5-2000

An investigation into the motivational design qualities of web-based instructional materials

Jun Wang

To the Graduate Council:

I am submitting herewith a dissertation written by Jun Wang entitled "An investigation into the motivational design qualities of web-based instructional materials." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Education.

Lonnie D. McIntyre, Major Professor

We have read this dissertation and recommend its acceptance:

Dale Doak, Schuyler Huck, Gretchen Whitney

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

To the Graduate Council:

I am submitting herewith a dissertation written by Jun Wang entitled "An Investigation into the Motivational Design Qualities of Web-Based Instructional Materials." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Education.

Lonnie D. McIntyre, Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

Associate Vice Chancellor and
Dean of The Graduate School

An Investigation into the Motivational Design Qualities of Web-Based Instructional Materials

A Dissertation

Presented for

Doctor of Philosophy Degree

The University of Tennessee, Knoxville

Jun Wang

May 2000

DEDICATION

This dissertation is dedicated to my late father,
Mr. Wang ZiWen

Who made the sacrifice to support my education in America

ACKNOWLEDGMENTS

I would like to express my greatest appreciation to my doctoral committee members, Dr. Lonnie McIntyre, Dr. Dale Doak, Dr. Schuyler Huck, and Dr. Gretchen Whitney for their constructive advise, sound guidance and invaluable support throughout the writing process of this dissertation.

I am grateful to my former and current directors, Ms. Camille Hazeur and Ms. Marva Rudolph, my colleagues, Jenny Richter and Khadra Baskin at the Office of Diversity Resources and Educational Services, for their consistent encouragement and assistance. The dissertation consultant of the Graduate School, Ann Lacava, and my friend, Zhen Ju, have been more than helpful in proof-reading and printing of the manuscript when I left UTK for job in China.

My greatest gratitude goes to my mother, Huang YuHua, whose love and care for me and my daughter have made my pursuit of degree easier and possible; and to my wonderful daughter, Phebe Shi who understood my efforts by spending lots of time by herself to allow me to finish my dissertation.

ABSTRACT

The purpose of this study was to assess the presence and absence of the motivational design components of John Keller's ARCS model of motivational design in Web-Based Instruction. Seventy five undergraduate students enrolled in the Spring semester 1999 at the University of Tennessee, Knoxville and three other universities whose courses had a Web-presence at the World Lecture Hall on the Internet were asked to evaluate their Web-Based Instructional materials. The instrument used to evaluate the Web-Based Instructional materials was John Keller's Instructional Materials Motivational Survey. Results from Repeated Measures of ANOVA indicated a general presence of the four motivational components (Attention, Relevance, Confidence & Satisfaction) of the ARCS model. Confidence subscale was rated highest. This finding did not support Duchastel's assumptions that WBI provided only for the first two factors (Attention and Relevance) but might be problematic for the latter two (Confidence and Satisfaction) in ARCS Model. Two-tailed T-test yielded significant differences between "the best sites and he worst sites in the mean scores of the four individual subscales and the sum scores of the four subscales. Such results provided some support for the utility of the ARCS model in assessing the Web-Based Instructional Materials.

TABLE OF CONTENTS

CHAPTER

LIST OF TABLES

TABLE

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Background of Study

As the popularity of the World Wide Web (WWW) increases, its use as a means of delivering instruction is also on the increase. Ritchie and Hoffman (1997) reported that educators are searching for ways to incorporate the Web into curricular areas. Professors and instructors are creating Web pages for their courses to post syllabi, assignments, reading material, and links to related resources. As a result, Web-Based Instruction is now blossoming. Researchers (Bannan & Milbeim, 1997) concluded that the current Web-based instruction courses exist in two formats: 1) classroom-based instruction, which includes information posted on the World Wide Web as an alternative delivery mode for information presented in class, and classroom-directed learning supplemented with specific Web-Based activities; and 2) courses delivered totally online, relying on Web-based resources as a full delivery mechanism for course interaction. Additionally, many instructors are beginning to incorporate electronic mail, newsgroups, and listserves to further augment instruction and promote interaction among students. The most wide use of the Web in instructional environments now is the first format: to distribute course materials (syllabi, assignments, calendars, notes, and course readings) to supplement traditional classrooms (Duchastel & Spahn, 1996, Hits & Ewing, no date). These classroom resources incorporate and utilize three primary functions of the Web: communication (the ability to communicate with other schools and community), information access (the ability to access and use information), and resource sharing (the ability to share and publish information resources for others to access and use).

Classroom use of the World Wide Web is affecting the way teachers and students interact.

However, just as with any new delivery medium, there is a tendency to focus on design strategies of the technological capabilities of the World Wide Web. Considerations of the core instructional elements are often neglected (Bannan & Milbeim, 1997). El-Tigi and Branch (1997) found that few instructional design guidelines existed for the World Wide Web. As Trochim (1996) commented: "People are implementing this revolutionary technology 'on the fly' and with virtually no rules or theories to guide them." In some ways, the need for careful instructional design is greater in Web-based courses (Bannan & Milbeim, 1997; Barnard ,1997; Small, 1997). Therefore, it is important to fully utilize the opportunity provided by Web technologies to re-examine university teaching and learning. Otherwise the Web will just become a nice modern-age photocopy machine to publish teaching notes and make them available to students inexpensively (Duchastel, 1997).

Designing and delivering instruction on the Web requires thoughtful analysis and investigation of how to use the Web's potential in relation to instructional principles (Hites & Ewing, no date; Ritchie & Hoffman, 1997). El-Tigi and Branch (1997) advocated combining the concepts of instructional design with the attributes of Web technology as a way to maximize Web-based learning. They believe that a lack of instructional design principles in Web-Based Instruction combined with an abundance of access to information could become overwhelmingly unstructured, thereby impeding the learning process.

It was recognized that an aspect of instructional design was the motivational one--the importance of focusing the learner's attention and keeping engagement high throughout the instructional event (Duchaster, 1997). Motivation was included as the first of the nine events of instruction in one of the most influential theories of instruction, that of Robert Gagné (1985). Dick and Reiser (1989) ranked "motivating the learner" as first of their seven common elements in instructional sequences. These seven events were recommended by Ritchie and Hoffman (1997) to be incorporated in Web-Based Instruction.

Small (1994) indicated that the identification and understanding of instructional design strategies that promote learner motivation would be useful for enhancing learning and performance. The use of technology to provide various stimuli to create appealing learning environment has become possible. However, simply adding color, graphics, or animation were not the only motivation strategies. A fancy web site could still be completely ineffective at guiding a learner towards an instructional goal if it is not created with sound instructional design theory in mind (Small, 1997).

To date, the only coherent and comprehensive instructional design model accommodating motivation is Keller's systematic and widely applied ARCS model (Small, 1983, Reigeluth, 1993). He identified four components (Attention, Relevance, Confidence, and Satisfaction) that could influence a person's motivation to learn. The initials of these four categories give Keller's model the acronym ARCS.

Statement of the Problem

There is a syndrome called "motivational complacency" which assumes that all new media are inherently motivating (Spitzer, 1997). The Web is believed to be

intrinsically motivating. With regard to this, Duchastel (1997) discussed the ARCS model in relation to WBI. He claimed that gaining and sustaining Attention would not be a problem in WBI because of the wealth of informative resources that were being made available and the richness of multimedia design strategies that were used to attract attention. WBI could provide the second factor of the ARCS model, Relevance, with the richness of the Web to enhance the possibilities of finding personally relevant resources that would match the learning outcomes. Confidence and Satisfaction, the last two ARCS factors were less controlled in WBI because they would generally require task persistence over time more than on the moment-to-moment task interaction. On the positive side, the sense of learner-control offered by WBI could be an encouragement for the curious student, but it's also easy to get lost in the Web and not fulfill learning expectations. Proper instructional supports were needed in developing these two factors in learners (Duchastel, 1996).

Duchastel finally concluded that WBI provided amply for the first two factors but might be problematic for the latter two of the ARCS Model. The assumption under this was that Attention and Relevance strategies would be found while Confidence or Satisfaction strategies would not be present in WBI

The current study intended to examine Duchastel's assumption about the ARCS model. It was expected that Web-Based Instruction would be **Attention** gaining and sustaining, be **Relevant** to students' needs, but might be problematic in building student's **Confidence** and generating **Satisfaction**.

Purpose of Study

The purpose of this study was to assess the presence and absence of the motivational design components of John Keller's ARCS model in WBI in relation to Duchastel's assumption about Keller's ARCS model.

The current study examined one type of Web-Based Instructional materials--the classroom supplemented Web-Based Instructional materials. The other kind, totally online Web-Based Instructional materials in which students and instructors only meet online, was not the focus of this study. For one thing, the number of the totally online courses was limited; for another, most of the totally online courses required passwords to get in. Even though the researcher could have logged in to these websites as a "guest," some of the information would not be available to outsiders who were not taking or teaching those classes.

Learners' perceptions were the major interest of this study because when considering the issues of learning and motivation, students' views of how the information should be organized and presented play an important role in what they can actually learn (Chanlin, 1996). Through an assessment of students' reactions toward the learning material, learners' perspectives about what should be included in instruction and what can be done to make instruction more motivational to the learners can be better understood.

Research Questions

Four questions were addressed in this study:

1. How did students perceive the motivation design qualities of the Web-Based Instructional materials in terms of Keller's ARCS Model?

2. Did websites that conformed more to Keller's model receive higher ratings from students than the websites that conformed less to Keller's model?

3. Which specific features of the ARCS Model did students perceive to be effective or ineffective in Web-Based Instructional materials?

4. What reactions did students have to the Web-Based Instructional materials?

Significance of the Study

It is believed that the issue of motivation will become more and more central to Web-Based Instruction as the true richness of the Web and its multimedia potential are realized (Duchastel, 1997). As a result, understanding the principles of motivation and how they apply to instruction is important for instructional designers. Motivation is important because no matter how skillfully instruction is planned, it can only be effective if learners persistently engage in it (Okey, 1991). Many education and training failures occurred because of the lack of concern for the "motivational side" of learning (Spitzer, 1989b). Instruction based on improved motivational strategies can result in improved learning.

Small (1997) indicated that even though the ability of educational designers to create instructional systems that were effective for students has grown tremendously in the last several decades, there is still a lag in knowing how to systematically develop effective motivational components of instruction. Everyone knows intuitively that motivation is vital to learning, but few understand what it is or how to use it systematically (Reigeluth & Curtis, 1987). Reigeluth (1993) indicated that the topic of how instruction should be designed in order to encourage students' involvement in learning requires further exploration. "More work is needed in this area, especially

regarding motivational strategies which are uniquely possible with advanced technologies" (Reigeluth, 1993).

Small (1997) found that a number of design guidelines existed that provided guidance on structure and content in WBI. However, few of those addressed the motivational aspects. Little research on analyzing the motivational design qualities of WBI has been conducted. Therefore, the current study was expected to contribute to the evaluation studies on the design of WBI and provide some design implications for motivating learning in developing WBI.

Definitions

Web-Based Instruction: Parson (1997) defines WBI as "Instruction delivered in whole or in part by the Web."

Motivational Design: Keller (1983) defines motivational design as an aspect of instructional design, which refers specifically to strategies, principles, and processes for making instruction appealing. It is concerned with how to make instruction appealing without becoming purely entertaining. Keller (1983) stated that instruction could sometimes be very effective without being appealing at all. At the other extreme, instructional materials can be very appealing without being effective. Thus, motivational design is concerned with how to make instruction appealing without becoming purely entertaining.

Okey (1991) proposed that motivational design theory guides the designer in how the events of instruction should be implemented. Motivational design addressed the characteristics of the instructional events that influence how attentive learners are during

instruction, the relevance seen in the learning tasks, the confidence with which instructional tasks are carried out, and the satisfaction derived from learning.

Instructional Design Theory: A theory of instructional design is an organized set of prescriptions that assists in the preparation of instruction (Duchastel, no date). Okay and Santiago (1991) acknowledged that instructional design theory guides the designer in what instructional events should be planned and in what order they should be carried out.

Courses with Web Presence : According to the definition on the homepage of University of Tennessee, Knoxville, "Courses augmented by the Web" were defined as "Courses with Web Presence."

