CHAPTER 3

REVIEW OF RELATED LITERATURE

3.0. INTRODUCTION

Every piece of ongoing research needs to be connected with the work already done, to attain an overall relevance and purpose. The review of literature thus becomes a link between the research proposed and the studies already done. It tells the reader about aspects that have been already established or concluded by other authors, and also gives a chance to the reader to appreciate the evidence that has already been collected by previous research, and thus projects the current research work in the proper perspective.

Review of literature actually needs to be done even before the research project is formalized and ensures the genuineness and uniqueness of your work. A reference of earlier work also gives the researcher an option to modify the work by adding a new perspective or altering some to make it more effective.

Review of literature is also important to highlight difference in opinions, contradictory findings or evidence, and the different explanations given for their conclusions and differences by different authors, the analysis which helps one understand may facets of a complex issue and can lead to wider prospective areas for research.

There is hardly any research project which is totally unrelated with research that has already taken place. Usually every individual research project only adds to the plethora of evidence on a particular issue. Unless the existing work, conclusions and controversies are
properly brought about, most research work would not appear relevant, nor will it appear important in the whole framework. Thus, review of literature is a very important aspect of any research both for planning your work as well as to show its relevance and significance.

3.1. LITERATURE REVIEW

Svec Michael in his study on “Improving Graphing Interpretation Skills And Understanding Of Motion Using Micro-computer Based Laboratories” sought to explore what the students were learning and how well they mastered those concepts. In addition, the study sought to identify what the students knew prior to instruction. Knowing what the students bring to the classroom helps the instructor better address the students' knowledge and elicit conceptual change, bringing the students' beliefs closer to the accepted scientific explanations.

The results on the Graphing Interpretation Skills Test and Motion Content Test indicated significant differences between a traditional laboratory and microcomputer-based laboratory. MBL was more effective at engendering conceptual change in students. The results were determined by computing effect sizes and by item analysis. The multiple-choice instruments had high reliability and the use of gain scores corrects for the initial differences in the two student populations.

The students in both groups entered the study being able to read and interpret a variety of line graphs. Understanding the change of slope remained the most difficult skill for the students, which is not unexpected since they probably have never had to interpret
this before. Only about one-half of the students were able to calculate a slope and interpret a zero-slope curve. This is a disappointing result for such a basic graphing skill. The ability to work with the slope is a significant skill for the students to master in order to facilitate interpreting motion graphs. Instructors cannot assume the students will completely understand how to calculate and interpret the slope. MBL provides an excellent medium for helping students develop a more thorough understanding of how to calculate the slope and how to interpret its meaning. Activities which involved slope should be built into the motion labs so that the students will gain experience with the skill. Students should be expected to understand how to determine the slope and how to apply this specifically to motion after instruction.

The study showed that the Q202 students learned more about graphing interpretation skills, more about motion graphs and more about conceptual understanding of motion, than did the P201 students. That learning was made possible by the effective use of MBL activities. While the P201 students spent less time on motion, it can and should be argued that if the students would gain as much as the Q202 students, then it would be to their advantage to devote more time to the basic concepts. Q202 took advantage of the learning environment and instructional possibilities made possible by MBL. As demonstrated by the Q202 lab materials, to effectively use that time, MBL activities designed to elicit conceptual change should be incorporated into introductory physics courses.

Yavuz Erdogan in his work on *An Evaluation of Web Based Instruction In view Of the Tutors ’ and Students ’ Perspectives* says that in today’s world, it is acknowledged
by almost all folks of life that the traditional educational institutions are inadequate in educating the growing population. This situation has triggered research into finding ways to provide economical and of high quality education to wider masses of people. Currently, web based instruction seems to be the point that has been reached to meet such a demand. In web based instruction, students’ and tutors’ perspectives play an important role in the facilitation of successful outcomes. Moving on from that, the aim of this research is to investigate web based instruction in view of the tutors’ and students’ perspectives. In order to achieve such an aim, face-to-face interviews were carried out with 10 tutors from the e-MBA Master’s Degree Program at Bilgi University, and with 10 students registered in the same program. Nine semi-structured interview questions were used to investigate the participants’ perspectives on web based instruction and the interview data were analyzed accordingly.

Lyu Michael R et.al in their paper on *Web-Based Education Techniques: Workflow, Collaboration, and Quality of Service* describe and evaluate a set of Web-based and workflow-sensitive educational techniques that can increase the effectiveness of teaching, collaboration, and resource sharing. These techniques allow educators to facilitate the goal of developing high quality teaching and learning, using the fast growing Internet technologies. We construct a system that supports implementation of these techniques in a broad range of institutions of higher learning. The system operates in the context of an efficient state-of-the-art, network-based engine that supports advanced virtual laboratory concepts, and collaborative content capture, development and delivery mechanisms. This support system, called "Multimedia Web-Presentation System", is easy-to-use, adaptable to
user workflow, profiles, and quality of service needs, and is affordable for wide distribution and adoption. We also discuss Web-based education issues and describe how our system can be used to address these issues.

