

DEVELOPMENT AND EVALUATION OF A WEB-BASED COURSE FOR COMPUTING AND INFORMATION TECHNOLOGY

Pawani Rasaratnam

School of Computing and Information Technology, INTI College Subang Jaya, Selangor, Malaysia
(pawani@inti.edu.my)

ABSTRACT

Most educators in this country have heard about the World Wide Web that is growing at an exponential rate. Many have explored this resource, and some are now publishing their own materials for student access. Educational content on the Internet is rapidly increasing. More course materials are placed online to supplement classroom situations. Prior research found that this new web-based technology had not integrated sound pedagogical practices into the authoring process when developing new courses. One of the most widely acknowledged problems is the lack of knowledge of instructional development and delivery among educators.

This research grew from the concern about the current status of instructional design in a college as well as the desire to help faculty implement sound instruction on the web. The research justifies and describes instructional design principles that can be used to transform web material from simple informational resources to a powerful instructional medium.

An overview of Instructional Design process is presented to guide us systematically to create the blue print or specification for the Web-based course. A sample Web-based course that includes all the important instructional design principles is finally developed. The Web-based course includes instructional goals, objectives, learning outcomes, instructional sequence, strategies as well as enrichment and remedial exercises.

The Web-based course was reviewed and evaluated by two different groups of users - 25 students and two lecturers. A questionnaire was distributed at the end of the course to gather information related to the Web-based course. Instructional and technical aspects were evaluated. Interviews were carried out with the

lecturers and randomly selected students. Pretest and posttest were conducted to assess the performance of students.

Data collected from the feedback, interviews and assessments were analyzed using simple quantitative and qualitative statistics. Students' scores in the pretest were compared with the posttest to find whether there was any improvement in performance. A t-distribution test was conducted to find if there was any significant difference. Interviews and feedback forms were used to find the acceptance of the Web-based course by the students and the lecturers.

Guidelines to develop, implement and evaluate Web-based course are also proposed. These guidelines will help us develop a quality program to be delivered over the Web.

INTRODUCTION

Information Technology (IT) plays a major role in our current education system where the Internet is used widely as a tool of instruction. The part of the Internet that has grown the most and has received the most attention is the World Wide Web (WWW). WWW is a vast network of information servers located in the Internet. These information servers are scattered across the globe and contain information on practically everything. The best feature of the WWW is that it specializes in multimedia aspects such as graphics, sound, audio, movie as well as text (Smith, 2001). WWW has provided higher education institutions with an effective medium to distribute course materials over the Internet.

This is the time when lecturers worldwide and especially in Malaysia are being faced with many new challenges. They are being asked to change the way they teach, adapt curriculum so as to meet new curriculum standards, change

assessment and evaluation practices and to integrate technology into their teaching and learning. They have to make a choice by slowly changing the traditional teaching and learning process to one that is more in line with the IT era. Lecturers need to change the traditional teaching and learning process in relation to one of the primary roles that they perform, as well as act as designers and implementers of instruction. They prepare plans that aid in the organization and delivery of their daily lessons. In order to negotiate a successful change they need a pedagogical framework that contains educational goals and objectives, the ability to sequence objectives, and proficiency in the skills and knowledge of a particular discipline. Goals and objectives are set to focus on the required achievements.

Lecturers choose the World Wide Web (WWW) as the tool for educational course delivery, and to establish their instruction. They are rapidly placing their course materials on the Web to meet many different needs. Web-based courses are instructions delivered on the web. Lecturers utilize the attributes and resources of the WWW to create a meaningful learning environment (Khan, 1997). However, there is too much instruction developed on the Web without appropriate guidelines. There is no single standard that describes how courses should be created or distributed over the Web. Indeed, a quality education is often sacrificed in favour of quantity, when a society becomes industrialized and technology driven (Oo, 2001). Lecturers should help themselves and their students to determine what is and what is not quality information.

There are many necessary conditions for successful Web-based instruction, which can be categorized into four main areas namely: pedagogical, social, managerial and technical. This research concentrates mainly on the pedagogical aspects, which involve the role of lecturers and their duties as educational facilitators in the learning organization.