Methodology

The purposive sampling procedure was employed in the study. The sample for the study included nine courses with Web presence, from University of Tennessee, Knoxville and the World Lecture Hall on the Internet. The subjects of the study were students of these nine courses at the University of Tennessee Knoxville and three other universities which posted their Web courses on the World Lecture Hall during the 1999 Spring semester. The IMMS (Instructional Materials Motivation Survey) by Keller (1983) was used as the instrument for data collection from the students in this study. Two additional sections were added to the original survey for this study: the open-ended question section about subjects' opinions on the problems and expectations in using WBI; and the section asking for demographic information about subjects' gender, and home institution names. The original survey was hosted on the personal homepage of the researcher. Since the topic of the study was using technology (web) for instruction, the researcher considered it appropriate to post and collect the data online. After gathering

data from students, the researcher used the Statistical Package for the Social Science (SPSS-X) computer program to conduct statistical analysis. Repeated Measures of ANOVA (simple analysis of variance) was conducted to determine if the category means of the four subscales of the ARCS model were significantly different. The researcher also evaluated the same websites that students evaluated following the subcomponent strategies suggested by Keller's ARCS model as guidelines. A two-tailed T-test was employed to test the group means between the "best " sites and "worst' sites, as were identified by the researcher.

Limitations

This study used the researcher only as a more experienced "expert" in comparison to students in evaluating the websites. Future study can use a panel of experts in instructional design to evaluate the websites to make the study more objective.

This study looked at one kind of WBI: the classroom supplemented Web-Based Instructional materials. Future studies can look at the totally online Web-Based Instructional materials to assess the related motivational design characteristics.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this study was to assess the presence and absence of the motivational design components of John Keller's ARCS model in Web-Based Instruction. This chapter reviews the theoretical and empirical background relevant to this study. It is divided into five sections. Section One is a more detailed introduction to the ARCS Model. Section Two reviews the theoretical origin of the ARCS Model. Section Three reviews the rationale for the ARCS Model. Section Four reviews the strategies embedded in the ARCS Model. Section Five reviews different studies involving the ARCS Model.

The ARCS Model

Motivation has been described by Keller (1983a) as "the heart" of understanding how to design effective instruction. Due to the lack of theory and lack of measurements dealing with motivation, instructional designers have assumed that good-quality instruction will in itself be motivating (Keller, 1983a). Concerned with the lack of prescriptive information on how to incorporate motivation into the instructional design process, Keller developed the ARCS Model for designing motivational materials and courses based on a review of psychological literature on motivation (Dick & Carey, 1990). He (1987a) posited that in order to motivate students to learn, instruction must: (1) gain and sustain learners' Attention, (2) be Relevant to learners' needs, (3) foster learners' Confidence in their abilities to successfully complete the task, and (4) be Satisfying to learners by meeting their expectations and providing equitable feedback.

In this model, **Attention** refers to arousing and maintaining interest throughout the instruction. This can be achieved through perceptual arousal, inquiry arousal, and variability in instruction. **Relevance** provides linkages between the content and methods of instruction and the importance of the instruction to the learner. Instruction must have perceived relevance to the immediate or long-term personal needs. This can be accomplished by matching the instruction to learners' goals, making the benefits clear, keeping the challenge level appropriate. **Confidence** refers to the feelings of competence in the ability to learn or perform a task. It is accomplished through identifying the learning requirements, providing opportunities for success and offering the learner personal control within the instructional materials. **Satisfaction** occurs when the learner perceives a direct relationship between successful achievement of learning goals and personal effort. It is accomplished through opportunities to use the new knowledge and skills, opportunities for positive consequences, and equity, which allows a learner to feel positive about his or her accomplishments through the application of consistent standards and consequences (Keller, 1987a).

According to Keller (1983a), these are four conditions that must be addressed during instruction for students to become and remain motivated. Keller (1979) maintained that learner deficiencies in any of these four areas might be improved through systematic instructional planning. The challenge of how to stimulate students' motivation to learn could become more predictable and manageable when these four basic human characteristics and the motivational dynamics associated with them were taken into consideration in designing instructional materials (Keller, 1987a). Keller (1987a) identified three distinctive features about the ARCS Model. First, the four

conceptual categories (Attention, Relevance, Confidence and Satisfaction) incorporated many of the specific concepts and variables that characterize human motivation. Second, the model included sets of strategies to use in enhancing the motivational appeal of instruction. And third, the model incorporated a systematic design process called motivational design.

The "adaptability to a wide variety of teaching methods and process" was regarded as the relative strength of the ARCS model (Bohlin, 1987). Bohlin (1987) claimed this to be of particular importance in context where an "extreme variance in classroom process is encouraged to accommodate a wide range of learning styles and to develop individuality."

The Theoretical Foundation of the ARCS Model

The ARCS model is the result of Keller's synthesis of affective, cognitive, and behavior theories of motivation into a comprehensive model (Snelbecker, 1985; Naime-Diefenbach, 1991). It is based upon inductive analyses of the actual teaching practices of highly motivating instructors and deductive analyses of current learning and motivation theories. The ARCS Model is rooted most notably in Expectancy-Value theory. E-V theory posits that people are motivated to engage in an activity if it is perceived to be linked to the satisfaction of personal needs (the value), and if there is a positive expectancy for success (the expectancy)(Keller, 1987). In Expectancy-Value theory, "effort" is identified as the major measurable motivational outcome. For "effort" to occur, two necessary prerequisites are specified: (1) the person must value the task and (2) the person must believe he or she can succeed at the task. According to Small's (1997) interpretation, this meant that, in an instructional situation, the learning task

needed to be presented in a way that was engaging and meaningful to the student, and in a way that promoted positive expectations for the successful achievement of learning objectives. Keller (1979) stated that the Value dimension of the E-V theory was most closely related to his Attention and Relevant components while the Expectancy dimensions was mostly closely aligned with the Confidence and Satisfaction components. Small and Gluck (1994) supported this distinction in a recent study. Keller's model is based on the premise that an individual's motivation (effort) can be influenced by manipulation of the learning environment and the instructional events which define that individual's perceptions concerning value and/or expectancy for success (Keller, 1979). This has significance for those concerned with the design, presentation, evaluation, and improvement of instruction.

The Rationale for Using the ARCS Model

Keller (1987b) developed the ARCS Model of motivation in response to a desire to find more effective ways of understanding the major influences on the motivation to learn, and for systematic ways of identifying and solving problems with learning motivation. It was created because of the lack of guidance that existed for improving the motivational quality of instruction. The three purposes of developing the ARCS model (Keller, 1983b) were:

To provide a theoretically-based model for integrating the numerous strategies for increasing motivation;

To facilitate the effort to integrate motivation theory and motivational strategies with instructional-design theory; and

To allow a problem-solving approach to identifying and solving motivational problems.

The primary emphasis of the ARCS model, as described by Bickford (1989), was to "change students' perceptions of control over their destinies and increase confidence in their abilities to foster motivation." The ARCS Model helps a designer identify and solve motivational problems related specifically to the design of materials, style of teaching and overall design of a course. It works best as a tool to assist in improving the appeal of instructional materials and programs (Keller, 1983b). However, it was not intended for use in solving individual personality problems or in teaching students how to be self-motivated. The model can be used effectively if the purpose is to improve the motivation appeal of instruction.

The Strategies Embedded in the ARCS Model

Visser and Keller (1990) identified two different conceptions about motivation. One looks upon motivation as a general state to be achieved before the implementation of learning tasks in order for learning to be efficient and effective. Many theories of instruction belong to this perception by considering "motivation" as a preliminary phase (or prerequisite) that must occur **prior to** instruction, rather than being viewed as a central element of the instruction itself (Spitzer, 1996). In the other conception, motivation is regarded as a continually changing set of factors influencing the individual's learning behavior **before** and **during** the learning task. Instructional interventions based on this latter are targeted towards **strategies** that aim at setting the motivational factors at appropriate levels during instruction for ideal learning conception (Keller,1987a, b). The ARCS Model is the only motivational design model that

prescribes a range of instructional strategies related specifically to the design of materials, style of teaching, and overall design of a course (Small, 1997). Keller viewed two conditions as prerequisites in improving motivation rationally and predictably. First, it was necessary to have an understanding of the primary components of the motivation to learn, and of the kinds of strategies that would have a positive influence on these components. Second, it was necessary to know what types of strategies to use, how many to use, and how to design them into the course. Keller (1983b) pinpointed four variables that had to be considered in motivational design: human characteristics that pertain to motivation; **design strategies** intended to influence motivation; social and environmental conditions that might influence the effectiveness of the motivational strategies; and consequences, which present special problems.

The ARCS model assumed that strategies embedded in instructional materials could enhance the learners' Attention to the materials and perceptions of Relevance, Confidence and Satisfaction about learning from them, which in turn would enhance cognitive performance. In addition to the four components of the model, Keller suggested a number of strategies to include in instruction to enhance the four conditions of motivation of the model. He maintained that it was possible to improve the motivational appeal of courses without having to make an enormous investment in special effects or other entertainment strategies (Keller, 1987a).

The ARCS model provides strategies which a course designer or teacher can use to make instruction responsive to the interest and needs of learners. Each of the four ARCS components consists of three sub-components with main supporting practical strategies to apply in achieving each of the four requirements. The strategy statements

were obtained by Keller from research studies in the primary areas of research on human motivation, from practical handbooks, and from interviews with practitioners (Keller, 1987b). Those sub-component strategies are listed in Table 1.

The issue of how the ARCS model and its' strategies work in WBI has not been explored. However, there are some initial attempts now in relating Keller's ARCS model to Web-Based Instruction. More and more interests are growing in this area. One website (http://home.istar.ca/~djcote/motivation/class.htm) on motivation design sought out some strategies based on the ARCS model from readers that could be used to design motivating web based instruction. The resulted strategies collected were presented in Table 2.

Dr. Ruth Small has been one of the pioneers in applying the ARCS model in WBI. She asserted that the ARCS Model provides a useful framework for both the design and improvement of the motivational quality of a range of information entities--from classroom instruction to Internet resources (1997). Some of the model's components may also be useful in describing the motivational characteristics of websites. She has invented a serious of survey instruments in evaluating the motivational characteristics of the website.

Studies Related to the ARCS Model

There were just a few studies involving the use of on the ARCS model. Those studies looked at different aspects of the model. Some of them examined the learning outcomes of the ARCS enhanced instruction, either by looking at the four components or by looking at one of the four components. Other studies used the ARCS model to measure the motivational levels of instructional materials.

Table 1 The ARCS model and strategies (John Keller, 1987)

Factors	Subcategories	Main Supporting Strategies
A	A1 Perceptual Arousal	Create curiosity, wonderment by using novel approaches, injecting personal and/or emotional material
	A2 Inquiry Arousal	Increase curiosity by asking questions, Creating paradoxes, generating inquiry, and nurturing thinking challenges.
	A3 Variability	Sustain interest with variations in presentation style, concrete analogies, human-interest examples, and unexpected events.
R	R1 Familiarity	Make the materials and concepts familiar by providing concrete examples and analogies related to the learner's work.
	R2 Goal Orientation	Provide statements or examples of the utility of the instruction, and either present goals or have learners define them.
	R3 Motive Matching	Make instruction responsive to learner motives and values by providing personal achievement opportunities, cooperative activities, leadership responsibilities, and positive role models.
C	C1 Expectancy for Success	Establish trust and positive expectations by explaining the requirements for success and the evaluative criteria.
	C2 Challenge setting	Increase belief in competence by providing many, varied and challenging experiences which increase learning success.
	C3 Attribution Molding	Use techniques that offer personal control (whenever possible), and provide feedback that attributes success to personal effort.
S	S1 Natural Consequences	Provide problems, simulations, or work samples that allow the students to see how they can solve "real-world" problems.
	S2 Positive Consequences	Use verbal praise, real or symbolic rewards, and incentives, or let students present the results of their efforts to reward success
	S3 Equity	Make performance requirements consistent with stated expectations, and provide consistent measurement standards for all learner's tasks and accomplishments.

Table 2 Suggested Strategies for Motivating Web Based Instruction

COMPONENTS	STRATEGIES
ATTENTION	Provoke mental reasoning and problem solving by sending students to Web Pages with differing opinions. Use good screen design to capture the interest and attention of the learner (Blair Johnson). Use good visuals to capture attention. Use relevant multi-media elements to help keep students on task. Build interactivity into the instructional design.
RELEVANCE	Show how instruction relates to the student's future goals. Try to apply instruction to real world scenarios. Demonstrate why the material is important to the student. Adapt course requirements to the learning style of the students.
CONFIDENCE	Build in frequent summaries and reviews. Provide opportunities for the students to interact with the instructor, other students, and the instructional materials.
SATISFACTION	Share work done on the web with others, especially at other institutions. Utilize fair rewards that are based on the quality of work produced. Encourage collaboration between students as they develop Web-based assignments.