Willis\textsuperscript{79} (1994) emphasized the importance of training faculty members, not only in managing the technical aspects of Web-based instruction, but also in becoming innovative in the planning and delivery of effective Web-based instruction courses. It was concluded from his study that it is essential that they learn to manage the process of continuous change and improve in this dynamic technological teaching environment.

According to Hagner\textsuperscript{28} (2003), a common theme in Web-based teaching research is the need to create faculty support systems that are both scalable and flexible systems that stimulate and engage. Although faculty acceptance is essential to the success of Web-based instructional programs intended to improve teaching and learning, it is now widely understood that faculty members themselves must be willing to see that Web based-enhanced learning environments are inextricably linked to an institution’s ability to fulfill its mission.

Lehman\textsuperscript{47} (2002) suggested that faculty development in Web-based higher education must first begin with a needs assessment to determine what the educator’s current knowledge and skill levels are and plan accordingly. Faculty members will not likely be motivated to learn new technologies if their current training needs are not being met. Early and ongoing needs assessment via surveys, testing, or one-to-one interaction is a key ingredient in developing successful faculty development. Technical skills’ training is only
one aspect of faculty development. The greater need is for training and guidance on how, when, and why to integrate Web-based instruction into learning. The pedagogical aspects of Web-based instruction must be emphasized. Numerous approaches have been conducted in successful faculty development of Web-based teaching. The most successful approaches seem to be mentoring, workshops, design teams, and one-to-one attention.

In agreement with the theme of mentoring, workshops, and one-to-one attention, Dubois (1996), Moore (1993), and Redline (2004) noted that faculty members who work towards course development in a one-to-one relationship with a mentor in a timely manner, using their own course material, will report positive attitudes toward refocusing on technological possibilities. Based on the success of these one-to-one workshops, the encouraging of collaboration and the sharing of best practices as well as important lessons learned while implementing Web-based courses would further enhance the medium. Current practices of distance education have largely involved adding new technology to old ways of teaching and learning. A “craft” view of teaching still exists, and most distance learning programs suffer from amateurishness, because educators, administrators, and policymakers have yet to come to terms with the consequences of teaching and redistribution of educational resources. In certain circumstances, the best technology is available to support teaching, but the human element is overlooked as a dimension in providing excellence in Web-based instruction. This neglect of the human element in terms of faculty development may be better understood in the context of the slow adoption of Web-based teaching in higher education. This response is typified by the hesitancy of higher education institutions
to implement fundamental change and their reliance on a pondering tinkering process in which limited experimentation is relegated to peripheral activities, process, and function. It is important to note the factors identified in the literature that impact the implementation of training and professional development programs for Web-based instruction and the extent to which these are faculty driven or institutionally driven. To meet these challenges, faculty development to assist faculty members in integrating Web-based instruction into teaching and learning concerns many institutions. Researchers have pointed out that training and support are significant in helping and facilitating faculty members to effectively integrate Web-based instruction into their classes.

Wilson\(^77\) (2003) and Young\(^82\) (2002) have written that university efforts to introduce Web-based technologies are influenced by several factors. Web-based instruction provides a way for students to learn more and varied content faster. Many public officials and higher education administrators see Web-based instruction as a means to make universities more efficient and more accessible. Others view Web-based instruction as a possible income generator for the institution. Still other officials see Web-based instruction as a vehicle to make education available to a diverse and dispersed population. Many students, professionals, and employers expect Web-based instruction to offer ways for them to gain the learning they want without leaving the home or workplace. However, new methods for teaching and effectively using Web-based instruction need to prevail. The complexity or the degree to which the technology is used in Web-based instruction is difficult to understand or use, can be intimidating to many faculty members due to their perceived complexity. Even
if the technology itself is not perceived to be difficult to understand, learning how to effectively apply it to Web-based instruction and learning can be. This perception of complexity causes many faculty members to assume, often incorrectly, that learning how to use Web-based instructional activities will take an inordinate amount of time and effort. Compounding the problem is the fact that many faculty members across the country say that the tenure-and-promotion system fails to recognize the investment of time and effort in learning how to use Web-based instructional technology. To ensure that the fear of technical complexity does not present itself as an obstacle, it is important that the content and outcomes of the development and training program be consistent with the knowledge, skills, and abilities of the faculty members involved.