RATIONALE

The key process for improving the quality of teaching and learning is instructional design (Braden, 1996). Instructional design (ID) has grown

to provide lecturers with rational and effective means for planning, implementing and evaluating the delivery of instruction. Before lecturers prepare instruction, select instructional procedures or subject matter or material, it is important to be able to state clearly just what they intend the results of their instruction to be. A clear statement of objectives will provide a sound basis for choosing methods and materials and for selecting the means for assessing whether the instruction has been successful. It keeps the lecturers focused on the learning process.

Lecturers' goal orientations and the way they teach students have a major impact on students' achievement. These give students a clear understanding of the learning task. Effective lecturers provide direction towards attainment of selected objectives. Clearly written objectives allow both lecturer and student to measure whether a goal has been met. Learning outcomes drive the instructional strategy, instructional delivery and assessment (Grady, 1991). Innovative strategies should be formed to gain optimum teaching-learning results (Wong, 2001). The only problem is that not many lecturers are aware of this. Each individual should play an effective role in developing and implementing Web-based learning.

Developing effective Web-based courses requires a systems approach and integrating instructional design principles (Howard and Terry, 1997). The systems approach provides the developer a framework to design the instructional material. Incorporating instructional design principles ensures that the courseware is developed with the learners in mind.

Ritchie and Hoffman (1997) asserted that Web pages, when properly structured, can guide students through a series of instructional activities that present information, afford practice and provide feedback to inform students of their strengths, weaknesses and suggestions for enrichment or remediation. The design of a Web-based classroom must draw on technical, educational, artistic and design factors, according to personal preferences. Only with these instructional design principles the Web can be transformed from its function as an informational

resource medium to an instructional medium. This in turn will help to contribute to the enhancement of students' achievement in a specified subject. Sani (2002), commented that the existence of instructionally designed teaching material or courseware is critical. He claimed that instructional design takes into consideration the effectiveness of achieving the learning objectives and outcomes for a particular topic in a course. He added that it might be a good idea to train at least one teacher or IT personnel from each school on the basic aspects of instructional design and Web page development.

In today's educational context, the delivery of education via the Internet or Web-based learning is not a new concept. In fact, this medium of educational delivery is much sought after by students, and many lecturers now accept and use this tool. The opportunity now exists for lecturers to look closely at the effectiveness and appropriateness of a Web-based learning environment.

Learning must be more effective and efficient. This need has given rise to the instructional design process, a systematic planning method that results in successful learning and performance. Learning is haphazard; instruction is planned. Thus, lecturers should create sound instruction that will lead to appropriate learning. Research has shown that if a student is prepared to learn and puts in the effort to study, but is unsuccessful in learning, a more careful design of the instructional plan can help overcome this shortcoming (Bloom, 1976). Lecturers need to equip themselves with the instruments that allow the effectiveness of their Web-based courses to be evaluated.

This research was conducted to develop a Web-based course for the Computing & IT subject based on a set of guidelines. An effective Web-based course developed along instructional design principles forms the backdrop of this study. Such a course will include elements that motivate the learner, specify what is to be learned, prompt the learner to recall and apply previous knowledge, provide new information, offer guidance and feedback, test comprehension, and supply enrichment and remediation.

Evaluation was also carried out among lecturers and students to find out the effectiveness of this Web-based course. Besides that, guidelines on how to develop and implement Web-based courses were also provided to the management of the organization. All the lecturers are encouraged to use these guidelines in order to help them develop their Web-based courses based on pedagogical principles.

METHODOLOGY

Participants

The participants of this study were chosen from the population of second semester Certificate students in Computing and Information Technology (CCIT), at a private college in Subang Jaya. Most of them are Form-Five school leavers aged between 18 and 20 years. They were all studying as full time students in the college. Currently, there are two CCIT second semester classes, Section A and B in the college.

Both classes have approximately the same number of students and consist of a mixture of Malaysian and International students, mostly from Indonesia. However, only one class, Section A, was selected for the final study. There were 25 students of which 8 were females and 17 were males.

All the students from this class went through the course together. Their lecturer conducted the course according to their scheduled class timetable. The medium of instruction that was used to run the course was English, which is the medium throughout the college. The subject taught was Fundamentals of Computing and Information Technology. This was a compulsory subject for all semester two CCIT students. The course was conducted over 14 weeks with 3 lecture hours, 1 tutorial hour and 2 lab hours per week. The students had very little conceptual knowledge regarding the subject. However, this was not a critical issue, as there was no prerequisite required for doing his course.