Learning Outcomes The learning outcomes of the ARCS-enhanced instruction were the major focus for some studies. Means et al (1997) concluded from their researches that ARCS-enhanced instruction has produced inconsistent results on motivation levels and learning outcomes in different groups of learners. Some studies indicated a possibility that the ARCS model strategies might be effective in increasing motivation and learning. For instance, Tilar and Rossett (1993) analyzed the effectiveness of job aids incorporating the ARCS strategies in their studies. They found that the job aids demonstrating all four components captured the attention of the users and fulfilled the needs of the users better than other job aids analyzed which did not incorporating the ARCS strategies. Naime-Diefenbach (1991) showed that lessons with enhanced Attention strategies of the ARCS model improved learners' attention, while confidence-enhanced materials resulted in improvement of confidence. In their study to investigate students' reaction to distance learning, Fulford and Zhang (1993) found that the addition of Keller's motivational strategies enhanced learners' feelings of active involvement and especially their sense of satisfaction with the distance education materials and classes. Klein's study (1992) determined the effects of using an instructional game and supplemental readings on student motivation using the ARCS model of motivation and performance. Results indicate that using the motivation-enhanced instructional game and completing the reading assignment both had a significant effect on motivation. Bickford (1989) concluded from her study that the ARCS Model was effective for both motivation and achievement: "Students who studied the motivationally-enhanced lesson learned more than the students who studied the original lesson." Means & others (1997) surveyed adults in a wide variety of settings to

determine their perceptions of their motivational needs. The results suggested that instructional strategies of the ARCS model could have a positive effect on the interest and effort of adult learners. In another study to test the application of a motivational intervention, developed according to the process outlined in the ARCS model of motivational design, Keller (1990) implemented and tested with a group of 15 adults participating in a staff development course. Results indicated that motivational messages had positive effects on student attitude and performance. Bohlin et al (1994) collected data regarding the instructional motivation perceptions of adults in a variety of learning environments in order to learn more about the motivational factors of adult learners. They found that the theoretical nature of the categories in the ARCS model were consistent with the nature of the self-reported motivational needs of adults in colleges and workshops. Lih-Juan (1994)'s case study employed Keller's motivational design strategies in a computer-assisted interactive lesson. Analysis of data supported the assumption that instructional treatments for motivating learning required consideration of the four motivational categories, and that strategies based on these categories were all essential in the process of learning.

Individual ARCS Factors Some researchers looked at specific factors of the ARCS model. Naimer-Diefenbach (1991) manipulated the Attention and Confidence variables of the ARCS model. One of their hypotheses sought to determine if materials enhanced by the ARCS model had a positive effect on learner confidence. It appeared that confidence was not affected by using the ARCS model. Their second hypothesis sought to determine if materials enhanced by the ARCS confidence strategies had an effect on learner achievement. The data analysis reporting the confidence-achievement

correlation showed no significant correlations. Correlations between confidence and achievement were not statistically significant either. They did not come to the conclusion that materials enhanced by the ARCS model increased achievement. Klein (1990) found no relationship between learners' perceptions of confidence and satisfaction and the embedded strategies. Price (1989) examined the influence of textual display in printed instruction on the attention of 90 preservice teachers measured by the Attention subscale of the Instructional Materials Motivation Scale (IMMS). Results did not support the expectation that textual display would significantly influence attention. In another study to determine whether instruction could be enhanced by following the ARCS confidence-building strategies with 66 graduate and undergraduate college students, Moller (1994) concluded that instructional materials incorporating the ARCS confidence strategies had no effect on learner confidence or achievement. The result from Bohin's (1990) study suggested that many instructors' motivational methods were perceived to have a stronger positive effect on adult learners' interests than on adult learners' efforts in learning. Confidence building strategies were found to be much more strongly linked to perceived effort of learners than to instructional appeal. Attention, relevance and satisfaction promoting strategies were not clearly linked more strongly to interest or to effort. Means and others (1997) found that embedded relevance-strategies resulted in greater motivation and performance gains. The result of their study indicated that learners for whom the materials were more relevant had higher perceived motivation levels and better task performance.

Motivational Levels of Instructional Materials A few studies used elements of the ARCS as a set of criteria to measure motivational levels of different instructional

materials. The ARCS model was first tested in two teacher training workshops in 1982-1983 (Keller, 1987). The results of these two field tests provided support for the comprehensibility and utility of the ARCS model as a means of assisting in the motivational design of instruction. Gallagher (1989) used the ARCS model as the theoretical framework to identify possible motivational factors that might contribute to the motivational problems among nursing students. Ley (1989) used the IMMS (based on the ARCS model) for analyzing the motivational level of instructional materials. In investigating the motivational level through providing a graphic illustration of concept trees, Hirumi and Bowers (1991) also used the ARCS model and IMMS to examine instructional materials.

In summary, it seems that most studies examined learners' motivation levels and learning outcome by using ARCS-enhanced instruction. And these studies produced inclusive results. While some empirical studies indicated a possibility that the ARCS model strategies might be effective in increasing motivation and learning, some studies proved otherwise. Another type of studies using the ARCS model to evaluate the motivational effects of instructional materials yielded the same inconclusive result. But no studies have been conducted so far to use the ARCS model to evaluate the motivational levels of web-based instructional materials.

CHAPTER III

METHODOLOGY AND PROCEDURES

Introduction

The purpose of this study was to assess the presence and absence of the motivational design components of John Keller's ARCS model in Web-Based Instruction. The following questions were examined by the current study:

1. How did students perceive the motivational design qualities of the Web-Based Instructional materials in terms of Keller's ARCS Model?
2. Did websites that conformed more to Keller's model receive higher ratings from students than the websites that conformed to Keller's model?
3. Which specific features of the ARCS Model did students perceive to be effective or ineffective in Web-Based instructional materials?
4. What reactions did students have to the Web-Based Instructional materials?

This chapter is a description of the methodology and procedures utilized in the current study. It consists of four parts: 1). A description of the study population; 2). A description of the survey instrument; 3). A description of the procedures used to gather and analyze data; and 4). A Summary.

Subjects and Sample

The purposive sampling procedure was employed in this study. McMillan (1996) defined "Purposive Sampling" as "selection of particularly useful subjects." In the current study, the researcher used purposive sampling to select subjects who were involved in using Web-Based Instructional materials because they were representative and informative of the topic of Web-Based Instructional materials.

The sample for the study were nine Web-Based courses. Three courese were identified from the website "World Lecture Hall" on the Internet (http://www/utexas.edu/world/instruction/index.html). This website, hosted by the University of Texas, listed hundreds of courses by faculty worldwide who were using the Web to deliver class materials. It was considered the "best site for instructional WWW sites" (Shotsberger, 1996). It's instructional uses of WWW provided a description of the topic covered; contents available (such as syllabi, lecture notes, and assignments); and a direct link to each site. The seventy-four subject areas on the site ranged from Accounting to Zoology. One subject area "Computer Science" was chosen to be the sample for the study with its largest number of web courses (one hundred and fifty-five) The original purpose of having the sample from one subject area instead of various areas was to make the study more focused.

The research further categorized those one hundred and fifty-five web classes in this subject area. It was found that the number of the totally online Web-Based Instructional sites where instructors and students did not meet physically in the classroom was too small-just a couple. In addition, those online web classes usually required passwords to access them. Therefore the main contents and documents would not be available or accessible to outsiders like the researcher. As a result only classroom-supplemented Web-Based Instructional classes (about forty sites) were considered to be selected as the sample for the study. To homogenize the sample to the greatest extent, only lower division undergraduate (freshmen and sofermen) web classes of the Spring Semester, 1999 were used, since the majority of the web classes fall into this category.

According to the above selection criteria, the courses available that met the requirements to be the sample for the study were about forty lower-division undergraduate classroom-supplemented web courses.

Participants of this study were fifteen students of three courses listed on the World Lecture Hall and sixty students at the University of Tennessee, Knoxville who were enrolled in the Spring semester of 1999. Respondents from World Lecture Hall were Computer Science Students from three universities. Respondents from UTK All the students were lower division undergraduates.

Instrumentation

The IMMS (Instructional Materials Motivation Survey, Appendix 1) was used to measure students' perceptions of the motivational design qualities of the web-based instructional materials. John Keller developed the IMMS in accordance with the theoretical foundation represented by the ARCS Model (Keller, 1987a, 1987b). The IMMS is intended to be a situational measure of the presence or absence of the motivational components of Attention, Relevance, Confidence, and Satisfaction in relation to the instructional materials they have used. The pool of items was prepared after reviewing the concepts and strategies that comprise the ARCS model and a variety of instruments used to measure motivational constructs. The IMMS asks students to rate 36 ARCS-related statements in relation to the instructional materials they have used. Each of the 36 Likert-scale statement was supposed to rate one of the four motivational factors by assigning one point for "Not True," two points for "Slightly True," three points for "Moderately True," four points for "Mostly True," and five points for "Very True." The internal consistency for the instrument is .89. Although empirical evidence

supporting the construct validity of the ARCS model is still rather limited, studies have reported statistical reliability of its measures.

Reliability estimates based on Cronbach's alpha measure were obtained for each subscale and the total scale was listed in Table 3.

The IMMS has been used widely to measure the motivational quality of a variety of educational materials and technologies. There are thirty-six statements related to the four primary dimensions of motivation of the ARCS model proposed by Keller. These thirty-six statements were grouped into four categories in Table 4.

Twenty-six of the thirty-six IMMS statements were positively stated statements. Those were questions "1, 2, 4, 5, 6, 8, 9, 10, 11,13, 14, 16, 17, 18, 20, 21, 23, 24, 25, 27, 28, 30, 32, 33, 35, and 36." The coding for those positively-stated statements were: "5 = Very True, 4 = Mostly True, 3 = Moderately True, 2 = Slightly True, 1 = Not True." For these positively worded statements a higher mean score corresponded to a more positive motivational design qualities as perceived by students. Ten of the thirty-six IMMS statements were negatively stated statements. Those were questions "3, 7, 12, 15, 19, 22, 26, 29, 31, and 34." The coding for those negatively-stated statements were:"1 = Very True, 2 = Mostly True, 3 = Moderately True, 4 = Slightly True, 5 = Not True." These were negatively worded statements, and the scores were coded inversely, so a higher mean score also corresponded to more positive attitudes. In general, the questions were coded in the way so that the higher score represented more positive motivational aspects as perceived by students.

In addition to Keller's thirty-six statements, two sections were added to the original instrument by the researcher. One section asked for open-ended answers about

Table 3 Reliability for ARCS Subscales

Subscale	Cronbach's alpha
Attention	.89
Relevance	.81
Confidence	.90
Satisfaction	.92
Total Scale	.96

Table 4 The ARCS Related Statements of the IMMS

Subscales	Statements
Attention	2, 8, 11, 12, 15, 17, 20, 22, 24, 28, 29, 31
Relevance	6, 9, 10, 16, 18, 23, 26, 30, 33
Confidence	1, 3, 4, 7, 13, 19, 25, 34, 35
Satisfaction	5, 14, 21, 27, 32, 36

Subjects' opinions on the problems and expectations in using WBI: "What do you think...." Another section asked respondents to fill in the demographic information like their gender (Appendix 1).

Permission for using the IMMS as the instrument of the current study was granted by Dr. John Keller, the author of the instrument. The researcher contacted Dr. Keller by email about using the IMMS for the study. Dr. Keller faxed the researcher a copy of the IMMS and the scoring guide.

Procedures

Distribution of the Questionnaire

Following approval from the Human Subjects Committee at the University of Tennessee, the survey was sent out by email at the end of March and the beginning of April. The researcher contacted thirty-four instructors of the web classes (identified to be the sample as mentioned above) from the World Lecture Hall on the Internet. The email addresses of these instructors were obtained from their class web sites on the World Lecture Hall. The purpose of this initial letter was to introduce the study and ask the instructors for permission to let their students participate in the study. It was stated in the letter that participation in the study was voluntary and the responses would be kept confidential.

Of the thirty-two instructors contacted, sixteen responded. Eleven instructors agreed to have their students participate in the study. Three instructors refused. One instructor rejected on the ground that his site was informational only—for schedules, office hours, etc. It could not be considered as an instructional website. One instructor could not participate because his students were approaching the end of the winter

semester. One instructor agreed to participate but asked the researcher to complete an IRB guide form from her university. However, neither she nor the researcher could access the Website, which provided the IRB guideline form. Therefore the site was not used in the study.

The eleven instructors who agreed to participate in the study either forwarded the cover letter (student version) to their students or put a hyperlink to the survey on their course websites. One professor posted the whole survey on the Website.