McDaniel\textsuperscript{52} (2004) noted that one important dimension to course quality is the faculty member’s perception of quality. In examining faculty perceptions of the online learning experience and their reasons for using online learning experiences, he found that the reason faculty members use educational technologies may affect their perceptions of the quality of the learning experience. Due to a lack of training in Web Based Teaching, many faculty members felt that the effectiveness of their online course was diminished compared to a traditional course because they were uncertain about their ability to teach via Web-based interaction. Institutions need to integrate Web based instruction into faculty training and development programs rather than teaching how to use the Web-based instruction in isolation.
According to Epper and Bates\textsuperscript{20} (2001), faculty use of Web-based instruction occurs as a four-stage process. The first stage of this process is access, which pertains to the faculty member’s ability to gain possession of the basic tools of technology such as computers, software, networks, and network services. The second stage in this process is awareness. Faculty members need to be aware of the resources available to them and how these available resources can be applied to their work in higher education. The third stage that is essential in encouraging faculty members to use Web-based instruction is mastery, which deals with the ability to have the skills necessary to use Web-based instructional resources in ways that are relevant to teaching and scholarly work. The last stage of this process is application. Access, awareness, and mastery allow faculty members to apply Web-based instruction, as appropriate, in their daily lives. Only when faculty members achieve some level of mastery, or proficiency, with particular Web-based instructional technologies can the application of that technology follow.

Bower \textsuperscript{7}(2001) concluded that institutional support for faculty involvement in Web Based learning is essential and should take a variety of forms to recognize the range of motivations and needs of faculty members. The literature indicates that Web-based courses require more faculty time than do traditional courses. The availability of adequate and effective training is also a requirement for the institution that intends to embark on Web-based education initiatives. Faculty development workshops that introduce faculty members to Web-based instruction and to the changes in pedagogical approach needed to effectively conduct Web-based courses are a necessity. Through these types of workshops, faculty
members can learn, among other things, strategies to improve the interpersonal dimension of Web-based learning, a concern of many educators. Many faculty members have been disillusioned by previous technologies touted as innovations that would alter the course of education. They show skepticism when they resist the call to jump on the latest educational bandwagon before assessing how this new technology will help their delivery of Web-based course information.

Chism (2003) encouraged university administration to use a framework to engage faculty members in instructional technologies. The study of how faculty in higher education develops as teachers focuses on individual development as well as on the context in which this development takes place. In order for faculty members to embrace instructional technologies, the faculty learning cycle must be developed. The power of this learning is that it arises from a felt need. For example, they observe the effect on student learning, followed by reflection on whether this strategy should be used in the future, should be adjusted, or should be abandoned as a bad idea. Once this observation has been assessed, faculty members can then experiment with the four-stage faculty learning cycle, which includes planning, acting, observing, and reflecting. Once a plan has been put into place for an educational purpose, the acting (experimentation) ensures that the learning is authentic rather than imposed, and the observation and reflection ensure that the planning is monitored and adapted to the need. Faculty members are critical to the successful use of technology in higher education. Developmental approaches rooted in an understanding of how faculty members grow in teaching and how this growth is influenced by their
organizational environment are more likely to produce lasting change than those that are not. For this reason, it is important to continue to discuss different ways of modeling the learning-to-teach process so that efforts to influence it are intentional and effective.

A growing number of colleges and universities are exhorting faculty members to integrate Web-based instruction into their instructional activities. This pressure is coming from administrators seeking to turn their institutions into high-tech learning communities and from students who are becoming increasingly insistent on Web-based instruction. Faculty members also face pressure from their peers who are considered early adopters of Web-based instruction and are always eager to cite its pedagogical advantages to non-adopters. Despite the increased pressure on faculty to integrate Web-based instruction into their courses, many remain reluctant to do so. In fact, the greatest obstacle to applying Web-based instruction in the classroom at many institutions is not a lack of funds or technology but a faculty that is unwilling to use the technology available to them. For example, despite the fact that 80% of public 4-year colleges make course management tools available to their faculty members, professors actually use them in only 20% of their courses (Bennett & Bennett75, 2003; Lynch76, 2002).

Lieberman and Miller49 (1991) argued that training and professional development is part of the institutional culture and that teachers must be at the center of helping to create and participate in their own development. In adapting their perspectives of training and professional development, two relevant themes are offered as critical to the professional
development of faculty in Web-based instructional environments: innovation and instructional effectiveness.

Hagner (2001) noted that while faculty members are still in varying stages of learning and incorporating new ways of presenting information to their students, those students possess the skills necessary to utilize these new communication forms and increasingly expect that these new communication paths be used. Faculty now find themselves in an environment in which the use of new technologies is demanded by those who often possess a superior understanding of their use. While faculty members can see the benefits of adopting Web-based instruction into the teaching and learning process, many are uneasy about doing so, given the changing nature of their audience or fearing looking foolish or incompetent in front of their students. Higher education administrators must understand the challenges presented by the revolutionary changes created by new teaching and learning technologies and by the pressures from students entering colleges and universities. Administrators must realize that faculty members vary considerably in both their abilities and their attitudes towards new technologies, and institutional-based attempts to engage the faculty must consider these variations in order to be successful. In order for faculty members to feel a sense of confidence and skill with these new technologies, institutions must consider and implement more training and professional development programs to achieve a greater level of success in Web-based instruction. The increasing adoption of distance education raises questions in a general sense about teaching effectiveness in higher education that have been largely ignored.
According to Willis\textsuperscript{36} (1994), teachers face new and greater challenges in seeking to transfer their traditional skills to the Web-based environment. He argued the case for enhancing faculty effectiveness within a larger context of a support model for instructional effectiveness in Web-based instructional environments. He identified underlying issues such as student-teacher ratios, teaching loads, compensation, collegiality, and the need for retraining. As these issues intensify, there is the need for rethinking the traditional academic values relating to pedagogy, faculty autonomy, and learning productivity.

Cyrs \textsuperscript{14}(1997) suggested that good distance teaching does not come naturally. He indicated that some administrators tell teachers that no difference exists between traditional classroom teaching and teaching at a distance. However, these administrators are poorly informed, and they perpetuate the myth that no additional training is necessary to go from the classroom to the Web-based classroom.

Hudson and Walther \textsuperscript{37}(2002) argued that the greatest impact of Web-based instruction on higher education comes from the World Wide Web. Increasingly, colleges and universities are using the Web as a mainstream tool; it is ubiquitous, and skill in using it is assumed. The Web is already so much a part of life that familiarity has clouded the perception of the Web itself. In 1945 Vannevar. Bush wrote about a photoelectrical-mechanical device called a Memex, for memory extension, which could make and follow links between documents on microfiche. This was followed in 1965 by Ted Nelson, who coined the word hypertext. In December 1991, Tim Berners Lee developed what is known
as the World Wide Web; there were no predictions then about the impact on higher
education and the importance of faculty training associated with Web-based learning.

Harlen (2005) identifies two main goals associated with any type of standardized
further identifies assessment as the key component of any teaching and learning situation.
Educators can achieve an instructional balance to meet these goals through investigating
traditional and computer-assisted instruction (Butzin, 2001; Cotton, 1991).

Traditional instruction is the most commonly used type of instruction in education
today. Preparation for high-stakes or standardized testing generally involves paper and
pencil review with perhaps the use of an overhead projector and handouts. In a study
examining instruction for student preparation of standardized mathematics and reading tests,
Butzin (2001) compared a school that used computer-based instruction, which included the
use of academic web sites, to a school that had many computers, but did not integrate
technology into the curriculum. The researcher described an important point for educators to
remember: A technology-rich classroom is not determined by the number of computers you
have in the classroom, but how you use them. The results of the study showed that students,
who were from technology-rich classrooms, scored higher on all test comparisons (Butzin,
2001).

Cotton (1991) emphasized a combination of traditional instruction and computer-assisted
instruction. The suggestion to combine the two instructional methods is made in
order to produce achievement results “superior to those obtained with traditional instruction
alone” (p. 3). However, Cotton\textsuperscript{13} (1991) further explains students experience a faster rate of learning when using computer-assisted instruction. Computer-assisted instruction is defined as a narrow term most often referring to drill and practice computer instruction. Computer-based instruction is a broader term including virtually any type of computer use in education. Both terms can refer to web based instruction (Cotton\textsuperscript{13}, 1991).

According to the Oregon Network for Education\textsuperscript{60} (2006), web-based instruction is a form of computer- Web-based instruction is suggested as a way to offer numerous opportunities for education to redesign itself (Alessi & Trollip\textsuperscript{1}, 2001).

A research study by Martindale\textsuperscript{51} et al. (2005) focused on the Florida Comprehensive Assessment Test (FCAT) and the web site developed to help students prepare for the test named the FCAT Explorer program. Researchers found the web site to be very promising, specifically for elementary school students. In addition, the researchers indicated that as a result of the web site, teachers felt more pressure to prepare students for high stake tests; thus, they were more likely to utilize test preparation resources for classroom instruction.

Driscoll and Carliner\textsuperscript{16} (2005) believe web-based instruction is instructionally sound and based in many different philosophies and theories. Web-based learning has foundations in cognitive theory and is specifically related to knowledge acquisition.

An earlier study of the FCAT Explorer program was conducted by Diefenbach and Sullivan\textsuperscript{15} (2003). One conclusion made by the researchers focused on the advantages of immediate feedback and its role in the process of knowledge acquisition. Most significantly, researchers found test practice of fifth grade mathematics concepts followed by feedback and
more practice opportunities enhanced learning and had a positive impact on student performance on the actual FCAT.

Research concerning the use of interactive whiteboards (IWB) for collaborative, whole group instruction supports this belief (Edwards, Hartnell, & Martin, 2002; Smith et al., 2005). Giving students the opportunity to interact and communicate using IWB technology is a key aspect of ensuring knowledge transfer. Interactive whiteboards are large boards operated by touch screen technology. The board allows users to control a computer connected to a digital projector (Smith et al., 2005). Interactive whiteboards offer a much larger view of what is taking place on the computer than a conventional monitor and promotes student interactions with classmates and teachers (Burden, 2002; Smith et al., 2005). In a qualitative study by Edwards, Hartnell, and Martin (2002), teachers made important observations when a class played an interactive game as a whole-group on the IWB. While students were playing the game, teachers were able to monitor student progress and identify any content areas in need of further review.

Higgins, Falzon, Hall, Moseley, Smith, Smith and Well (2005) found teachers and students to be enthusiastic about using the IWB and to have a preference for including the IWB in classroom instruction. Data to support those findings were based on 184 WB lesson observations and interviews with 68 teachers. Using an interactive whiteboard can provide opportunities for students to physically interact with lessons. Austin (2003) observed students using the IWB for a mathematics lesson. The students came up to the board and using the board’s pen, counted forward and backwards on a number line.
Neo\(^6\)(2003) researched on developing a collaborative learning environment using a web-based design. In this paper, a web-based design project is used to create a collaborative learning environment with the aim of inculcating collaborative skills into the learners and increasing their problem-solving and critical thinking skills. The design project was created using multimedia tools such as Dream Weaver and Adobe Photoshop. Students worked in groups and were actively responsible for their own learning processes. Results showed that students engaged in collaborative learning enhanced their problem-solving and critical thinking skills, learned to work in a team and became more autonomous learners.

Evans and Khaled\(^2\)(2003) studied the Evaluation of the Interactivity of Web-Based Learning Systems: Principles and Process. They adopted the heuristic approach usually employed for usability evaluations. A three-way model of interactivity (3-WMI) is proposed. On the basis of this a provisional set of interactivity heuristics is developed. The method and heuristics are then assessed through a trial evaluation using three different WBLSs. Two of the systems are taken from a MSc course at a local university. The third is a commercially available system. The results of the trial were also used to improve the set of heuristics. It is concluded that heuristic evaluation provides a cheap, intuitive and practical method for the assessment of interactivity.

Patil, Arun S and Pudlowski, Zenon J.\(^6\)(2003) enquired the instructional design strategies for interactive Web-based tutorials and laboratory procedures in engineering education. The work addresses a few important issues related to the design and development of web-based intelligent and interactive tutorials and laboratory procedures in an
engineering domain, with examples from basic electrical engineering. The work also advocates appropriate instructional design strategies to be implemented in the development of the online laboratory procedures in the engineering domain, which can also be generalized and applied to other domains.

According to the study conducted by Torres\textsuperscript{73}, traditionally, instructional design has adopted a behaviorist theoretical perspective, but with the influence of other major learning theories and the latest technological advances, cognitive and constructivist perspectives have gained more predominance. Whichever approach we choose, if we want to take advantage of the web potential as an educational tool, we need to apply the basic components and principles of instructional design. Deciding to incorporate strategies from an objective theoretical approach or a constructivist one will depend on the learning circumstances. The intrinsic characteristics of the web allow the learning process to be more constructivist and offer a wider space to design and implement activities based on the use of web resources and tools.

In the study conducted by Frizell, Sherri and Hubscher, Roland\textsuperscript{23}, they opined that designing instructionally sound web courses is a difficult task for amateurs in interaction and web-based instructional design. Learning theories and instructional strategies can provide course designers with principles and design guidelines associated with effective instruction that can be utilized in the design of web based instruction. However, it can be difficult, especially for novice course designers to operationalize these theories and apply them to the design and development of specific web courses. Effective design methods for
WBI that focus on student learning are needed. Design patterns have emerged as a means to capture design knowledge and present design solutions to designers. Design patterns can be used to effectively support novice designers of web-based courses. This paper discusses how design patterns that capture pedagogical principles and good design strategies can be used to support educators in designing instructionally sound web based courses. A design framework for WBI presented and the resulting pattern language is introduced.

Jung, Insung; Choi, Seonghee et.al. (2002); Effects of different types of interaction on learning achievement, satisfaction and participation in web based instruction. This study investigated the effects of three types of interaction (academic, collaborative and social interaction) on learning, satisfaction, participation and attitude towards online learning in a web-based instruction environment. Academic interaction includes interaction between learners and online resources as well as task oriented interaction between learners and instructor. Collaborative interaction among learners becomes possible when a group of learners work collaboratively on a specific topic or share ideas and materials to solve a given problem. Social interaction between learners and instructors occurs when instructors adopt strategies to promote interpersonal encouragement or social integration. The results indicate that the social interaction group outperformed the other groups; the collaborative interaction group expressed the highest level of satisfaction with their learning experience. The collaborative and social interaction group participated more actively in posting their opinions than the academic interaction group and web based learning experiences brought positive attitude changes with respect to the use of the web in learning – regardless of the
type of interaction. It is concluded that even for adult learners, social interaction with instructors and collaborative interaction with peer students are important in enhancing learning and active participation in online discussion.

According to a study conducted by Vrasidas, Charalambos and McIsaac, Marina S. (2000) - Principles of Pedagogy and evaluation for web based learning, teaching online is not as easy as it may sound. It requires detailed planning and hard work. The issues addressed in this paper illustrate that structure is crucial for promoting interaction and social presence in distance education. Interaction among students and interaction between students and instructor needs to be carefully planned. The online nature of the course described illustrates that multiple methods for evaluation are essential in order to get a clear picture of what is happening in online environments.

Graff, Martin (2003) studied the Learning from web based instructional systems and cognitive style. Two of the principal issues, which have been addressed in assessments of the benefits of web based instructional systems are firstly, whether the segmentation of information provided by the web structure aids users in apprehending the interrelationships between the units of information featured in the web. Secondly whether providing the user with an overview of the web system assists in facilitating learning. It was suggested in the study that these two issues may be more effectively understood by a consideration of an individual’s cognitive style. Fifty participants were assigned to one of two web based instructional systems featuring information on the subject of psychological ethics. The information in one of the web systems was segmented to a greater degree than the
information in the other. Half the participants using each web system were given an overview of the system and half were not. After a given time using the system, participants were tested on the information from the web. The findings suggest that cognitive style and segmentation had an effect on the performance, although the provision of the overview had little effect. The results are discussed in terms of a consideration of cognitive style in the design of web based instructional systems.

Cook, David A and Dupras, Denise M\(^{11}\) (2004) - A practical guide to developing effective web based learning; In this study, the essential steps in the development of web-based courses or curricula that employ principles of active learning are outlined. It does not address technical issues such as web programming or the specifics of web page design. This study presents the practical framework for developing effective educational websites by combining principles of active learning with the unique features of the web. It was concluded that teaching on the web involves more than putting together a colorful web page. By consistently employing principles of effective learning, educators will unlock the full potential of web based medical education.

Janicki, Thomas and Liegle, Jens O\(^{38}\) (2001); Development and evaluation of a framework for creating web-based learning modules: A pedagogical and systems perspective. This study was to incorporate learning principles into a new web based authoring system. It reviews the process of verifying that five learning principles had been incorporated into the authoring process. The principles were –

a. A clear definition of learning objectives.
b. Listing of pre requisite knowledge.

c. Providing a variety of presentation styles.

d. Enhanced feedback and testing.

e. Permitting the learner to control the pace and direction of the learning module.

Two different approaches were used to test the validity:

1. A group of educational experts were surveyed to seek their opinion if the authoring system incorporated five principles into the system. Their results validated that the system would prompt developers to build a tutorial based on pedagogy and a high agreement was noted in the self-direction and pace of the lesson offered to the learner.

2. Ten volunteer instructors were recruited to develop tutorials using two different authoring systems. Volunteers built one tutorial using a tool of their choosing and then one tutorial using WeBTAS. Eight out of ten volunteers chose PowerPoint as the vehicle to build their tutorials.

Analysis of results show that the total development time spent on both systems was identical and that the WeBTAS system created an average of two more screens of tutorial content in the same amount of creation time and also provided for a variety of presentation styles. The instructors ranked the new system as easy to use and agreed that the system prompted them for lesson content in an organized and coherent manner. The capability to create online quizzes, an online glossary and key points ranked high in listing of features.
Sung, W.T and Ou, S.C\textsuperscript{68} (2002); Web based learning in the computer aided design curriculum. This study attempts to apply the principle of constructivism and virtual reality (VR) technologies to computer aided design (CAD) curriculum by integrating network, CAD and VR into a web-based learning environment. The following merits were listed from the study.

1. Develop and integrated graphics learning system in real time.

2. Share its resources among networks.

3. Establish a computer network assisted learning system.

4. Explore and compare curve and surface logarithms.

5. Integrate VRML with web based learning system and establish 3D graphics in a VR environment.

Lee, Kevin M. Lee et. Al. \textsuperscript{46}(2004) compares two protocols for web-based instruction using simulations in an introductory physics class. The Inquiry protocol allowed students to control input parameters while the Worked Example protocol did not. Students in the Worked Example group performed significantly higher on a common assessment. The ramifications of this study are discussed in relation to Scientific Discovery Learning and Cognitive Load Theory.

Rohaida Mohd Saat\textsuperscript{65} (2004) stated in her study that Web-based learning is becoming prevalent in science learning. Some use specially designed programs, while others use materials available on the Internet. This qualitative case study examined the process of acquisition of integrated science process skills, particularly the skill of
controlling variables, in a web-based learning environment among grade 5 children. Data were gathered primarily from children's conversations and teacher-student conversations. Analysis of the data revealed that the children acquired the skill in three phases: from the phase of recognition to the phase of familiarization and finally to the phase of automation. Nevertheless, the acquisition of the skill only involved the acquisition of certain sub skills of the skill of controlling variables. This progression could be influenced by the web-based instructional material that provided declarative knowledge, concrete visualization and opportunities for practice.

Liaw, Shu-sheng; Huang, Hsiu-mei (2000) in their study Enhancing Interactivity in Web-based Instruction: A Review of the Literature reviewed the incorporation of interactivity in Web-based instruction. Discusses computer mediated learning; interactivity and learning, including instructional transaction theory and cognitive flexibility theory; advantages of Web-based instruction; content and social interactivity; asynchronous and synchronous communication; individual and group communication; and the implementation of interaction into Web-based instruction (LRW).

Lee, Yu-Fen; Guo, Yuying (2008); Explore Effective Use of Computer Simulations for Physics Education; Journal of Computers in Mathematics and Science Teaching explores the findings related to the use of computer simulations in physics education and to present implications for teachers and researchers in science education. We try to establish a conceptual framework for the utilization of computer simulations as a tool for learning and instruction in physics education and explore effective approaches to
integrate computer simulations into physics education. To achieve these goals, we first review studies pertaining to computer simulations in physics education categorized by three different learning frameworks and studies comparing the effects of different simulation environments. Our intent is to present the learning context and factors for successful use of computer simulations in past studies and to learn from the studies which did not obtain a significant result. Based on our analysis of the reviewed literature, we also propose effective approaches to integrate computer simulations in physics education, together with the discussion of implications for future research in the field.

Bliuc, Ana-Maria; Goodyear, Peter; Ellis, Robert A. 6(2007) in their study on Research Focus and Methodological Choices in studies into Students' Experiences of Blended Learning in Higher Education; reviews representative research into blended learning in universities, taking into account the methodology used, the focus of the research and the relationship between the two. In terms of methodology, most research was classifiable as case-studies, survey-based studies or comparative studies. A small number of studies take a comparatively more holistic approach and one of the outcomes from this review is a recommendation for more holistic studies to be undertaken. In the studies reviewed, the focus of the research is often related to the degree of methodological complexity. That is, less methodologically elaborated studies tend to have a more specific focus, while the studies employing a more complex methodology tend to report more varied aspects of the students' learning experience. It is argued that educationally useful research on blended learning needs to focus on the relationships between different modes of learning.
(for example, face-to-face and on-line) and especially on the nature of their integration. In particular, such research needs to generate usable evidence about the quality of the students' learning experiences and learning outcomes. In turn, this demands appropriately powerful methodologies, rooted in a firm theoretical foundation.

Graff, Martin ²⁵ (2006) Constructing and Maintaining an Effective Hypertext-Based Learning Environment: Web Based Learning and Cognitive Style, reviewed the literature on the utility of employing the construct of cognitive style in understanding behavior in web based learning environments. Design/ methodology/ approach: The paper initially examines whether the web architecture may be matched to an individual's cognitive style in order to facilitate learning, before progressing to assess whether different architectures influence a web users' internal representations of web based learning systems, as measured by concept map drawings. Other issues explored are users' web navigation and users' sense of learning community when receiving instruction via web based learning environments. Findings: The studies reviewed indicate that cognitive style is a pertinent factor for consideration when assessing the success with which users engage with web based learning systems. Research limitations/implications: Some of the studies reviewed here are small-scale and caution is urged in generalizing the findings. Practical implications: In terms of the practical implications, however, it is suggested that web based systems should be designed with consideration to individual differences in user characteristics, as this is related to the success with which users learn, navigate and interact socially in an online environment. However, it is concluded that more research is required in order to produce general rules relating
cognitive style to the use of web based learning systems. Originality/value: The findings from the numerous studies on the implications of considering the function of individual differences in using web based learning are notable and useful in the context of web based instruction.

Sadik, Alaa; Reisman, Sorel 66(2004) in their study on Design and Implementation of a Web Based Learning Environment: Lessons Learned, presents sets of observations and recommendations for web based distance learning, based on formative and summative performance and opinion data collected from participants involved in the design, development, and utilization of Wired Class, a web based learning environment that was developed to teach mathematics to Egyptian secondary school students. The discussion focuses on issues related to the nature of (1) web based learning materials, (2) the spectrum of learning/teaching interactions, (3) the web as a learning environment, and (4) costs associated with delivering web based instruction. Examples are used to illustrate the basis for recommendations that evolved from the work on which this article is based.

Holliday, William G. et. Al. 32(1984) reviewed A Summary of Research in Science Education--1983. Holliday, William G. et. Al. (1984).This review covers 422 studies of the following types: reports prepared for scientific organizations, dissertations, journal articles, research papers, and papers presented at conferences. The studies have been organized into one of seven clusters for analysis and discussion. They are: (1) learning and instruction (summarizing studies related to models and explanations of how students learn, aptitudes and individualized instruction, textbooks and comprehensibility, problem-solving and
thinking, prior knowledge and misconceptions, museums and field trips, computers and instruction, and other areas); (2) curriculum development and evaluation (including studies related to policies, models, textbooks, and curriculum materials); (3) cognitive development (reviewing studies on cognitive growth and development, reasoning, achievement, concepts, and processes); (4) instrument development (summarizing studies on learning and achievement, reasoning and logical thinking, science process skills, and attitudes, perceptions, and interests); (5) pre service teacher education (presenting studies related to attitudes, process skills and logical thinking, science anxiety, and methods courses) and in service teacher education (presenting studies related to questioning and wait time, methods courses, and teacher behavior); (6) research completed in foreign countries (including research focusing on learning, classrooms, curriculum development/evaluation, science and non science majors, and teacher education); and (7) special topics (including meta-analysis studies and studies focusing on race and/or gender). A bibliography (by author) and subject index are included.

Tisher, Richard P., Ed.\textsuperscript{72}(1983); Research in Science Education. Volume 13. Proceedings of the Annual Conference of the Australian Science Education Research Association (14th, University of Waikato, New Zealand, May 1983). This publication contains a review of trends in research over the past decade followed by 24 studies focusing on cognitive structure, instructional strategies, curricular issues, and attitudes. Among the specific areas investigated are: concept maps as reflectors of conceptual understanding; equations, translations, and number skills in learning chemical stoichiometry; responses to
diagnostic, multiple-choice, physics items; children's explanations of natural phenomena; reading and the science learner; students' understanding of space, velocity, and acceleration; student beliefs about place value and decimals; beginning student teachers' opinions about teaching primary science; teacher behaviors and student task involvement within small group and individual activity settings; cognitive preferences and chemistry achievement; investigatory learning in elementary school science; hands-on science program for the intellectually immature high school student; implications of research on alternative frameworks for science teacher education; dimensions of cognitive demand; attainment of an attitudinal objective (belief in the value of community and personal health); arrows in science diagrams; origin and development of the modern science textbook; and use of a repertory grid technique to analyze students' reactions to science. Each study includes rationale, methodology, results, and conclusions.

Harris, Rorie N. Et. Al. (2003); Are Learning Styles Relevant In Web-Based Instruction?; This study investigated the impact of learning style on performance in a Web-based learning environment. Specifically, Introductory Psychology students with different learning styles, as measured by Kolb's Learning Styles Inventory (LSI-IIa), were randomly assigned to one of two Web-based training modules that differed only in terms of their number of multimedia enhancements and user interaction options. Outcome measures included an online final test over the material presented in the modules and an online survey measuring participants' reactions to the modules. The potential impact of learning style was also assessed with respect to the students' final grade in the lecture course. Results indicated
that neither student learning style nor online course module version had any impact on mean test score or on reaction to the online module. Furthermore, learning style was not related to the students' overall performance in the lecture course. The implications of these results for considering learning styles in the design of Web-based instruction are discussed.

Jang\textsuperscript{38} (2009) made a study on “Exploration of Secondary Students Creativity by Integrating Web-based Technology into an Innovative Science Curriculum”. The purpose of the study was to investigate how web-based technology could be utilized and integrated with real-life scientific materials to stimulate the creativity of secondary school students. Several real-life experience science sessions integrated with online teaching were used for one semester. The study used an interpretive methodology, which was qualitative analysis rather than quantitative analysis. The results showed that the study provided information to enhance students' expression of sensitivity, fluency, flexibility, originality, and elaboration of scientific creativities. Students' creativity was motivated by the online interactivities and the teacher's inquiry.