Two lecturers from the college who teach the same subject were selected to participate in the study. Both the lecturers were degree holders in Information Technology and have been working in the college for more than two years. They had attended a one-day workshop on

pedagogical skills organized by the college. This was their first job as educators. Both were lady lecturers in their late twenties.

Instructional Goals and Objectives

To provide a pedagogical foundation for learning, a series of instructional design concepts were included in a framework model of this study. They were chosen as they repetitively surfaced as the keys to effective learning in research. Systematic ID processes for this study involved the following steps:

1. Identification of instructional goals, objectives and learning outcomes.
2. Identification of instructional sequence and strategies.
3. Development of exercises and assessment.
4. Conducting evaluation.

These particular steps were found to be the easiest and most logical sequence to follow in the development of the Web-based course. Application of this framework provides an efficient and effective means of creating instruction, which ensures that students obtain the knowledge, skills and attitudes they require (Moisey, 2001).

The instructional goals and objectives that were intended were the results of decisions made by curriculum and instruction planners after identifying students' behavior upon entry. Relevant learning outcomes were identified and described in action verbs to achieve each instructional objective. Learning outcomes were formulated based on the resources available in the college. Description of learning outcomes were supplemented with description of situations and indicated the minimum standard on which the behavior was judged. The learning outcomes in this research focused mainly on the cognitive domain. Bloom's cognitive domain taxonomy was used in stating each learning outcome in this Web-based course.

Seven elements of Instructional activities

A learning hierarchy was formed using a concept map to show the link and relationship between

the topics in the Web-based course. Prerequisite skills and subtopics required were identified. Linear sequencing was used in each topic for novice learners. Some branching was provided for selected terms in each topic for further reading. The instructional activities were divided into three stages: pre-lesson activities, lesson and post-lesson activities. Each stage was conducted according to the allocated time and resources. Reiser and Dick's (1996), seven elements of instructional activities were used in conducting the instruction. The seven elements are:

1. Motivating learners.
2. Identifying or explaining what is to be learned.
3. Helping the learner recall previous knowledge.
4. Providing instructional material.
5. Providing guidance and feedback.
6. Testing comprehension.
7. Providing enrichment or remediation.

Implementation

Appropriate instructional strategies were selected based on student learning targets, and were matched with the content that was to be covered. Examples of instructional strategies included lectures, tutoring, discussions, practices, independent study, self-instruction, lab work and homework. The researcher worked together with the course lecturers to determine which instructional strategies could best achieve the learning objectives of the module.

Checklist tables were used to plan before and during implementation of the course. Lecturers were required to use these checklists to evaluate the learning outcomes, and the test items. They were also required to analyze and elaborate the three essential elements required to measure the learning outcomes of students' performance, conditions, and standards. The lecturers were also requested to note the instructional activities that were suitable to the learning outcomes. Using a table to list the learning outcomes before the delivery in classroom helped the lecturer to be more prepared and confident. Besides that, students too would

be more aware of what was expected of them. Two sample checklists are shown in Tables 1 and 2.

Exercises related to the topics taught were embedded in the course. Students were also provided with assisted and unassisted exercises. Assisted exercises were useful because lecturers helped their students take their first steps and supported them if they began to stumble. Unassisted exercises could be considered as the most important step in instructional delivery because they indicate what the students have actually learned. Lecturers would be able to determine who are weak students and need enrichment and remedial exercises accordingly. Students who had mastered the topics were given enrichment exercises, whereas those who had not were given remedial exercises. Several types of assessment were used to obtain information on the performance of students. These included essay questions, labelling diagrams and multiple-choice questions. Multiple-choice questions were also used in the pretest and the posttest. Results from the pretest and the posttest were compared and analyzed.

Evaluation

The initial evaluation of the Web-based course by students was carried out during the pilot study. Revisions were made to goals, objectives, learning

outcomes, instructional sequencing, instructional strategies, exercises and assessments, when needed. Formative evaluation was used widely throughout the course. A questionnaire was distributed at the end of the course to obtain feedback about the Web-based course from the students and lecturers. Instructional and technical aspects were evaluated. An interview was carried out with the lecturers and randomly selected students.

Analysis of data

The data collected from the study were analyzed manually using descriptive and inference statistics through frequency measurement and t-test distribution. Frequency measurement was used to interpret the feedback questionnaire data. It is suitable for qualitative type of a research analysis and used widely in descriptive statistics, but it is not suitable for inference statistics. Answers for each question in the feedback questionnaire were analyzed using a simple descriptive statistics, to find the perceptions and acceptance level of the web-based course among students and lecturers. The number of participants who responded positively was compared with the total number of participants. Scores of the pretest and the posttest were analyzed using a t-distribution test to find if there was any significant difference. Responses from the interview session were also considered.

Table 1. Checklist – Three Elements of Learning Outcomes

Learning Outcomes	Performance	Conditions	Standard
Explain why it is important to be computer literate	Speak or write	Topic related to computer literacy	Involves human and computer
Define the term "computer"	Speak or write	Short sentences	In 2 sentences
Explain why a computer is a powerful tool	Speak or write	From the writer's viewpoint	With at least 3 valid reasons
Identify the components of a computer	Label a diagram	Diagrams with arrows	List minimum 3 out of 5 components
Differentiate the various categories of software	Draw a table	Purpose and usage	List minimum 3 categories
Describe the categories of computers and their uses	Speak or write	From past to present	List minimum 3 categories

• Chapter 1 (Discovering Computers 2002, Shelly Cashman, Thomson Course Technology)

Table 2. Checklist – Elements of Bloom's Taxonomy

Learning outcomes	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Explain why it is important to be computer literate	•	•				
Define the term "computer"	•	•				
Explain why a computer is a powerful tool	•	•				
Identify the components of a computer	•		•			
Differentiate the various categories of software	•	•		•		
Describe the categories of computers and their uses	•	•				

• Chapter 1 (Discovering Computers 2002, Shelly Cashman, Thomson Course Technology)

Table 3. Feedback for Instructional Quality

Instructional Quality	Yes		Some times		No	
	n	%	n	%	n	%
1. Does the course clearly state the instructional goals?	25	100	0	0	0	0
2. Does the course clearly state the instructional objectives?	25	100	0	0	0	0
3. Does the course meet your instructional goal?	25	100	0	0	0	0
4. Does the course meet your instructional objectives?	25	100	0	0	0	0
5. Does the course list out the learner outcomes at the beginning of a lesson?	25	100	0	0	0	0
6. Is the content of the course accurate and relevant to the subject?	24	96	1	4	0	0
7. Is the course well organized and logically sequenced?	22	88	3	12	0	0
8. Is each section of the page labeled with a heading?	21	84	3	12	1	4
9. Is the vocabulary level appropriate?	22	88	2	8	1	4
10. Does the course have branching elements to provide for greater individualisation?	17	68	7	28	1	4
11. The ability to click on a more detailed explanation is provided where appropriate.	17	68	7	28	1	4
12. Does the course provide sufficient prompts and cues to the learner?	18	72	6	24	1	4
13. Is the ability to work at learner's own pace incorporated in the instruction?	21	84	3	12	1	4
14. Is feedback given at the appropriate time?	25	100	0	0	0	0
15. Is the feedback informational and motivational?	21	84	4	16	0	0
16. Does the course come with supporting teaching materials such as quizzes, examples and exercises?	25	100	0	0	0	0
17. A learner satisfaction survey is conducted.	25	100	0	0	0	0
18. The course is designed in such a way that learners will actually learn.	24	96	1	4	0	0

Table 4. Feedback for Technical Quality

Technical Quality	Yes		Sometimes		No	
	n	%	n	%	n	%
1. Does the web page download efficiently enough to be used during whole class instruction?	25	100	0	0	0	0
2. Are visuals presented clearly?	25	100	0	0	0	0
3. Are there any distracting visuals or sound?	3	12	0	0	22	88
4. Does the program crash or hang?	1	4	1	4	23	92
5. Are large graphic files and items that are slow to download avoided?	21	84	4	16	0	0
6. Sufficient links to other relevant web sites provided.	21	84	3	12	1	4
7. No sites were locked out, all referenced URL's are viable?	23	92	2	8	0	0
8. Each link page includes options such as "Next", "Previous"?	24	96	1	4	0	0
9. The navigation tools are consistent throughout the lesson.	23	92	2	8	0	0
10. Can learners quit the program easily?	25	100	0	0	0	0
11. Does the lecturer provide availability to learners including e-mail address and consultation time?	24	96	1	4	0	0
12. Is there a date on the page that tells you when it was last updated?	24	96	1	4	0	0

RESULTS AND DISCUSSION

Responses from feedback questionnaire

The analysis of the questionnaire distributed to 25 students is shown in Tables 3 and 4. Table 3 shows the feedback obtained from the students on the instructional quality of the Web-based course whereas Table 4 shows the feedback obtained on the technical quality of the Web-based course. The first column in the Table shows the rubric according to each section in the feedback questionnaire. Number, (n) and percentage, (%) of students who answered 'yes', 'sometimes' and 'no' for each question in the questionnaire are listed. The analysis of data obtained from the feedback questionnaire was done using descriptive statistics.

Tables 3 and 4 show the responses yielded from the questionnaire. From the analysis, it shows that most of the students responded positively to the instructional aspects of the Web-based course. Therefore, it could be concluded that the main aim of this Web-based course had been achieved. They claimed that now they need not worry about not obtaining notes and exercises from their lecturers. They also welcomed the idea of structured learning and submitting their work through e-mail facilities. However, a few students suggested that more aspects could be included in the course. The most commonly desired aspects were images and links in the course. They also

suggested improvements to be made to the background and font colours.

Test Scores

The last column in Table 5 shows whether there was any improvement or gain in the score of each student. A positive difference shows that there was improvement in the performance of students. Any improvement in scores indicated students had actually learned as a result of instruction (Clothier, 1998). The college considers that if there was a gain in the test score of a student then it shows that there was improvement in the teaching.

Based on the analysis, 24 out of 25 students (96%) have shown some improvement (progress/achievement) in their post-test scores when compared with their pre-test scores. In this research, the amount of learning is determined from the gain in scores between the pre-test and the posttest. An illustration of this is shown in Figure 1. Besides frequency measurement a t-test was also done to show if there was any significant difference. The findings are shown in Table 6.

The analysis also revealed that only 3 students failed the post-test, compared to 17 students who failed the pre-test. The passing mark for pre-test and post-test was 40%. However, out of 25 students 1 student did not show any improvement. After further investigations it was found that this student was absent from class on

Table 5. Comparison between the pre-test and the post-test scores

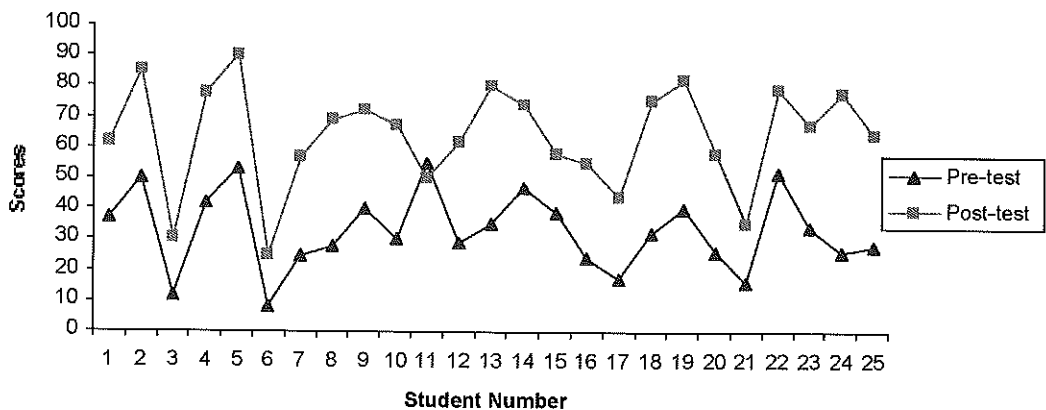
Student no.	Pre-test (100%)	Post-test (100%)	Difference (100%)	Improvement
1	37	62	25	Yes
2	50	85	35	Yes
3	12	30	18	Yes
4	42	78	36	Yes
5	53	90	37	Yes
6	8	25	17	Yes
7	25	57	32	Yes
8	28	69	41	Yes
9	40	72	32	Yes
10	30	67	37	Yes
11	55	50	-5	No
12	29	62	33	Yes
13	35	80	45	Yes
14	47	74	27	Yes
15	39	58	19	Yes
16	24	55	31	Yes
17	17	44	27	Yes
18	32	75	43	Yes
19	40	82	42	Yes
20	26	58	32	Yes
21	16	35	19	Yes
22	52	79	27	Yes
23	34	67	33	Yes
24	26	78	52	Yes
25	28	64	36	Yes

Table 6. t-test for pre-test and post-test scores

	Post-test	Pre-test	t value*
Min score	63.84	33	7.249
Standard deviation	17.036	12.741	

* Significance level at 0.05

There is a big jump of 30.84 points in the post-test mean score as compared to the pre-test mean score and the difference is significant ($t = 7.249, p < 0.05$).

**Figure 1.** Comparison between pre-test and post-test scores

several occasions and thus had been missing from many learning activities.

Responses from interview sessions

Five students and two lecturers were selected for this interview session to obtain feedback related to the Web-based course. Students were interviewed in a classroom whereas lecturers were interviewed in the staff room. Interviews were conducted in week 14 of the semester. Questions that were asked in the interview session were quite similar to the feedback questionnaire. However, the lecturers were also asked to rate the problems that they had faced related to their preparation before the start of the course.

Overall, the comments from the five students were as follows:-

1. Instructional objectives and learning outcomes helped them to focus on the important aspects of the topic to be learned and to be prepared for the exam.
2. Exercises at the end of the topic helped them to judge their understanding of the topic that they had studied.
3. Links provided in the Web-based course helped them to do their assignments.
4. Concept maps used at the beginning of the course, as well as the chapters, had helped them to see the flow of the course.
5. They liked the activities conducted in the lab because the activities helped them to understand the concepts learned in the class better when they applied it in practical assignments given during lab sessions.
6. The ability to learn the course at anytime or anywhere gave them more flexibility and opportunity to go through lessons that had been taught and prepare for new lesson in advance.
7. The ability to communicate with the lecturer at anytime had also given them the opportunity to clear their doubts before they started new topics.
8. They suggested that more colourful pictures be included in the web-based course.
9. Images and video clips were also suggested as an additional feature in the course.
10. A discussion forum was to be included in the Web-based course so that they could clear their doubts with their colleagues.

The two lecturers commented:-

1. With the inclusion of instructional goals, objectives and learning outcomes at the beginning of every topic, students could understand the course better.
2. The pictures and links in each chapter made their students visualize whatever they were taught.
3. The preparations had helped them to present their lectures more effectively.
4. The various types of instructional activities have actually motivated students and made them participate more actively in the class.
5. Exercises at the end of each chapter have helped students to remember and understand each chapter clearly.
6. At the initial stage there was some difficulty in listing the instructional objectives and learning outcomes, but after much practice it was easier to list the objectives and outcomes correctly.
7. The screen design aspect of the Web-based course could be improved by including more attractive background and fonts in each frame.
8. More pictures for the subtopics were also suggested.

Comments from students and lecturers were given due consideration. The webpage was modified to suit the needs of the users.

CONCLUSION

As we post course schedules and syllabi online, courses with sound pedagogy should receive priority. Developing a Web-based course with sound pedagogy is indeed timely and relevant. In order to produce an efficient course a set of guidelines has to be followed. The guidelines suggest a number of basic instructional design principles that should underpin the development of each Web-based course. This will enhance effective teaching and learning.

REFERENCES

- Arnold, M. (1997). *Using the web to augment Teaching and Learning*. Available: www.ascilite.org.au/conferences/perth97/papers/Arnold/Arnold.html
- Bloom, B.S. (1964). *Taxonomy of Educational Objectives: The classification of Educational Goals*. New York: McKay.
- Bloom, B.S. (1976). *Human characteristics and School Learning*. New York: McGraw-Hill.
- Braden, R.A. (1996). The case for linear instructional design and development: A commentary on models, challenges and myths. *Educational Technology*, 2, 5-23.
- Clothier, P. (1998). *The Complete Computer Trainer*. London: McGraw-Hill.
- Davies, I.K. (1971). *The Management of Learning*. London: McGraw-Hill
- Dick, W. and Carey, L. (1990). *The Systematic Design of Instruction*. (3rd Ed). Harper Collins.
- Doulai, P. and Stace, R. (1998). *Web-based Survey and Assessment*. Available: <http://www.ascilite.org.au/conferences/wollongong98/asc98-pdf/doulaistace.pdf>
- Eggers, M. (2000). *Web-based instruction for higher education: Creating active learning environments*. Doctoral Dissertation, Andrews University. Available: <http://www.atie.org/research/>
- Formosa, J. (1998). Are you sure you want to train faculty to develop Web-based Instruction? *Paper presented at the 3rd Annual Mid-South Instructional Technology Conference, April 5-7*. Available: <http://www.mtsu.edu/~itconf/proceed98/jformosa.html>
- Gagne, R.M. and Briggs, L.J. (1979). *Principles of instructional design*. (2nd Ed.) New York: Holt, Rinehart and Winston
- Grady, H.M. (1991). *Instructional design principles for web-based training and education*. [Online]. Available: http://www.stcatlanta.org/currents00/instructional_design_principles.htm
- Hazari, S.I. (1998). *Evaluation and selection of web course management tools*. Available: <http://sunil.umd.edu/webct>
- Honolulu Community College (2002). *Lesson Planning Procedures*. Available: <http://www.hcc.hawaii.edu/intranet/committees/FacDevCom/guidebk/teachtip/lesspln1.htm>
- Howard, J.T. and Terry, R.V. (1997). *A systems approach and instructional design principles: two critical elements for effective WWW courseware development*. Available: <http://www.uvm.edu/~hag/naweb97/papers/howard.html>
- IHEP (2000). *Quality on the line. Benchmarks for success in Internet-based distance education*. [Online]. Available: <http://www.ihep.com/Pubs/PDF/Quality.pdf>
- Jessie, E. (1999). How teachers relate to high-achieving students. *Paper presented at the Mera-Era Joint Conferences, December 1999, Malacca, Malaysia*.
- Khan, B. H. (1997). *Web-based instruction: What is it and why is it?* Englewood Cliffs, NJ: Educational Technology Publications. Available: <http://bookstoread.com/framework/>
- Mager, R.F. (1975). *Preparing Instructional Objectives*. (2nd Ed.). Belmont, CA: Fearon Publishers Inc.
- Mathew, N. and Dohery-Poirier, M. (2000). *Using the World Wide Web to enhance classroom instruction*. Available: http://www.firstmonday.dk/issue/issue5_3/mathew/index.html.
- McManus, T.F. (1996). *Delivering instruction on the World Wide Web*. Available: <http://penta.ufrgs.br/edu/edu3375/wbi.htm>
- Melton, R.F. (1997). *Objectives, Competences and Learning Outcomes. Developing Instructional Materials in Open and Distance Learning*. London: Kogan Page Ltd
- Merrill, D. (2001). *Instructional that doesn't teach has no value*. Available: www.knowledgenet.com/pdf/wp%20%20instructional%20design.pdf
- Moisey, S.D. (2001). An integrated instructional design approach for fostering lasting behavioral change. *Educational Technology*, Vol 39(2): 60-62.

- Michigan Virtual University, (2002). *Standards for Quality Online Courses*. Available : <http://ideos.mivu.org/standards/>
- Olson, T.M. and Wisher, R.A. (2002). The effectiveness of web-based instruction: An initial inquiry. *Paper presented at International Review of research in open and distance learning*. Available: <http://www.irrodl.org/content/v3.2/olsen.html>
- Oo, Y.H. (2001). E-Education : Quality versus Quantity. *Paper presented at the ICEE International Conference, October 29-30, Kuala Lumpur, Malaysia*.
- Reiser, R. and Dick, W. (1996). *Instructional Planning. A Guide for Teachers*. (2nd Ed.). Allyn & Bacon, Massachusetts, US.
- Ritchie, D.C. and Hoffman, B. (1997). *Using Instructional Design Principles to Amplify Learning on the World Wide Web*. ERIC Clearing House, Article No: ED415835.
- Sani, R. (2002). *Make e-learning easy in school*. Computimes, 12 August, pg 31.
- Smith P. (2001). *WWW in education*. Available: <http://adam.spu.edu/~psmith/iet.chpt4.htm>
- Wong, T.F. (2001). Instructional and Management Strategies of E-Lab in Multi Intelligent Engineering Student Environment. *Paper presented at the ICEE International Conference, October 29-30, Kuala Lumpur, Malaysia*.
-