Unfortunately the UTK web server which hosted the researcher's personal homepage with the survey questionnaires was down for several days soon after the researcher had notified instructors and students of the selected web courses of the study. The questionnaire posted on the personal homepage of the researcher was intermittently available. Because of this problem, the students' responses were not satisfactory due to access problem. Only fifteen students from three web classes completed the survey. The researcher brought this issue up to the Ph.D. advisory committee. The committee approved the researcher's request to enlarge the sample by adding a few Web courses at the University of Tennessee, Knoxville. Using the same criteria for selecting the sample sites from World Lecture Hall on the Internet, the researcher identified, according to alphabetic order, eight undergraduate classes with a Web presence listed on the UTK web site. There was no one single subject area which provided enough Web courses that met the requirements to be the sample for the study. As a result, Web courses from different subject areas were chosen. The instructors of these websites were contacted by e-mail. Five of the instructors replied promptly. They were very enthusiastic and supportive of the study and encouraged their students to participate. They all posted the survey on their

course web sites or provided a special link to the questionnaire. One of the instructors even gave special credits to students for completing the survey. The researcher either contacted the students whose e-mail addresses were provided by instructors or sent the cover letter and questionnaire to the instructors who agreed to let their students participate in the study and asked those instructors to forward the letter to students.

In summary, a sample of nine web classes from eight instructors was used for evaluation in the study (see Table 5).

Table 5 Response Rate by Instructors

Number of Instructors Contacted	Number of the Instructors Responded	Number of the Instructors Agreed to Participate	Response Rate*
Total : 40	21	16	40%
UTK: 8	5	5	63%
Non-UTK: 32	16	11	34%

*Based on the number of the instructors agreed to participate in the study.

Collection of Survey

Since the study is on Web-Based Instruction, the researcher thought it would be appropriate to publish and collect data online. The survey was hosted on the personal homepage of the researcher. It was published in an interactive form format. Students were asked to evaluate their class websites and then filled out and submitted the survey online. A total of seventy-five responses were collected from the students of nine

websites of the eight instructors contacted. The response rate, based on the number of the students was listed in Table 6.

Data Analysis

The data collected were analyzed using the Statistical Package for the Social Sciences (SPSS-X) computer program with assistance provided by The Statistical and Computational Consulting Center of the University of Tennessee. The scoring scale for the questionnaire ranged from 1 to 5. Scores were determined by summing the responses for each of the four ARCS subscale and the total score. Then Repeated Measures of ANOVA (simple analysis of variance) was used to test the category means for significant differences. In other words this test was done to find out if there would be a subscale that would score higher on average than the others.

Before the evaluation, the researcher evaluated a website as the baseline data to provide basis for evaluation. The site used for evaluation was selected from the same subject area (Computer Science) from the World Lecture Hall. This subject area was the one students used for evaluation. Keller's three-strategy sub-components of the four ARCS factors (Table 1) were employed by the researcher as the evaluation criteria. A scoring guide (Appendix 2) was developed based on the evaluation result by the researcher. The scoring guide consisted a "0, 1, 2" scoring system where 0 represented the lowest degree to which a strategy was applied, 2 represented the greatest degree. Each ARCS factor consisted three subcomponents. Therefore the minimum score for each subscale was 0, and the maximum was 6. Accordingly, the maximum for the four subscales was 24. The sum of the nine sites for each subscale was 54. For example, the

Table 6 Responses Information from Students of Nine Classes

Number of the Sites Returned the Survey	Number of the Responses from Each Site	Subject Areas
1	1	Computer Science
2	6	Computer Science
3	8	Computer Science
4	9	English
5	6	Chemical Engineering
6	6	Classics
7	24	English
8	4	Electrical Engineering
9	11	Chemical Engineering

total score obtained in evaluating the website in the pilot study was 19. Therefore it indicated that the motivational design qualities were relatively high. In addition, Attention and Confidence strategies were used more effectively than the other two strategies according to John Keller's criteria.

For the results of the researcher, descriptive statistics were used to summarize the responses. The total scores were determined by summing the responses for each subscale to identify the best and worst sites being evaluated.

Descriptive analyses are provided in the next chapter to compare the responses of the students as evaluators with the responses of the researcher as the evaluator. The results showed whether the responses from the two sides yielded the same findings.

CHAPTER IV

DATA ANALYSIS

This chapter presents the results from the analysis of data collected from seventy-four out of the seventy-five returned questionnaires. The purpose of this study was to assess the presence and absence of the motivational design components of John Keller's ARCS model in Web-Based Instruction. Answers to the following questions were sought:

1. How did students perceive the motivational design qualities of the Web-Based Instructional materials, in terms of the components of Keller's ARCS Model?
2. Did websites that conformed more to Keller's model receive higher ratings from students than the websites that conformed less to Keller's model?
3. Which specific features of the ARCS Model did students perceive to be effective or ineffective in Web-based Instructional materials?
4. What reactions did students have to the web-based instructional materials?

The chapter is organized into two sections: (1) Quantitative results which are divided into three subcategories: (A) Description of the respondents, (B) Data related to research question 1, (C) Data related to researcher question 2; and (D) Data related to research question 3; (2) Qualitative results based on the written responses of the students related to research question 4.

Quantitative Results

The data were analyzed using the Statistical Package for the Social Science computer statistics program. The responses came from the nine classes of eight instructors (two of the classes were from the same professor) who agreed to have their students participate in the study. Of the seventy-five returned responses, one was discarded because it was missing too much data with only five of the thirty-six items being filled out. The thirty-six items of the IMMS survey were rated on a five-point Likert scale. The scores ranged from 1-5 where 1= Not true, 2 = Slightly true, 3 = Moderately true, 4 = Mostly true, 5 = Very true. Therefore, higher mean scores indicated more positive motivational design qualities of the Web-Based Instructional materials being evaluated by students. Some items in the IMMS survey were stated in a negative manner. The scores for the responses of these negatively stated items were reversed before they were added into the response total. That is, for these items, 5 = 1, 4 = 2, 3 = 3, 2 = 4, and 1 = 5. The statements stated in a negative manner are listed in Table 7.

From the data collected, students' perceptions to the motivational design qualities of web-based instructional materials in terms of the ARCS Model and other related feedback were summarized. The issues those students addressed regarding the design of Web-based instructional materials, which are pertinent to understanding motivational and learning were presented.

Table 7 The IMMS Statements Stated in a Negative Manner

Subscales	Statements
Attention	15. The pages of this lesson look dry and unappealing.
	22. The amount of repetition in this lesson caused me to get bored sometimes.
	29. The style of writing is boring.
	31. There are so many words on each page that it is irritating.
Relevance	26. This lesson was not relevant to my needs because I already knew most of it.
Confidence	3. This material was more difficult to understand than I would like for it to be.
	7. Many of the pages had so much information that it was hard to pick out and remember the important points.
	19. The exercises in this lesson were too difficult
	34. I could not really understand quite a bit of the material in this lesson.

(A). Description of the Respondents

Demographic data were obtained from participants' responses to Section III of the questionnaire (Appendix 1). The participants of the study were lower division undergraduate students enrolled in the 1999 Spring Semester at the University of Tennessee, Knoxville and some students at three other universities whose courses had "web presence" on the World Lecture Hall on the Internet. Of the seventy-five respondents, sixty were from UTK and fifteen were from three other universities on the World Lecture Hall. The selection of the UTK Web courses was done in alphabetic order on UTK website, which listed "courses with Web absences." Students of these courses at UTK were majoring in several different subject areas in English, Classics or Engineering Dept. Students from courses on the World Lecture Hall on the Internet were selected from one subject area - Computer Science. Figure 1 presents the number and percentage of all the respondents.

Of the seventy-five respondents, forty-one were female respondents. Thirty-five were from UTK and six were from the World Lecture Hall. The total number of the male respondents was thirty-one. Twenty-three were from UTK and eight of them were from the World Lecture Hall. The gender of three respondents was unknown. Figure 2 presents the gender information of the seventy-five respondents.

(B). Data related to Research Question 1

Question

"How did students perceive the motivational design qualities of the Web-Based Instructional materials in terms of Keller's ARCS Model?"

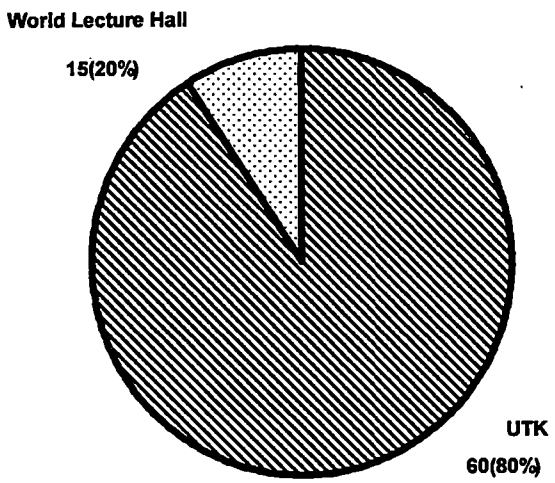


Figure 1 The Number and Percentage of All the Respondents

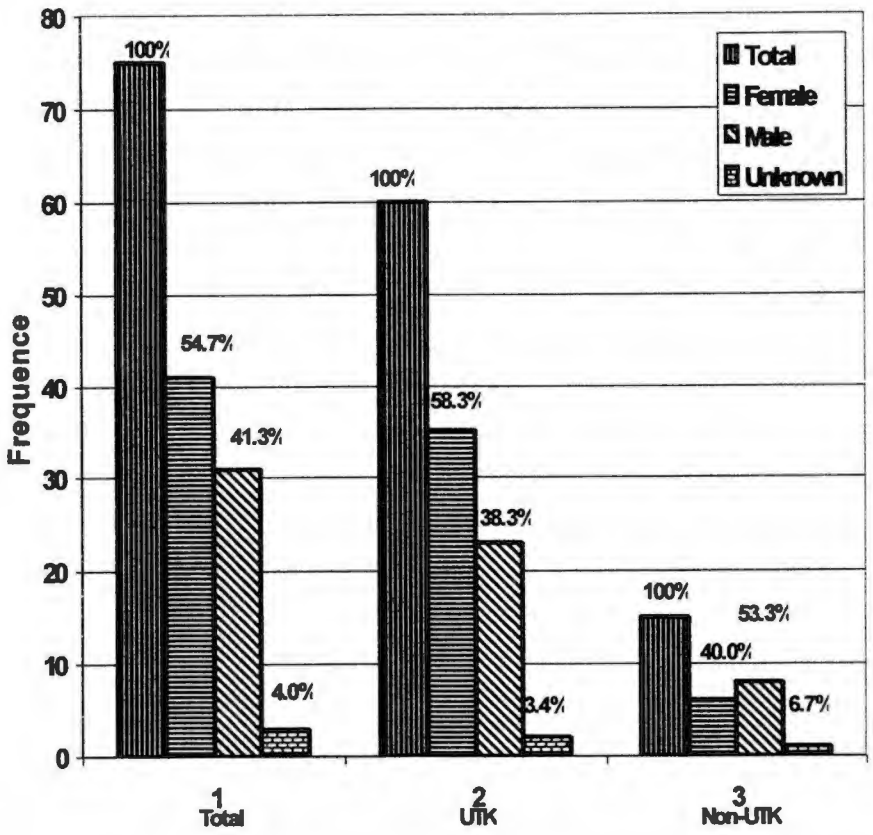
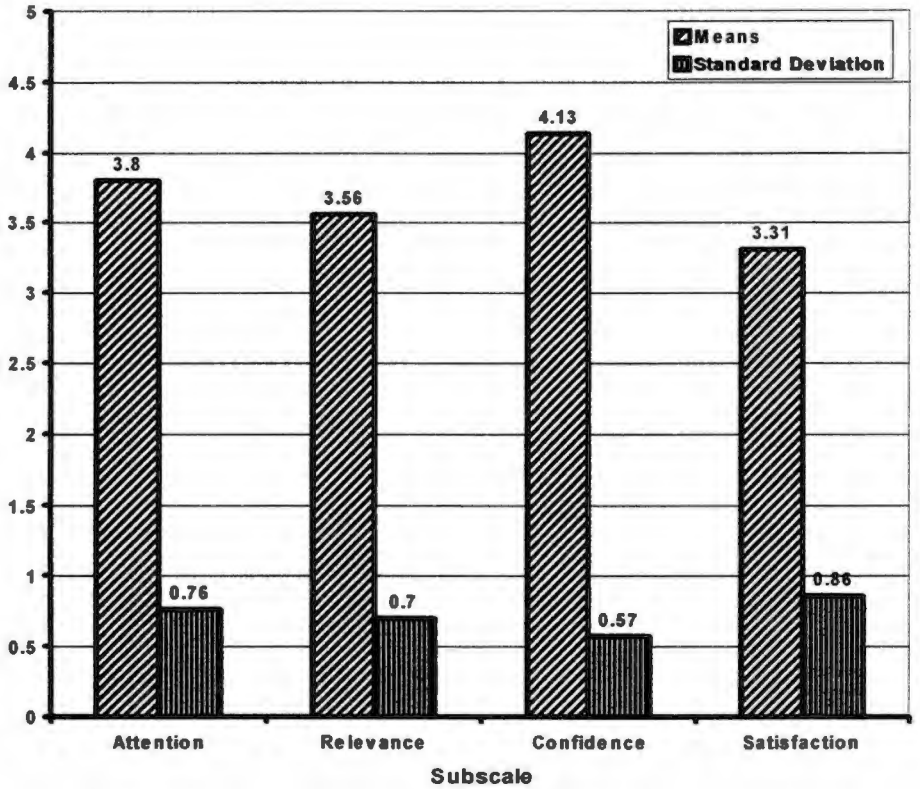


Figure 2 The Gender Information of All the Respondents

Repeated Measures of ANOVA were conducted to answer this question to determine if there were statistical differences in the mean scores of the four subscales of the thirty-six items of IMMS. The pairwise comparison (alpha=. 05) using Bonferroni adjustment revealed that all the means were above three on a five-point Likert scale. Results yielded significant difference between only the Confidence subscale and Satisfaction subscale. Figure 3 shows that the mean scores of the four subscales were all above the middle point "three" on the five-point Likert scale indicating that the Web-Based Instructional materials evaluated were generally perceived by students as motivation-enhancing. The evaluations of the four subscales by the students resulted in highest scores on Confidence, second on Attention, third on Relevance and lowest on Satisfaction. The relatively high mean score on Confidence suggested that Web-Based Instruction was considered to be mostly effective in building students' Confidence. Responses to this question were further explored by categorizing the respondents into UTK group and non-UTK group. With sixty responses from UTK and only fifteen responses obtained from the World Lecture Hall, the gap between the numbers of the respondents of the two groups was too big for a statistical comparison. Therefore a statistical analysis to test group means was not possible. But raw data (Figure 4) according to the ranking orders of the mean scores could still provide some information in identifying the characteristics of the two groups in evaluating their Web-Based Instructional materials. Figure 4 reveals in detail the similarities and differences in the rating of the four subscales between UTK students and non - UTK students. It showed that students from UTK ranked Confidence the highest, Attention the second, Relevance the third, and Satisfaction the last. Responses from the World Lecture Hall yielded very



F (3. 72)=45.972 P-value <. 0001

Key: 1=Not true 2=Slightly true

3=Moderately true 4=Mostly true

5=Very true

Figure 3 Means and Standard Deviations for ARCS Subscales

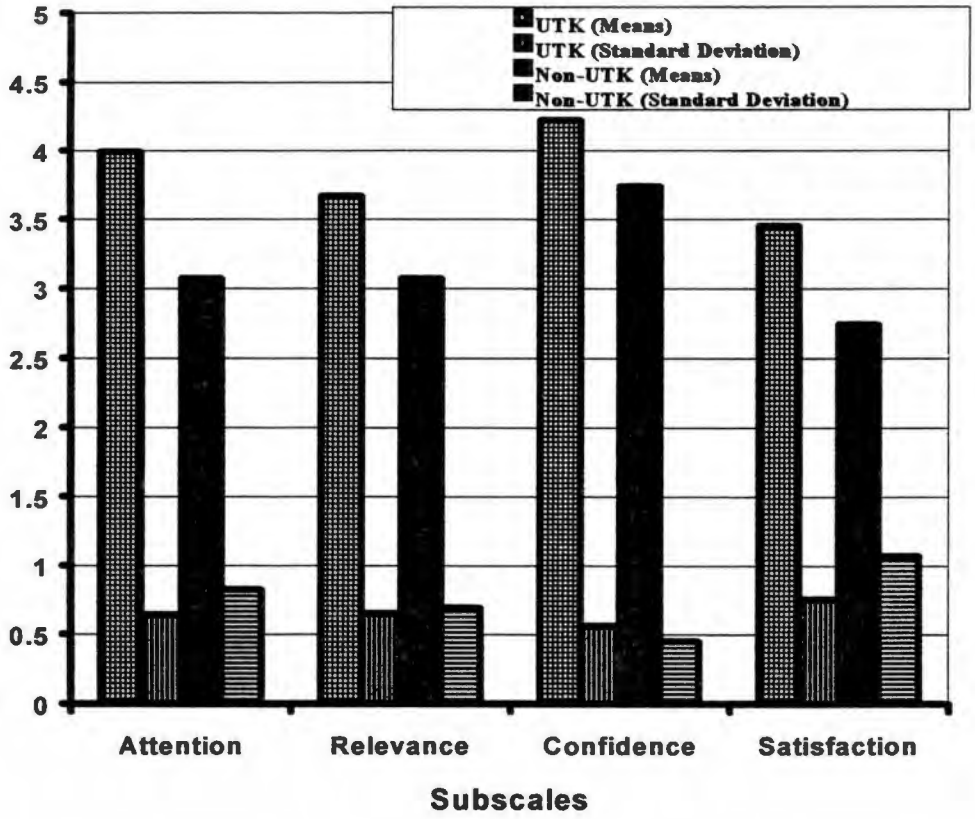


Figure 4 **Means and Standard Deviation by Group**

similar results. Confidence was ranked the highest by students from this group too. However, Attention and Relevance received the same mean scores in this group, Satisfaction received the lowest again. The similarity of the two groups in rating of the four subscales was in the ranking of "Confidence" as the highest and "Satisfaction" as the lowest. What differed was the ranking of Attention and Relevance. While Attention subscale received a little bit higher mean score than Relevance subscale by the UTK group, it was rated the same by the non-UTK group.

Means and Standard Deviation of the Four Subscales by Gender

The analysis of the collected data yielded the mean scores of the subscales by gender. Figure 1 shows the mean scores produced on the ratings of the four ARCS subscales by two gender groups. As can be seen, the responses generally showed a pattern of higher ratings by female respondents than those by male respondents on every subscale. However, the difference in the mean scores of the four subscales between male and female respondents was not statistically significant. Figure 5 presents the rating of the four subscales by gender.

Means and Standard Deviation of the Four Subscales by Site

Since the number of the responses from nine sites varied from one to twenty-four, it was not feasible to conduct a statistical test to find out the differences of the mean score for each of the four subscales or the sum of the four subscales from each site or subject area. Therefore a conclusion could not be drawn if students from different subjects had different perception on the motivational design qualities of their Web-Based Instructional materials or if the Web-based instructional materials from different subject areas had

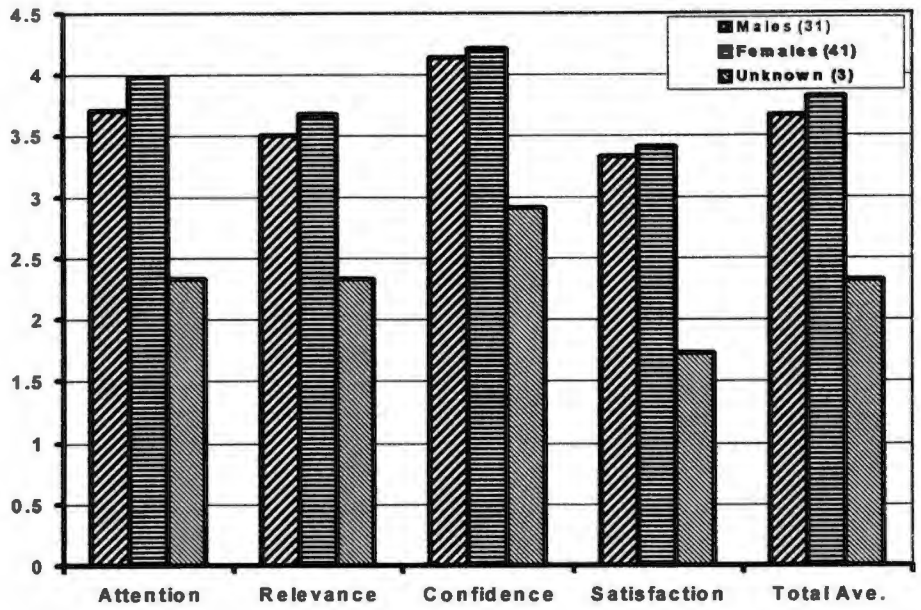


Figure 5 **Means and Standard Deviations of the Four Subscales by Gender**

different motivational design characteristics. However, the raw data were presented in Table 8 for information.

(C) Data Related to Research Question 2

Question:

"Did websites that conformed more to Keller's model receive higher ratings from students than the websites that conformed less to Keller's model?"

To answer this question, the researcher evaluated the same websites that students evaluated. The purpose of doing this was to evaluate specifically the degree to which an instructional website conformed to Keller's criteria for having a website be motivational for students. It was expected that the "best" website would get higher ratings from students than those of the "worst" website if the ARCS model holds true.

To identify the sites which conformed more or less to the strategies suggested by Keller's model, the researcher summed the total scores of the four subcomponents for each of the nine sites evaluated by the researcher. Two sites with the same highest mean scores were sorted out as the "best" sites. Accordingly, two (instead of one) sites receiving the lowest mean score were chosen to be the "worst" one to make the statistical test possible. The "best" sites identified were site 5 and 9 (tie mean: 22) and the worst sites identified were: Site 3 (15) and Site 8 (17). Results from the researcher are presented in Table 9.

These results by the researcher were compared with students' ratings of these four sites on two things: 1). mean score for each of the four ARCS subcomponents and 2) mean score for the total sum of the four subcomponents. Repeated Measures of ANOVA was applied to test if the subscale scores differed between the "best" and the "worst"

Table 8 Means and Standard Deviations by Site

	A		R		C		S		
Site/No of responses	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Ave.**
1(1) (Non-UTK)	**3.50**		**3.67**		**4.00**		**3.17**		**3.58**
2(6) (Non-UTK)	**3.76**	.46	**3.61**	.48	**3.94**	.40	**3.78**	.31	**3.77**
3(8) (Non-UTK)	**2.50**	.61	**2.60**	.48	**3.57**	.47	**1.92**	.69	**2.64**
4(9) (UTK)	**4.23**	.53	**4.02**	.56	**4.27**	.43	**3.81**	.56	**4.08**
5(6) (UTK)	**3.44**	.54	**3.52**	.61	**4.36**	.36	**3.39**	.58	**3.68**
6(6) (UTK)	**4.04**	.30	**3.91**	.42	**4.59**	.30	**3.83**	.63	**4.09**
7(24) (UTK)	**4.30**	.42	**3.65**	.63	**4.24**	.41	**3.47**	.75	**3.92**
8(4) (UTK)	**3.54**	.46	**3.50**	.58	**3.69**	.63	**3.33**	.36	**3.52**
9(11) (UTK)	**3.52**	.83	**3.43**	.86	**4.07**	.91	**2.30**	.97	**3.50**

Table 9 Ratings by the Researcher

	Site 1	**Site 2**	**Site 3**	**Site 4**	**Site 5**	**Site 6**	**Site 7**	**Site 8**	**Site 9**	**Avg. Mean (for 4 subscales)**
A1	0	0	1	2	1	2	2	1	1	
A2	2	2	1	2	2	2	1	2	2	
A3	2	2	1	2	2	1	2	1	2	
Atotal	**4**	**4**	**3**	**6**	**5**	**5**	**5**	**4**	**5**	**4.6**
R1	1	2	2	0	2	2	1	2	2	
R2	2	1	1	2	2	1	2	1	2	
R3	2	1	2	2	2	2	1	1	2	
Rtotal	**5**	**4**	**5**	**4**	**6**	**5**	**4**	**4**	**6**	**4.8**
C1	2	2	1	2	2	2	2	2	2	
C2	2	2	1	2	2	1	1	2	2	
C3	1	1	1	2	1	2	2	1	1	
Ctotal	**5**	**5**	**3**	**6**	**5**	**5**	**5**	**5**	**5**	**4.8**
S1	2	2	2	2	2	1	2	2	2	
S2	2	1	0	1	2	2	1	0	2	
S3	2	2	2	1	2	2	2	2	2	
Stotal	**6**	**5**	**4**	**4**	**6**	**5**	**5**	**4**	**6**	**5**
Sum of the 4 subscales	**20**	**18**	**15**	**20**	**22**	**20**	**19**	**17**	**22**	

sites. Results of the ANOVA yielded significant difference of the four subscales from two groups ("the best" and "the worst"). The subscale differences were the same within each group. That is to say, in both the best sites and worst sites, Confidence was the highest and Satisfaction was the lowest. As Figure 6 reveals that the "best" sites scored higher in all of the four subscales than those of the "worst" sites.

A two-tailed T-test was then conducted to see if the total sum of the four subscales differed between the two groups. Results again confirmed that the two groups differed significantly from each other. Best sites produced a significantly higher total sum than that of the worst sites. Table 10 indicated significant differences between the two groups.

Given the consistent ratings, these results provided support for the acceptability and utility of the ARCS model in assessing Web-Based Instructional materials.

Table 10 The Sum Scores of the "Best" and "Worst" Sites

Sites	Number	Total Sum	Std. Deviation
Best	17	3.57	.71
Worst	12	2.94	.56

(D) Results of the Data Analysis Related to Research Question 3

Question

"Which specific features of the ARCS Model did students perceive to be effective or ineffective in Web-Based Instructional materials?"

The purpose of this question was to seek some design guideline in WBI. To answer this question, individual items from each of the four subscales were ranked in the tables below according to the mean score and standard deviations to identify the effective

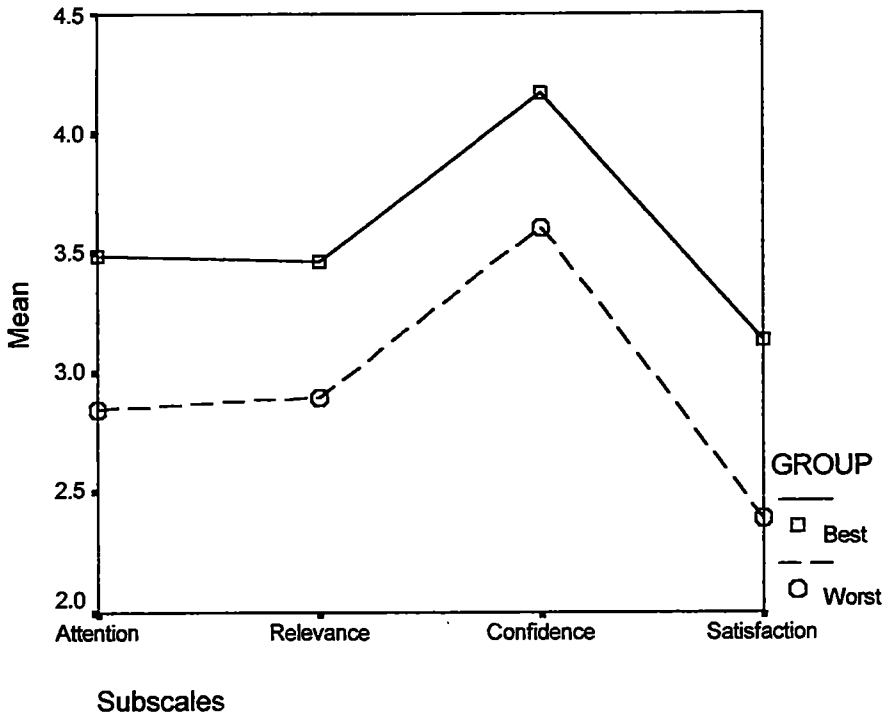


Figure 6 **Means Scores of the "Best" Sites and "Worst" Sites**

and ineffective motivational strategies of the Web-Based Instructional materials as perceived by students.

The items marked "*" were originally stated in negative manner. Scores were reversed before calculating. Therefore, the mean scores of these items actually represented the positive meaning of the negative-stated statements.

Attention Subscale Respondents from UTK and Non-UTK differed only slightly in the ranking of the twelve items under Attention subscale. The scores from Non-UTK were generally lower than those from UTK. As stated previously, the number of the non-UTK responses was not enough for a statistical comparison with UTK responses. No statistical analyses were conducted to test the statistical significance of the mean scores between the UTK group and the non-UTK group. The ranking orders of the items for each subscales presented in the Table 11 were for reference only.

Overall, the mean scores of the twelve Attention items were all above three points on the five-point Likert-scale where five represented "Very True" and one represented "Not True." This suggested that the respondents on the whole considered the Web-based instructional materials to be effective in keeping and sustaining their attentions and interests. Tabulated material on p. 5 shows the ratings of the mean scores of the twelve statements of the **Attention** subscale by all respondents, the breakdowns by UTK respondents and by non-UTK respondents.

The five statements of the Attention subscale rated high (above four on the five-point scale) by all respondents were (in order):

*Q12 This website is so abstract that it was hard to keep my attention.

Table 11 Means for Attention Subscale by Individual Items from All Respondents

Item	All Mean	Std.	UTK Mean	Std.	Non-UTK Mean	Std.
* Q12 This website is so abstract that it was hard to keep my attention	4.59	.70	4.65	.68	4.31	.75
*Q22 The amount of repetition in this website caused me to get bored sometimes.	4.39	.92	4.43	.89	4.20	1.08
*Q31 There are so many words on the site that it is irritating.	4.31	1.10	4.31	1.17	4.23	.80
*Q29 The style of writing is boring.	4.05	1.15	4.12	1.08	3.80	1.42
* Q15 The pages of this site look dry and unappealing.	4.00	1.22	4.17	1.10	3.33	1.50
Q17 The way the information is arranged on the website helped keep my attention.	3.73	1.09	3.98	.94	2.73	1.10
Q24 I learned something that was surprising or unexpected.	3.63	1.19	3.77	1.05	3.07	1.58
Q20 This website has things that stimulated my curiosity.	3.59	1.24	3.80	.97	2.73	1.79
Q11 The quality of the writing helped to hold my attention.	3.53	1.28	3.83	1.08	2.33	1.34
Q2 There was something interesting at the beginning of this webstie that got my attention.	3.43	1.39	3.68	1.28	2.36	1.33
Q28 The variety of reading passages, exercises, illustrations, etc. helped keep my attention on this website.	3.24	1.32	3.58	1.18	1.93	1.03
Q8 These materials are eye-catching.	3.20	1.49	3.51	1.37	2.00	1.36

*Q22 The amount of repetition in this website caused me to get bored sometimes.

*Q31 There are so many words on the site that it is irritating.

*Q29 The style of writing is boring.

*Q15 The pages of this site look dry and unappealing.

The five statements of the Attention subscale rated high by UTK respondents were (in order):

* Q12 This website is so abstract that it was hard to keep my attention.

*Q22 The amount of repetition in this website caused me to get bored sometimes.

*Q31 There are so many words on the site that it is irritating.

*Q15 The pages of this site look dry and unappealing.

*Q29 The style of writing is boring.

The five statements of the Attention subscale rated high by Non-UTK respondents were (in order):

*Q12 This website is so abstract that it was hard to keep my attention.

*Q31 There are so many words on the site that it is irritating.

*Q22 The amount of repetition in this website caused me to get bored sometimes.

*Q29 The style of writing is boring.

*Q15 The pages of this site look dry and unappealing.

Overall, students from non-UTK assigned lower scores to the Attention statements than students from UTK. Six items were rated below three points and one of these was even rated below two points.

Relevance subscale The overall mean score for the Relevance subscale was 3.56. However, the mean scores of some individual items were relatively low, especially when looking at the UTK and Non-UTK group separately. Only one item from the Relevance subscale was ranked above four points. Two of the items were ranked below three points. This suggested that even though those web-based instructional materials were on the whole relevant to learners' needs, there were some specific strategies which needed improvements.

Table 12 shows the mean scores and standard deviation for the Relevance subscale by all respondents, UTK respondents and non-UTK respondents.

The five statements of the Relevance subscale rated high by all respondents were (in order):

*Q26 This website was not relevant to my needs because I already knew most of it.

Q33 The content of this lesson will be useful to me.

Q6 It is clear to me how the content of this material is related to things already know.

Q16 The content of this website is relevant to my interests.

Q23 The content and style of writing in this lesson convey the impression that its content is worth knowing.

Table 12 Means for Relevance Subscale by Individual Items from All Respondents

ITEMS	ALL Mean	Std.	UTK Mean	Std.	NON-UTK Mean	Std.
*Q26 This website was not relevant to my needs because I already knew most of it.	4.30	.89	4.43	.80	3.80	1.08
Q33 The content of this lesson will be useful to me.	3.92	1.08	3.92	1.08	3.93	1.10
Q6 It is clear to me how the content of this material is related to things I already know.	3.84	1.03	3.93	1.04	3.47	.92
Q16 The content of this website is relevant to my interests.	3.77	1.15	3.75	1.18	3.87	1.06
Q23 The content and style of writing in this lesson convey the impression that its content is worth knowing.	3.75	1.08	3.90	1.02	3.13	1.13
Q10 Completing this lesson successfully was important to me.	3.33	1.41	3.42	1.33	3.00	1.69
Q9 There were stories, pictures, or examples that showed me how this material could be important to some people.	3.13	1.47	3.38	1.34	2.13	1.60
Q18 There are explanations or examples of how people use this knowledge in this website.	2.89	1.33	3.13	1.28	1.93	1.10
Q30 I could relate the content of this website to things I have seen, done, or thought about in my own life.	2.75	1.06	2.89	0.96	2.17	1.27

The five statements of the Relevance subscale rated high by UTK respondents were (in order):

*Q26 This website was not relevant to my needs because I already knew most of it.

Q6 It is clear to me how the content of this material is related to things I already know.

Q33 The content of this lesson will be useful to me.

Q23 The content and style of writing in this lesson convey the impression that its content is worth knowing.

Q16 The content of this website is relevant to my interests.

The five statements of the Relevance subscale rated high by Non-UTK respondents were (in order):

Q33 The content of this lesson will be useful to me.

Q16 The content of this website is relevant to my interests.

*Q26 This website was not relevant to my needs because I already knew most of it.

Q6 It is clear to me how the content of this material is related to things I already know.

Q23 The content and style of writing in this lesson convey the impression that its content is worth knowing.

Confidence subscale was the subscale that was ranked the highest among the four subscales of the ARCS model. Seven out of nine items were all rated above four on the five point Likert-scale. This meant that web-based instructional materials were

perceived by students to be mostly effective in building their confidences. Table 13 shows the mean scores and standard deviations for each individual item under "Confidence".

The five statements of the Confidence subscale rated high by ALL respondents were (in order):

*Q3 This material was more difficult to understand than I would like for it to be.

*Q19 The exercises in this website were too difficult.

*Q34 I could not really understand quite a bit of the material in this website.

*Q7 Many of the pages had so much information that it was hard to pick out and remember the important points.

Q1 When I first looked at this website, I had the impression that it would be easy for me.

The five statements of the Confidence subscale rated high by UTK respondents were (in order):

*Q3 This material was more difficult to understand than I would like for it be.

*Q19 The exercises in this website were too difficult.

*Q34 I could not really understand quite a bit of the material in this website.

*Q7 Many of the pages had so much information that it was hard to

Table 13 Means for Confidence Subscale by Individual Items from All Respondents

Items	ALL Mean	Std.	UTK Mean	Std.	Non-Mean	UTK Std.
*Q3 This material was more difficult to understand than I would like for it to be.	4.64	.76	4.67	.68	4.53	1.06
*Q19 The exercises in this website were too difficult.	4.37	.87	4.43	.81	4.13	1.06
*Q34 I could not really understand quite a bit of the material in this website.	4.33	.95	4.38	.92	4.13	1.06
*Q7 Many of the pages had so much information that it was hard to pick out and remember the important points.	4.12	1.10	4.18	1.08	3.85	1.21
Q1 When I first looked at this website, I had the impression that it would be easy for me.	4.05	.94	4.15	.88	3.67	1.11
Q4 After reading the introductory information, I felt confident that I knew what I was supposed to learn from this website.	4.04	1.01	4.18	.89	3.47	1.25
Q13 As I worked on this website, I was confident that I could learn the content.	4.00	.97	4.03	1.02	3.86	.77
Q35 The good organization of content helped me be confident that I would learn this material.	3.97	1.07	4.16	.93	3.27	1.28
Q25 After working on this website for a while, I was confident that I would be able to pass a test on it.	3.64	1.15	3.82	1.07	2.93	1.22

Q4 After reading the introductory information, I felt confident that I knew what I was supposed to learn from this website.

The five statements of the Confidence subscale rated high by Non-UTK respondents were (in order):

*Q3 This material was more difficult to understand than I would like for it to be.

*Q19 The exercises in this website were too difficult.

*Q34 I could not really understand quite a bit of the material in this website.

*Q7 Many of the pages had so much information that it was hard to pick out and remember the important points.

Q4 After reading the introductory information, I felt confident that I knew what I was supposed to learn from this website.

Satisfaction subscale was the one that was ranked the lowest among the four subscales of the ARCS model. However, the ratings for each individual item showed a consistency of a mean score above three on the five-point Likert scale. Table 14 shows the means and standard deviations for each individual item under "Satisfaction."

The three statements of the Satisfaction subscale rated high by ALL respondents were (in order):

Q36 It was a pleasure to work on such a well-designed website.

Q32 It felt good to successfully complete this website.

Table 14 The Means for Satisfaction Subscale from All Respondents

Items	ALL Mean	Std.	UTK Mean	Std.	Non-UTK Mean	Std.
Q36 I t was a pleasure to work on such a well-designed website.	4.13	1.13	4.13	1.13	2.93	1.03
Q32 It felt good to successfully complete this website.	3.55	1.06	3.55	1.06	3.27	1.58
Q21 I really enjoyed studying this website.	3.55	1.06	3.55	1.06	2.67	1.72
Q5 Completing the exercises in this website gave me a satisfying feeling of accomplishment.	3.55	1.06	3.20	.89	2.93	1.28
Q14 I enjoyed this website so much that I would like to know more about this topic.	3.13	1.11	3.13	1.11	2.67	1.29
Q27 The wording of feedback after the exercises, or of other comments in this website, helped me feel rewarded for my effort.	3.10	1.19	3.10	1.18	2.00	1.36

Q21 I really enjoyed studying this website.

Q5 Completing the exercises in this website gave me a satisfying feeling of accomplishment.

Here, two statements, 21 and 5, received the same mean scores.

The three statements of the Satisfaction subscale rated high by UTK respondents were (in order):

Q36 It was a pleasure to work on such a well-designed Website.

Q32 It felt good to successfully complete this Website.

Q21 I really enjoyed studying this Website.

The three statements of the Satisfaction subscale rated high by UTK respondents were (in order):

Q32 It felt good to successfully complete this Website.

Q36 It was a pleasure to work on such a well-designed Website.

Q5 Completing the exercises in this website gave me a satisfying feeling of accomplishment.

To conclude, the most effective (means above four points) and ineffective (means below two points) motivational strategies of the thirty-six items of IMMS are summarized and listed in Table 15 and Table 16.

Qualitative Results

Research question four looked at the general perceptions and specific suggestions students had towards Web-Based Instructional materials. These data were gathered from the additional section added by the researcher to the original IMMS survey (Appendix 1): "Please tell us what you consider as the problems about this web site" and "Please

Table 15 The Most Effective Features

Attention	Q12.	The website is easy to keep my attention.
	Q22	The amount of repetition did not cause me to get bored.
	Q31	There are not so many words on the site so it's not irritating.
	Q29	The style of writing is not boring.
	Q15	The pages of this site do not look dry and are appealing.
Relevance	Q26	The website was relevant.
Confidence	Q3	This material was no more difficult to understand than I would like for it to be.
	Q19	The exercises in this website was not difficult
	Q34	I could really understand quite a bit of the material in this website.
	Q7	It was easy to pick out and remember the important points from the site.
	Q1	When I first looked at this website, I had the impression that it Would be easy for me.
	Q4	After reading the introductory information, I felt confident that I knew what I was supposed to learn from this website.
	Q13	As I worked on this website, I was confident that I could learn the content.
Satisfaction	Q36	It was a pleasure to work on such a well-designed website.

Table 16 The Most Ineffective Features

Relevance	Q18	There are explanations or examples of how people use this Knowledge on this website.
	Q30	I could relate the content of this website to things I have seen, done, or thought about in my own life.

suggest aspects of the web site that need improvement." The questions focused upon the problems that students perceived in Web-Based Instructional materials to provide possible design considerations to improve the way the Web-Based Instructional materials were presented. Since these questions were mainly seeking "problems and suggestions", positive comments were not expected. Therefore the responses were mainly "negative or suggestive" in nature. But these seemingly egative responses did not indicate that the Web-Based Instructional materials in the study only had negative design qualities.

Of the seventy-five returned responses, twenty-eight responded to the written question. These written responses were categorized into three groups listed below:

Positive Features

Serving the intended purposes There was an general satisfaction towards the Web-Based Instructional materials being evaluated. Several students wrote that they

"could not find any problems with the website. "Serving the intended purposes" was what students appreciated.

Clear navigation A straightforward design layout assisted students in accessing the materials on the Web. Some students wrote that "the selection bar is right at the top" and "listed in a more clear and readable manner" made "navigation easier," "easier to pull up".

Negative features

Annoying background colors The fancy, unnecessary background colors were considered to be distraction rather than attraction. Since the Web-Based Instructional material mainly served for "instructional purposes," students did not like "annoying background colors which make reading hard."

Plug-Ins While more and more websites are using the more advanced technologies and software as plug-ins for various instructional methods, those plug-ins made the materials less accessible and more time consuming. "Some materials or links can only be viewed with the appropriate plug-ins" was responded by some students to the question "Please tell us what you consider as the problems about the web site".

Technical problems with Online discussion The technical problems often created frustrations to students. Several students reported that "The online discussion was a little hard to figure out." "I have had a few problems with the on-line discussion." "The column on the left side of the website was situated in such a way that I had difficulty accessing the bottom-most entry." ("The column" here referred to the one with the class online discussion-note by the researcher.)

Suggested Features

Interactive tools Students liked having some action and responses to keep them from passive learning. They felt that "there are a lot of resources, but few exercises to be done online." "Maybe a few simple interactive tools will help the students' curiosity about this class. It's just one big list of information. It's useful as a reference but doesn't do much in the way of teaching or in helping besides providing extra copies of information passed out in class." Making the lessons more interactive rather than just presenting information would be very helpful.

Related links and resources Students would like to have more resources and links related to current study or subjects. One student wrote : "Web site could be linking to online resources that would go beyond what was covered in class and help make the subject matter more understandable." "I think a URL related to class is extremely helpful and a great learning tool." "The only suggestion I might have is that more real world examples could be used to correlate the material with the learning objectives. This alone is a substantial aid in keeping one attention on the task at hand." These comments corresponded with the low mean scores on the same items under Relevance from quantitative results.

Updating Outdated information or unchanged materials were certainly not welcome. Several students suggested "updating more often".

Emphasizing the important points The important information should be somehow highlighted or emphasized. Students suggested "making the writing, especially the important points, more readable." "It helps a lot when the words are in bold print (the most important points)"

Use of graphics With regard to the use of graphics, some students felt that graphics helped attracting their attention to make the materials more motivating, while for other students, they were a distraction. Students understood that for the subject areas like engineering, "it is difficult to make topics as interesting as other areas."

This chapter summarized the statistical analysis of the study. Discussion based on the analysis will be presented in the next chapter.

CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

This chapter is organized into three sections. The first section summarizes the purpose and research procedures of this study. The second section summarizes the conclusions, implications and discussions drawn from the findings presented in Chapter IV. The last section presents suggestions and recommendations for future studies.

Summary

The current study sought to assess the presence and absence of the motivational design components of John Keller's ARCS model in Web-Based Instruction. To achieve the purpose, the Instructional Materials Motivational Survey was administered to sixty students who were enrolled at the University of Tennessee, Knoxville and fifteen students at three other universities, whose courses had a "web presence" on the World Lecture Hall in the 1999 Spring semester. Forty-one females and thirty-one males, plus three who did not indicate gender, responded to the questionnaire. Students were lower division undergraduate students.

To accomplish the purpose of the study, the following four research questions were addressed and answered in this study:

1. How did students perceive the motivational design qualities of the Web-Based Instructional materials, in terms of John Keller's ARCS model?

2. Did websites that conformed more to Keller's model receive higher ratings from students than the websites that conformed less to Keller's model?

3. Which specific features of the ARCS model did students perceive to be effective or ineffective in Web-Based Instructional materials?

4. What reactions did students have to the Web-Based Instructional materials?

Quantitative data obtained from the students' responses were analyzed to answer the first three research questions. Repeated Measure of ANOVA were conducted using the Statistical Package for the Social Science (SPSS-X) computer program with assistance provided by the Statistical and Computational Consulting Center of The University of Tennessee, Knoxville. A two-tailed test was applied to compare the ratings by students of the "best sites" and the ratings of the "worst sites," identified from the evaluation result of the researcher. The written responses to the open-ended question were categorized and analyzed qualitatively to answer question four. Results of the quantitative and qualitative data identified general perceptions of the motivational design qualities of Web-Based Instructional materials.

Discussions, Conclusions, and Implications

The following conclusions were reached in response to the four research questions.

A general presence of the motivational design components of Keller's ARCS model in WBI. In regard to research question one, students' perceptions toward the motivational design qualities of Web-based instructional materials were generally positive. The mean scores for the four subscales of the ARCS model were all above three on a five-point Likert scale where five represented "Very true," and one represented "Not

true." This finding indicated that the content of the Web-Based Instructional materials were designed in a way that students were most **confident** about learning the materials, the general design of the websites were moderately **attention**-keeping, the materials were on the whole moderately **relevant** to students' needs and students were **moderately satisfied** with what they learned.

Inconclusive findings with regard to Duchastel's assumption. In terms of Duchastel's assumption that WBI provided amply for the first two factors (Attention and Relevance) but might be problematic for the latter two (Confidence and Satisfaction) of the ARCS model, data produced different findings. Results seemed to support his assumption that WBI would be Attention-gaining and be Relevant to students' needs since Attention and Relevance strategies were rated high. This suggested that these strategies were moderately effective in the Web-Based instructional materials evaluated. However, results yielded different findings with his assumptions that WBI would be problematic in providing Confidence and Satisfaction. The highest ranking of the Confidence subscale by all respondents indicated that the Web-Based Instructional materials were perceived to be most effective in building Confidence. Satisfaction was rated lowest among the four subscales. It should be noted, however, that this "lowest mean score" was only relative to the other three subscales. Therefore these data did not lead to the conclusion that Web-Based Instructional materials were "problematic" in generating Satisfaction since the mean score for this subscale was still above three on the five point Likert scale. This finding was not congruous with Duchastel's assumption that WBI might be problematic for the latter two (Confidence and Satisfaction) of the ARCS model.

Support for the utility of the ARCS model in evaluating Web-Based Instructional materials With regard to research question two, significant differences existed between "the best" sites and "the worst" sites, as identified by the researcher, in the mean scores of each of the four subscales and the total sum of the four subscales. This provided some support for the utility of the ARCS model in evaluating Web-Based Instructional materials.

Effective Confidence strategies and relatively ineffective Relevance strategies. With regard to research question three, the specific effective and ineffective strategies revealed that the highly rated statements were all under the Confidence subscale.

The uniquely high mean value of the Confidence subscale could be explained in the light of Keller's definition of Confidence subscale: "Confidence describes the learner's subjective belief in the probability that expending effort will lead to goal attainment" (Keller, 1987 a & b). It is associated with the learner's expectancy for success or failure experience. Main (1993) further suggested that difficulty of tasks was also a factor in the Confidence subscale. The Confidence statements of the IMMS were mostly concerned with the difficulty levels of the instructional materials. Success at simple tasks may not generate confidence. There was evidence (Bohlin, 1990) that Confidence was more related to effort than to instructional appeal. Therefore the high mean score of Confidence in the current study indicated that the learning activities of the Web-Based Instructional materials were challenging yet not overwhelming to students.

The same high rating for this subscale by the researcher can further explain why Confidence was rated high by looking at the three-subcomponent strategies under

Confidence. As previously stated, the ARCS model describes confidence as the combined result of three major components: learning requirements, success opportunities, and personal control. The first component, "learning requirements," refers to assisting the learner in building a positive expectation of success by explaining the requirements for success and the evaluative criteria (Keller, 1987a). The researcher noted that almost every website being evaluated met this requirement by providing detailed project requirements and evaluative criteria. The second component of Confidence "success opportunities"describes the possibilities for learners to experience or enhance their own feelings of competence through many, varied, and challenging experiences. This strategy was achieved effectively on the website being evaluated for the study with varied, challenging and meaningful projects, exercises and assignments. The new Web-related technologies like email, online discussion etc, made it possible for various instructional methods and activities. The various challenging instruction events were found to be designed in such a way that students were likely to succeed but required some effort. The researcher also found that most of the web-based instructional materials evaluated provided clear and specific criteria for evaluation. All these characteristics contributed to the high ratings for Confidence subscale by students and the researcher as well.

The third component, "personal control" refers to the learner's perception that success is caused by individual efforts (Keller, 1987a). The instructional materials of the websites evaluated in current study were designed in such a way that it linked learning success to students' personal effort and ability. They provided learners with some reasonable degree of control over their own learning. Students were confident that they

would be capable of resolving or performing whatever was required if they invested some efforts.

The finding that the subscale Confidence was rated highest in this study is important and may give some directions for future motivational design in developing Web-Based Instructional materials. It is essential to apply Confidence strategies in designing instructional materials because confidence have an influential role in motivation and the resulting action in influencing the choice of tasks and effort levels. An appropriate amount of confidence contributes to sustaining motivation.

Another finding which is worthy of notice is the low rating on the subscale Satisfaction. Among the four subscales, "Satisfaction" was rated the lowest by students. The ARCS model describes satisfaction as the result of three major components: Natural Consequences, Positive Consequences (provide positive reinforcement and motivational feedback) and Equity. One of the main strategies here is "reinforcement and feedback" However, corrective feedback was not commonly present on the web-based instructional materials evaluated. The lack of this strategy may have contributed to the low rating of the Satisfaction subscale. Students' written responses also revealed this problem. This also corresponded to the findings from other studies (El-Tigi & Branch ,1997) which claimed that interaction, learner control, and feedback was often missing from Web sites dedicated to instruction.

Contrasting to students' ratings, the mean score from the researcher on this subscale was the highest. Again, this contrast can be examined by looking at the three-subcomponet strategies. The strategies suggested by Keller under the subcomponent "Natural Consequences" were to "provide problems, simulations, or work samples that

allow students to see how they can now solve 'real-world' problems." The researcher did find that all the websites provided relevant and challenging assignments, homework for students to apply what they have learnt. The strategies suggested by Keller under "Positive Consequences" were to "use verbal praises, real or symbolic rewards, and incentives, or let students present the results of their effort." Some opportunities for students to present their results were also existent in the websites evaluated. The strategies suggested by Keller for "Equity" were to "make performance requirements consistent with stated expectations, and provide consistent measurement standards for all learners tasks and accomplishment." The researcher found these to be the mostly effectively used strategies by the instructors of the websites evaluated. A possibility for the different rating between the students and the researcher may be that the Satisfaction statements in the survey may not represent the strategies well. However, more evidences are needed to draw this conclusion since the comparison was based on one researcher verses seventy-five students.

The significant difference between the mean scores of Confidence and Satisfaction is congruous with the findings of some previous studies. Yang and Chin (1997) argued that Confidence and Satisfaction had different motivational features needed for instruction. Confidence comes from learners' experience of an individual's success or failure about tasks to be learned while satisfaction is a sense of accomplishment with the process or results of the learning experiences. Small and Gluck (1994) conducted a study to identify which instructional strategies were perceived as highly related to resulting motivational conditions in order to provide guidance for instructional planning. She concluded that there was a significant difference between

confidence and satisfaction factors in magnitude scaling method to determine the relationship of thirty-five instructional attributes to Keller's ARCS factors.

Interestingly enough, the specific individual items perceived as the most "ineffective" was not the ones under the Satisfaction subscale but the ones under Relevance subscale (18: There were explanations or examples of how people use this knowledge on this website; and 30: I could relate the content of this website to things I have seen, done, or though about my life). The extremely low rankings of these items didn't necessary mean that the content of the instructional materials being evaluated was not relevant. Keller (1983) indicated that Relevance did not have to come from the content itself but could come from the way something is taught. The ARCS model argues that unless instruction is intrinsically relevant because of course context or a job requirement, then it should connect the learning to the learner (Keller, 1987a) by embedding relevance-enhancing strategies to improve motivation and performance. Lack of perceived relevance may significantly reduce learner motivation. The ARCS model argues that relevance strategies increase the meaningfulness of instruction by relating it to personal needs (Mean & Others, 1997). The low ranking of the above Relevance statements indicated that the Web-Based Instructional materials did not relate to real life situations. This problem was manifested by the low mean score for this item and the written responses as well from students who expected more related resources and links. This provided some design implications for motivating learning in designing Web-Based Instructional materials to try to relate instruction to real-life. Relevance can be addressed in the lesson by use of testimonials, illustrative stories, and the use of simulations or exercises with actual equipment (Keller, 1983). Students will be motivated to learn if

instruction can be tied to students' experience (FAMILIARITY), personal interest (INTEREST MATCHING), or what they need (GOAL ORIENTATION). The main focus for this component is to show learner how the instructional materials relate to specific, current needs. A description of the application of the course content to the real life of the learner where it can be transferred after the course is over may be a good strategy to increase relevance.

Data obtained from students' written responses for research question four suggested that the motivational appeal of Web-Based Instructions could be improved to increase students' satisfaction by providing proper rewards for success, giving information and corrective feedback, and making the materials more interactive rather than just putting lots of resources online. In addition, in terms of using graphics in WBI, educators should consider more than perceptual arousal to attract students' attention. Attention can also be sustained through inquiry arousal which present problem or mystery to be resolved.

Recommendations

It should be noted that the ARCS model is used to analyze, on the basis of regularly collected data, the motivational requirements of the learner in terms of the four dimensions of the model. However, as Chanlin (1994) pointed out that there is normally not just one solution to satisfy them. Knowing what these requirements are not enough. Keller's ARCS model "does not typically provide a standard answer to questions about what should be done to provide motivation, nor is it a model that provides its users with a simple algorithm to find such answers" (Visser, 1990). The model assumes that instructional designers take on a continuous examination and review to analyze what

should be required to achieve the motivational requirements. Spitzer (1996) noted that any instruction can be highly motivating if instructional designers put more emphasis on the motivational aspects of the instruction they are designing.

As Keller(1987)stated that the ARCS model was a problem-solving model, and it does require some time to acquire an understanding of the basic strategies and concepts included in it.

The researcher made the following recommendations for future study:

1. Studies involving more or focusing on a specific subject area are needed to investigate any differences in motivational design qualities on the part of instructors and motivational requirements on the part of the learners. This may help provide a more comprehensive information of the motivational design characteristics of the web-based instructional materials.
2. This study examined the current status and qualities of motivational design of web-based instructional materials. Future study can explore how to use the ARCS model and strategies in designing web-based instructional materials.

BIBLIOGRAPHY

Arnone, M. P. & Small, R. V. (1995). Arousing and sustaining curiosity: Lessons from the ARCS model. Proceedings of the 1995 Annual National Conventions and Technology.

Bannan B. & Milheim W. D. (1997). Existing Web-Based Instruction Courses and Their Design. Khan, B. H., Web-Based Instruction. Englewood Cliffs, N.J.: Educational Technology Publications.

Barnard. J. (1997). The World Wide Web and higher education: The promise of virtual universities and online libraries. Educational Technology. 37 (3), 30-34.

Bickford, N. (1989). The systematic application of principles of motivation to the design of printed instructional materials. Unpublished doctoral dissertation . Florida State University, Tallhassee.

Bohlin, R. M. & Others (1990). A model for the motivational instruction of adults. Proceedings of Selected Paper Presentations at the Convention of the Association for Educational Communications and Technology.

Bohlin, R. M. & Others (1990). A prescription model for the design of motivating instruction for adults. American Educational Research Association Annual Conference, Boston.

Bohlin, R. M. & Others (1993a). Factor analyses of the instructional motivation needs of adult learners. Proceedings of Selected Research and Development Presentations at the 1994 National Convention of the Association for Educational Communications and Technology Sponsored by the Research and Theory Division (New Orleans, Louisiana, January)

Bohlin, R., Milheim, W. D. & Viechnicki, K. (1993b). The Development of a model for the design of motivational adult Instruction in higher education. Journal of Educational Technology Systems, 22(1), 3-18.

Bohlin, R. M. & Milheim, W. D. (1994). Applications of an adult motivational instructional design model. Proceedings of Selected Research and Development Presentations at the 1994 National Convention of the Association for Educational Communications and Technology Sponsored by the Research and Theory Division (16th, Nashivelle, TN).

Bostock, S. J. (1997). Designing Web-Based Instruction for Active Learning. Khan, B. H., Web-Based Instruction. Englewood Cliffs, N.J.: Educational Technology Publications.

ChanLin, L. (1994). A case for assessing motivation from learning a computer-assisted instruction. (ED376 803.)

ChanLin, L. & Chan, K-C. (1996). Computer graphics and metaphorical elaboration for learning science concepts. Paper presented at the Annual Meeting of the Association for Educational Communication and Technology(Indianapolis, IN).

Clark, R. E. (1994). Media will never influence learning. Educational Technology Research and Development, 42(2), 21-29.

Cornell R. & Martin, B. L. (1997). The Role of Motivation in Web-Based Instruction. Khan, B. H., Web-Based Instruction. Englewood Cliffs, N.J.: Educational Technology Publications.

Cote, D. J. (1998). Why worry about motivation in instructional design? [Online]. Available: http://home.istar.ca/~djcote/motivation/model.htm

Dick, W. & Reiser, R. (1989). Planning effective instruction. Englewood Cliffs, NJ: Prentice-Hall.

Dillon A. & Zhu E. (1997). Designing Web-Based Instruction: A Human-Computer Interaction Perspective. Khan, B. H. Web-Based- Instruction. Englewood Cliffs, N.J.: Educational Technology Publications.

Duchastel & Spahn (1996). Design for Web-based learning. [Online]. Available: http://home.earthlink.net/~castelnet/old/OldDucPapers/design.html

Duchastel, P. A. (no date). Prolegomena to a theory of instructional design. [Online]. Available: http://www.fcae.nova.edu/~duchaste/papers-online

Duchastel P. (1997). A Web-Based model for university instruction. Journal of Educational Technology System, 25 (3), 221-228.

Duchastel, P. A. (1997). A Motivational Framework for Web-Based Instruction. Khan, B. H. Web-Based- Instruction. Englewood Cliffs, N.J.: Educational Technology Publications.

El-Tigi & Branch. M. (1997). Designing for interaction, learner control, and feedback During Web-Based learning. Educational Technology, 37 (3), 23-29.

Fulford, C. P. & Zhang, S. (1993). Perceptions of interaction: The critical predictor in distance education. American Journal of Distance Education, 7(2), 8-21

Fitzelle G. T. & Trochim, W. M. K. (1996). Survey evaluation of Web site instructional technology: Does it increase student learning? [Online]. Available: http://trochim.human.cornell.edu/webeval/webques/webques.htm

Gagné. R. M., Briggs. I., J. & Wager, W. W. (1992). Principles of instructional design (4TH ED.). FortWorth. TX: Harcourt Brace Jovanovich College.

Gallagher, R. J. D. (1989). An analysis of motivational variables in female generic and registered nurse baccalaureate nursing students. (Doctoral dissertation, Widener University School of Nursing). Dissertation Abstract International, 50/07B. Publication No: AAC8919803).

Henke H. (1997). Evaluating Web-based instruction design.[Online]. Available: http://scis.nova.edu/henkeh/story1.html

Hirumi, A & Bowers, D. (1991). Enhancing motivation and the acquisition of coordinate concepts through the use of concept trees. Journal of Educational Research, 84 (5), 273-279.

Hites. J. M. & Ewing. K. (no date). Designing and implementing instruction on the World Wide Web: A case study. [Online]. Available: http://lrs.stcloud.msus.edu/ispi/proceeding.html

Keller, J. M. (1983a). Motivational design. (IDD&E Working Paper No. 15.)

Keller, J. M. (1983b). Use of the ARCS model of motivation in teacher training. (IDD&E Working Paper No. 15.)

Keller, J. M. (1987a). Strategies for stimulating the motivation to learn. Performance & Instruction, 26(8), 1-7.

Keller, J. M. (1987b). The systematic process of motivational design. Performance & Instruction, 26(9), 1-8.

Khan, B. H. (1997). Web-Based Instruction (WBI): What Is It and Why Is It? Khan B. H. Web-Based instruction. Englewood Cliffs, N.J.: Educational Technology Publications.

Klein, J. D. & Freitag, T. E. (1992). Training students to utilize self-motivational strategies. Educational Technology, 44-48

Klein, J. D. (1990). The effects of student ability, locus of control, and type of instructional control on motivation and performance. Doctoral dissertation, Florida State University.

Kozma, R. B. (1991). Learning with media. Review of Educational Research, 61(2), 179-212.

Kozma, R. B. (1994). Will media influence learning? Reframing the debate. