

ASSESSMENT OF WEB-BASED COURSES: A DISCUSSION AND ANALYSIS OF LEARNERS' INDIVIDUAL DIFFERENCES AND TEACHING-LEARNING PROCESS

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ABSTRACT

This study examined the role of individual differences and the quality of the teaching-learning process on learning outcomes in a web-based instructional environment, and explored the implications of those variables on the design, delivery and evaluation stages of web-based instruction. The study used data from two web-supported courses, one is undergraduate, and the other one is graduate. One of the major findings of this study was the need for providing different formats of materials and different sources of information in order to enrich the content on the web. Another important finding was the importance of providing sufficient guidance for using both web-based environment and communication tools since this guidance has a direct effect on learning outcomes. The findings of this study showed that each learner has different characteristics and preferences in their learning process. When instructors provide rich media and material sources, individual differences does not yield differences on learning outcomes.

INTRODUCTION

Innovation in the development of technology has introduced different concepts for the teaching-learning process other than classrooms and homes. Many terms like web-based instruction, distance education, and life-long learning have gained popularity with this rapid developments in the 21st century. Hence, educational institutions are getting shaped by these emerging technologies, and the web has becoming an inevitable part of instructors' daily activities. Thus, in order to integrate these new emerging technologies into the existing curricula, it is obvious that instructors should take steps carefully. Thus, instructors have to "... create educational materials that instructionally sound while delivered effectively through their intended media." (Osciak & Milheim, 2001, p. 355).

Educators have to consider all the possible factors which may have possible effects on the teaching-learning process, in order to improve quality of instruction. Researchers have been trying to solve educational problems by shedding light on a more effective environment, and to do so, they have been trying to systematize the steps or actions which take place during the teaching-learning process. Moreover, they have been outlining the variables which the educators have to consider. Although most of the researchers congregate in some common points, some may point out different factors according to their perception about the teaching-learning process (Carroll (1963); Bloom (1976); Bims & Moore (1993); Huitt (1995); Walberg, (1974)).

Investigating proposed models of teaching-learning process brings us to the point that many factors of the teaching-learning process are categorized generally as; learner characteristics and quality of instruction which seem to have considerable effect on learning outcomes. Here, learner characteristics refers to the special attributes of learners shaping their cognitive and affective characteristics, whereas the quality of instruction refers to the design and delivery of instruction as well as the teachers' qualifications.

The effective integration of technology is another factor directly affecting the teaching-learning process. Mellon (1999), considering the effectiveness of technology stated: "For technology-based learning to be effective, teachers must select materials that help meet carefully defined instructional objectives and integrate them into learning experiences that motivate and excite learners" (p. 34). Thus, to benefit from the technology integrated into existing learning environments, two key points are crucial: Which technology to choose and what degree to integrate the chosen technology. This point is also underlined by Knapp & Glenn (1996): "As the amount of technology has increased in schools, more attention has been paid to creating an environment that is conducive to its effective use" (p. 20).

For many of the teaching-learning processes, the most effective approach may not be pure traditional instruction or pure web-based instruction but a mixed approach combining the best features of each. As stated by Horton (2000), web-based and traditional instruction can be combined so that one can benefit from the advantage of the strengths of each. However, the question to be raised is "how effective is web-based and traditional instruction combination in the teaching-learning process?". Newby, Stepich, Lehman and Russell (1996) stated that among three major points, one or more can justify the investment done in the creation and use of instruction. These three points are; increased instructional effectiveness, increased instructional efficiency and increased instructional appeal (p. 9, 11). Sanders & Morrison-Shetlar (2001) have supported the traditional instruction by web technologies and tried to find out the attitudes of the learners toward this new system. Reporting the web components' highly positive effect on student learning, critical-thinking and problem-solving skills, the researchers suggested the following: "... instructors should use the Web for the posting of course syllabi, grades, quizzes, questions, and materials that encourage student-to-student and student-to-faculty interaction" (p. 251).

To sum up, learning environments created by using instructional technologies, not only make the learning environments richer by supplying a variety of resources, but also motivate the learner by supplying a more visual and attractive learning environment. Thus, educators have to deal with the factors which have a direct impact on learning. Thompson, Simonson & Hargrave (1996) specified their opinions on this topic by stating: "Understanding the learner and the process of organizing instruction and learning are the critical issues of educational technology" (p. 63).

RESEARCH METHOD

This research is undertaken to assess the role of entry characteristics of students and the teaching-learning process on learning outcomes in a web-supported instructional environment, and explore the implications of these variables on the design, delivery and evaluation stages of web-supported instruction. This research study included the following research questions:

- What is the role of entry characteristics of students in a web-supported environment?
- What are the instructional and communication preferences of the participants?
- How did students assess the quality of the teaching-learning process in general?
- What are the students' perceptions about the web site of the course?

Sample

The participants of this study were the students who enrolled two web-supported traditional courses offered by the Computer Education and Instructional Technologies Department of a state university in Turkey. One of the courses was an undergraduate course and the other was a graduate one. For the undergraduate course, 43 out of 65 3rd year students (11 female, 32 male) participated in the study. For the graduate course, 9 out of 12 students participated in the study; 2 female and 7 male.

Procedure

At the first class meeting, students were asked to participate in the study voluntarily and were given time to complete the instruments. The instruments used in this first meeting, aimed to collect data for identifying the entry characteristics of students.

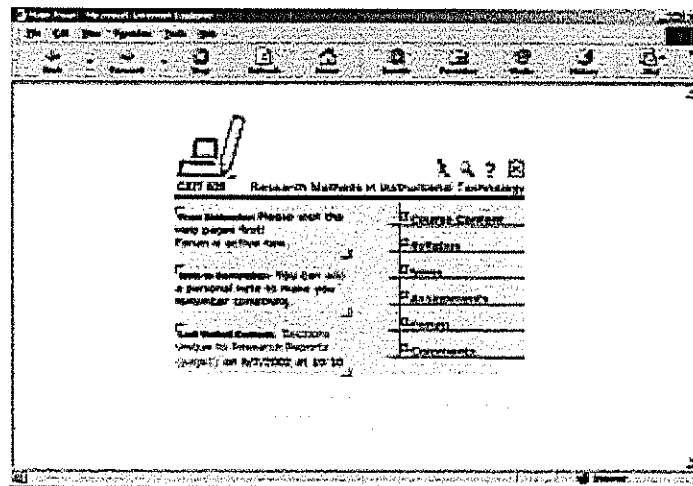
To assess the quality of instructional content, the quality of the instructor and the quality of the design and delivery process for each online course, the questionnaire determining the quality of web-supported instruction in were administered to the whole class at the end of the semester during the courses' final examination. The final grades of students were obtained from the course instructors to determine their academic performance.

The researcher also conducted structured focus group interviews with students in order to investigate their perceptions in depth about the web site at the end of the semester. These focus group interviews aimed to explore the phenomena which could not be revealed through the other instruments.

Web Sites of the Courses

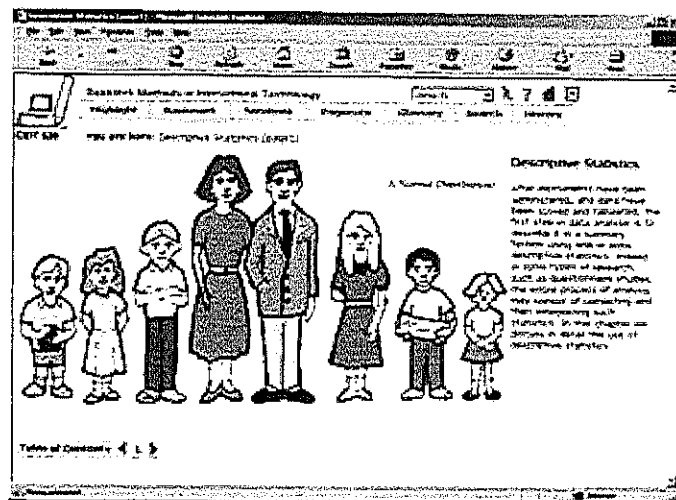
For this study, one graduate and one undergraduate courses given by two different instructors were examined. The graduate course was named as "Research Methods in Instructional Technology" and the undergraduate course was named as "Computer Networks and Communication". For both courses, the same web tools were used with the same features (Figure 1). The web tools were originally designed and developed by Ozcelik (2002). The content of the graduate course was adapted from the course textbook (Fraenkel & Wallien, 2000) and other textbooks by the researcher, where the content of the undergraduate course was directly adapted from a commercially well-known source.

FIGURE 1. THE MAIN PAGE OF THE WEB SITE FOR THE GRADUATE COURSE



The course content is divided into chapters and when a chapter is selected, more detailed content page appears (Figure 2). In each chapter, both before and after reading the content, the student can take a test both before and after covering the course content for self-evaluation. After taking the self-check test, students can read the objectives and then view problem statements through which they can get an idea about the content and topic after answering the problem statements. The navigation in all the pages is user driven, so students can select any option or topic they want at anytime. After reading the chapter content, students come to the summary part at the end of each chapter under the heading 'Major Points'. After studying the content, students can take the self-evaluation test to get feedback about their performance.

FIGURE 2. SAMPLE CONTENT PAGE FOR THE GRADUATE COURSE



FINDINGS

Entry Characteristics of the Students

The participants in this study were predominantly male for both undergraduate (74%, $n=43$) and graduate (78%, $n=9$). Of the graduate respondents, 67% didn't have previous on-line course experience whereas 80% of undergraduate participants did.

In order to assess students' entry characteristics, students' university entrance exam results were analyzed. The results indicated that both graduate and undergraduate students had similar scores on the national university entrance exam. (Mean: 506.00, Std. Dev: 43.4, Mean: 512.55, Std. Dev: 9.9, respectively).

Pertaining to students' GPA scores, graduate students had higher scores (Mean: 3.5, Std. Dev: 0.7) than undergraduate students (Mean: 2.9, Std. Dev: 0.6). Finally, graduate students (Mean: 34.9, Std. Dev: 2.6) scored higher than undergraduate students (Mean: 30.9, Std. Dev: 3.9) on the Brookover's Academic Self Concept test.

In terms of communicational and instructional preferences, respondents answered 4 questions and ranked the related items starting from 1 as representing the least preferred method (Table 1).

Properties of The Teaching-Learning Process

In order to assess students' views on the teaching-learning process, respondents answered questions on their instructor, course content, and web site of the course. Perceptions of the students on the course content are presented one-by-one in Table 2.

TABLE 1. MEANS AND STANDARD DEVIATIONS FOR RANKING OF PREFERRED INSTRUCTIONAL METHOD, INSTRUCTIONAL MEDIA, EVALUATION METHOD, AND COMMUNICATION METHOD

Preferences	Undergraduate Course		Graduate Course	
	M	SD	M	SD
Instructional Method				
Lecture	5.16	2.42	6.22	1.99
Group Work	4.35	1.80	5.00	1.12
Discussion	4.37	1.83	4.00	1.22
Instructional Games	4.16	1.31	3.89	1.45
Drill and Practice	2.70	1.91	2.33	1.66
One-to-One Tutorial	3.33	1.94	3.78	2.05
Computer Aided I.	3.95	1.81	2.78	2.05
Instructional Media				
Printed Material	4.65	2.13	5.00	1.73
Work Books	3.91	1.81	4.11	1.90
Course Books	4.26	1.83	4.22	1.09
Journals/Papers	4.51	1.71	4.89	1.83
Audio	4.28	1.78	4.78	1.92
Visuals	3.16	1.85	2.56	2.07
Film/Animation	3.19	2.40	2.44	2.13
Evaluation Method				
Group Projects	3.93	1.82	2.78	1.79
Individual Projects	3.12	1.94	2.11	1.17
Observations in class	4.26	2.08	4.33	1.94
Essay Test	4.91	2.27	6.11	2.03
Multiple-choice Test	3.93	1.86	5.11	1.05
Short-answer Test	3.91	1.66	4.00	1.58
Mixed-type Test	3.95	2.05	3.56	1.74
Communication Method				
Electronic Mail	3.61	1.84	3.56	1.88
Discussion List	3.63	1.68	3.78	1.48
Forum	3.51	1.49	4.00	1.32
Chat	2.85	1.41	4.11	1.76
Audio Conference	3.80	1.49	3.44	1.74
Video Conference	3.51	2.21	2.11	1.76

TABLE 2. MEANS AND STANDARD DEVIATIONS FOR EACH ITEM ON THE PERCEPTIONS ABOUT THE CONTENT

	Undergraduate Course		Graduate Course	
	Mean	S.D.	Mean	S.D.
1. Enough information on the purposes and objectives of the course has been provided.	2.67	.61	3	0
2. The topics and their contents covered on the web site were at a sufficient level to teach the subject matter efficiently.	2.40	.74	2.78	0.44
3. The selection of titles and sub titles for topics was done in a logical manner.	2.85	.36	3	0
4. The course content was rich enough and visually appealing.	2.25	.77	2.44	0.73
5. The course content was easy to understand and fluently worded.	1.97	.80	2.56	0.73
6. The course content was presented in a logical manner.	2.57	.63	3	0
7. The examples in the topics were illustrative enough.	1.77	.80	2.56	0.73
8. Audio-visual materials supplied within the course content were sufficient.	1.87	.80	2.22	0.67
9. The related web site addresses to support the course content were provided.	2.50	.71	2.44	0.88
10. Enough information on assessing student performance was provided.	1.87	.75	3	0

For the undergraduate course, except for item-numbers 5, 7, 8, and 10, the mean responses appeared to indicate that these respondents were satisfied with the logical structure and topics of the content (85%), navigation of topics (65%), and information about the course purpose and objectives (75%).

Although there is variability in the responses of the undergraduate group, the mean responses of the graduate group appeared to indicate that they were satisfied with the properties of the content.

In terms of the perceptions of the students to the web site, all items are presented in Table-3. The results indicated that students in both groups favored navigation and usability through the web site. Results also showed that the choice of colors was another item also favored by students, since the selected colors did not put any constraints on the eyes.

On the other hand, the greatest percent of participants (79.5%) indicated that they were unsatisfied with the print support made available on the web site for the course content. For the items questioning the visual appeal of the web site and opportunities for communication, the respondents' answers were neutral.

TABLE 3. MEANS AND STANDARD DEVIATIONS FOR EACH ITEM ON PERCEPTIONS ABOUT THE WEB SITE

	Undergraduate Course		Graduate Course	
	Mean	S.D.	Mean	S.D.
1. The web pages were designed in such a way that any topic was easily accessible at any time.	2.74	.63	2.56	0.88
2. Navigation throughout the web site was easy.	2.76	.53	2.78	0.44
3. Downloading speed for web pages was fast enough.	2.87	.33	2.22	0.83
4. The web site was designed in such a way that it made it easy to start at any page or topic, thus making it possible to surf the site.	2.79	.52	2.78	0.67
5. Web pages were visually appealing.	2.07	.80	2.22	0.67
6. Course handouts were designed in such a way that they could be printed at any time.	1.23	.48	1.56	0.88
7. Sufficient instructive opportunities for communication and discussion were provided throughout the course.	1.92	.77	2.22	0.97
8. The colors used on the web pages were carefully selected and did not put any constraint on the eyes.	2.87	.40	2.89	0.33

Qualitative Data Analysis

The interview results for the undergraduate and graduate students were analyzed separately. However, most responses obtained from both groups were similar. Therefore, the results of qualitative analysis are presented together for the both groups.

Perceptions on the Instructional Design of the Web Site of the Course

To find out the perceptions of students about the instructional design of the web site, their views on the instructional supplements such as syllabus, cognitive tools, and other utilities like index, help, additional materials supplied by the instructor were asked. Almost the same common points of criticism were stated among all interview groups.

When the interview results are analyzed, the most remarkable point seems to be the fact that most students preferred to print out the web pages since they disliked reading the text off a computer screen. One of the undergraduate students

said: "I already do spend a lot of time on the computer, so I do not wish to spend any time I have allotted to homework and studying on the computer, either".

Students also reported the advantages of reading from paper by comparing the computer screen and printed materials. They stated several reasons for taking print outs to study the course content. One of the undergraduate students explained the reason as: "When you work on the computer, whether you are at home or in the computer lab, you are limited to a sitting position, which leaves you immobile. On the other hand, the paper increases your mobility, and you can underline the text, take notes, and even compare two pages by putting one next to the other".

Students had similar perceptions about the utilities provided to them. They stated that they valued the "search" option since such option provides a quick access to the page they want to go. They also stated adding the "glossary" utility to the web site would be more helpful in order to find information with the key-word they look for. About the "glossary" on the site, one student stated: "... in some topics there are words whose meanings we do not know. If these words were defined in the glossary we could look them up by clicking on the word".

Undergraduate students also expressed their wish for more interactivity. One student said: "More drill and practice as to make the web site more interactive can be added. For example, the site could tell us how to place computers in a lab, and how to connect them to each other".

Perceptions on Visual Design of the Web Site of the Course

For the purpose of taking the perceptions of students about the visual design of the web site of the course, their thoughts on user interface, navigation, and supplied visual materials were solicited. Most common points stated by the students both as advantage and disadvantage are listed as follows.

The web site was reported to be consistent, which is an important point in visual design. On this topic, one student stated: "Pictures and texts were located in the same place on all pages. This was good. In my opinion, there was consistency in the web site which I think was pretty good".

Most students stated that they liked the user navigation and navigating through the web pages was as easy as possible. One undergraduate student said: "The web site is well-designed, by well-designed I mean that access is easy. You can know which page you visited last, and you can see where you are on the site. ... It is good in terms of the properties supplied". The web site was designed in a manner that students could see under which chapter and subtopic they were, and this feature was favored by students. The reason stated by the students for this favoritism was that they never got lost in so many web pages within the web site.

