu var ve ben direk böyle bilgisayarımın o sırada interneti yavaş olmasına rağmen, onun yüklenmesini bekledim sadece, sırf onu izlemek için. Çünkü eğlenceli ve direk... hala daha gözümün önüne geliyor. Çok şey... akılda kalıcı birşey...

[S14 (G3P2C3)] Yanlış ve doğruları şey yaptıktan sonra, çıktıktan sonra, onun üzerinden de tekrar yapıyorum. İşte bu ne demekmiş, bunlar nasıl oluyormuş filan diye, neresini anlamadığımı anladıktan sonra, o konulara geri dönmek için kullandım.

[S39 (G1P3C1)] burda yapamadığım birşey altlarını çizemedim. İşte o yüzden not aldım. O yüzden yapamadığım birşey yok diyebiriz.

APPENDIX F

SCREENSHOTS

The following screenshots are showing different parts of the hypermedia program.

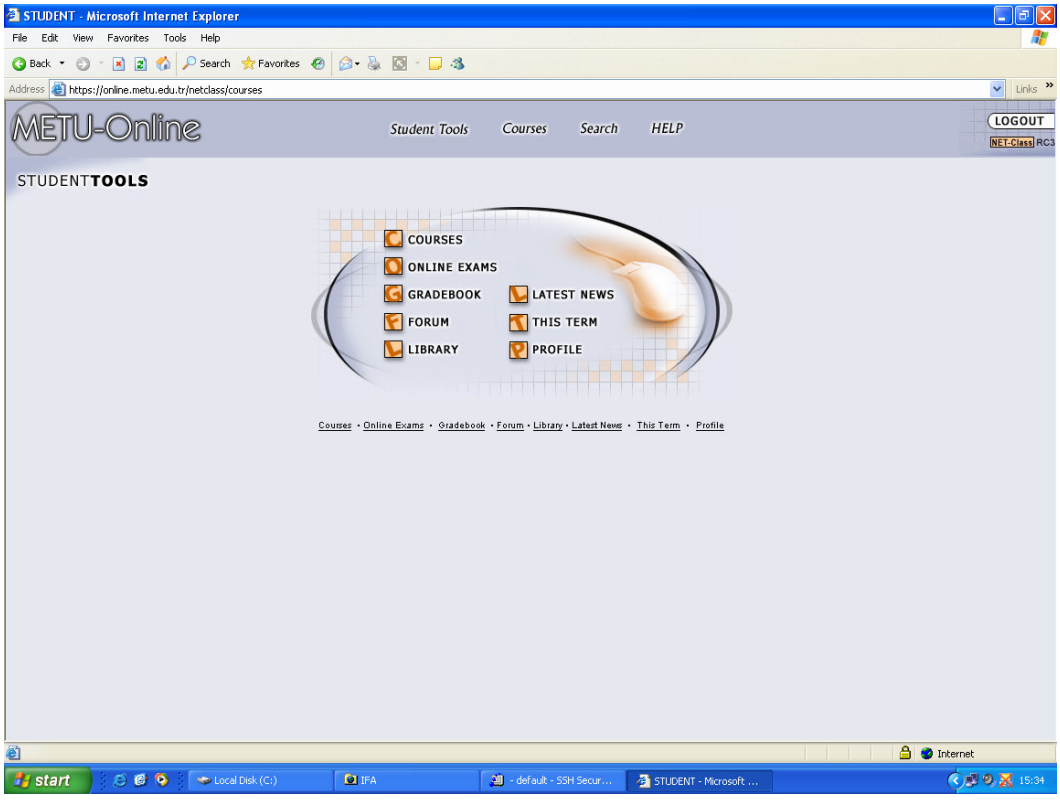


Figure F.1. A screenshot from the entrance page of the LMS and Student Tools for the LMS provided.

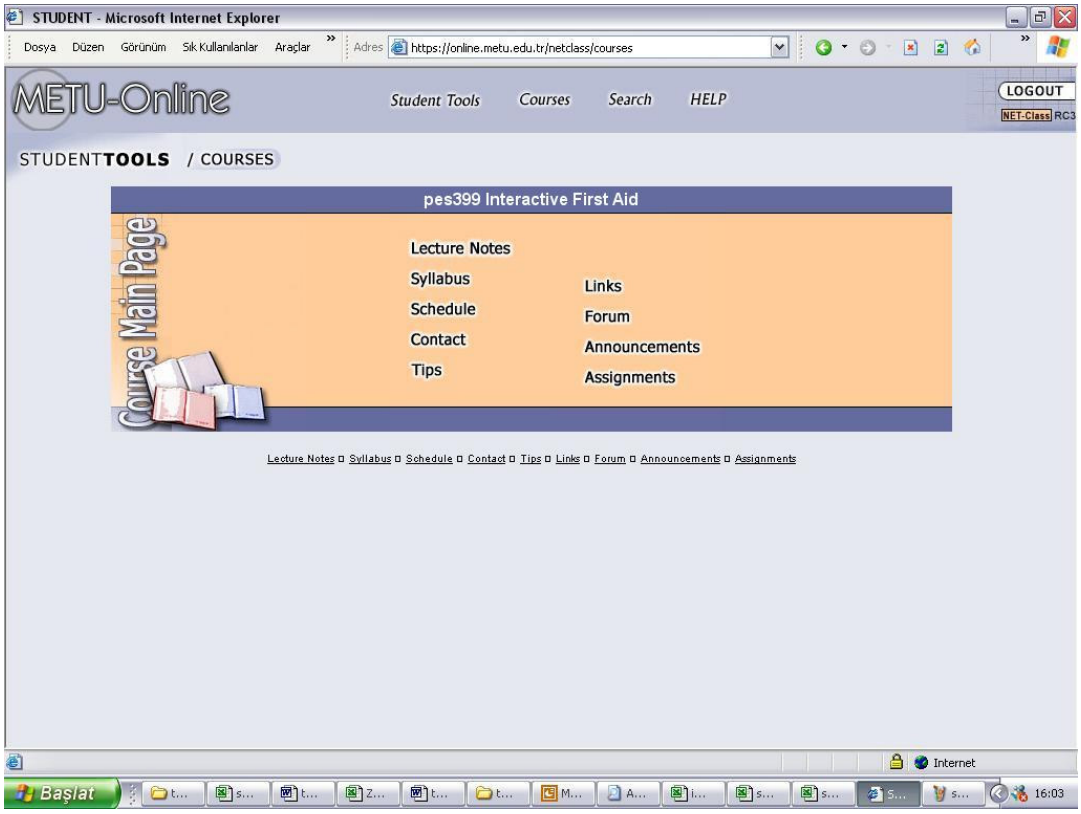


Figure F.2. A screenshot from the entrance page of the First Aid Course and Students Tools for the course provided.

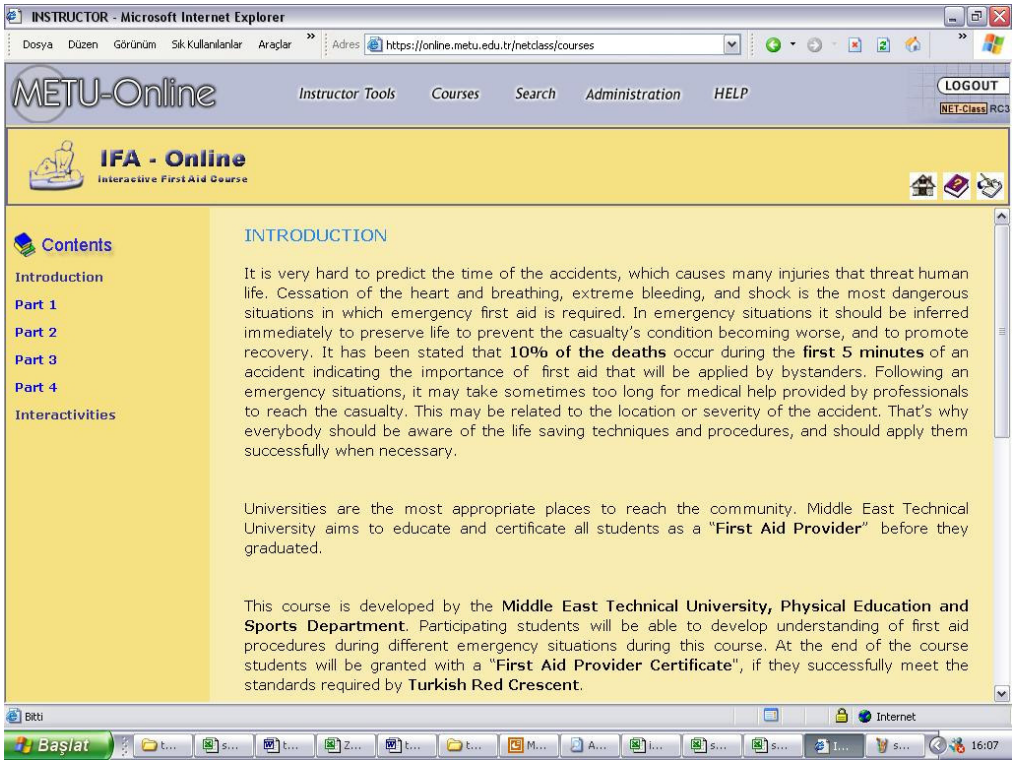


Figure F.3. A screenshot from the entrance page of the lecture notes for PES339.

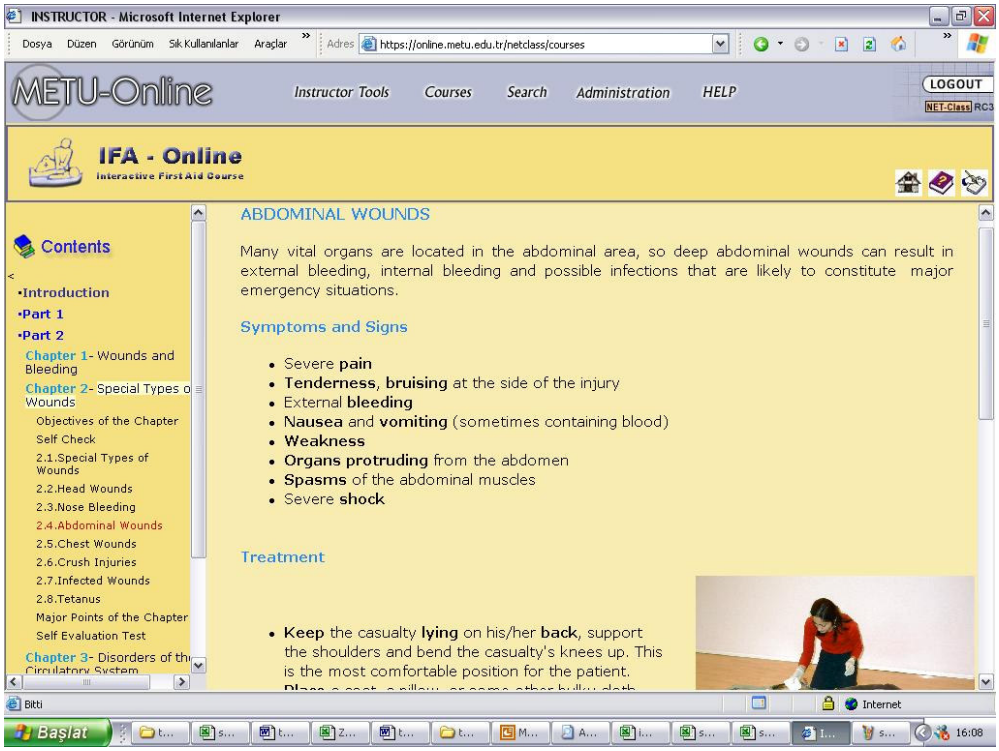


Figure F.4. A screenshot from the content presentation part of the lecture notes for PES339.