Most students reported that they liked the user interface. One undergraduate student commented about the page itself by stating: "Interface was good; it does not tire the eyes. It is not crowded, so you do not get confused. When the topics are presented, there is a picture next to the text, which makes it easier to understand the content. When we learn by seeing, the retention increases". One graduate student emphasized the importance of supporting the texts with pictures, since it makes the topic easier to be understood.

Perceptions on the Course Content provided on the Web Site

In order to find out their perceptions about the content provided in the web site of the course, students were asked what they thought about features like content sequence and details. Among many ideas the most frequently reported ones are listed as follows.

Undergraduate students stated that they found out the content to be loaded. Thus, they stated that more summarized knowledge should be communicated to them via web. Most students underlined the importance of giving as many examples as possible. One student commented on this topic by saying: "If I were the instructor, before giving homework I would give many examples on the related topic. The students have to see what I want. So I have to give examples for laboratory homework. Moreover, there should be many examples within the content also". In terms of visual support in the content, students stated that although the pictures were appealing and good enough to represent the topic, they were not plenty enough for web-based instruction. More visuals, animations and short films were needed in order to motivate students, and to make the web site more visually appealing.

The course content for the graduate course was presented in a summarized form. The overall content and structure was strongly favored by the students. About the content one student stated: "The presentation of the content within short paragraphs was very helpful. Since there were one or two paragraphs on each page, we did not get distracted". All of the students stated that they found the parts objectives, questions that make you think, major points and self-evaluation tests helpful. About the part questions that make you think one student stated: "Before starting to read the content, those questions guided us about what to think and what to expect from that topic. Moreover, they motivated by brainstorming. "Major points" part was used differently by students. One student stated: "I would look at major points to have a general idea about the chapter first, and then I would begin to read the content". And yet another student added: "My style is different. I would read the content at first. I would use the 'major points' section when I wanted to remember something about the previous week". And most students stated that they used the 'major points' section for repeating the content. About the self-checking and self-evaluation tests provided both at the beginning and end of the chapter, students stated that they frequently used these tests for self-assessment and found very useful.

Perceptions on the Communication Tools provided on the Web Site

In order to find out how often the students used communication tools for specific reasons, students were asked how often they used these tools in order to communicate with the instructor or their peers. There was a 'message board' on the site designed like a forum, and an 'announcements' part to inform students about the future events. Unfortunately, the usage of communication tools was rare because of the presence of face-to-face interaction for both the undergraduate and graduate course.

Suggestions about the Effective Use of the Web Site of the Course

One important point emphasized by most undergraduate students was about the assessment procedures. They mentioned that tests for self-evaluation and self-check were really important to assess the weakest points about themselves. Midterms and quizzes were not enough for evaluation as they thought. In fact, they asked for more sample exam questions accessible on the web so that they could prepare for a formal exam in an informal environment. They also underlined the importance of feedback and added that the results of the assignments and feedback about the assignments should be placed on web. Suggestions made by the graduate students were different somehow. There were some suggestions parallel with those of the undergraduate students and some suggestions more specific to the content. Students addressed some obstacles for reading the text off the screen and taking printouts.

CONCLUSION AND SUGGESTIONS

Web based learning is a new area to be explored. Therefore there is little to be known about this new medium pertaining to how it fits to individuals' needs and differences. However, this study serves as one of the pioneer studies for instructional designers to further enhance their design skills for web based course.

Based on the findings of this study, the following suggestions may be helpful for instructors and instructional designers while designing, delivering and implementing a web-supported traditional environment.

- Provide all possible types of media and material sources (text, audio, video, animation, Simulation etc.) in the web site.
- Provide course handouts in different file formats (word document, pdf document, html file etc.) with supplying a friendly-print option.
- Provide a wide range of pre-and post activities (additional resources, additional materials, self assessment utilities etc.) apart from the content.
- Provide enough guidance by structuring the site with add-ons like objectives, thinking questions, pretest and posttest for each chapter, major points etc.
- Even for adult learners do not hesitate to use humor throughout the web site.
- Provide enough guidance and support to make students communicate online. By posing questions to think on and discuss, sending examples, additional materials and Internet addresses to check for, make the students check the web site at least once a day.
- Besides supplying self-assessment utilities like drill and practice, tutorial, open-ended learning environment etc., send your feedback to students online individually.
- Keep the movements of each student as computer log, and give feedback to each student by examining these logs at least in two weeks throughout the semester.
- Keep the design of the web pages simple and consistent. Provide simple navigation by informing the student in which page he/she is at that moment. Make all the utilities accessible in every page.

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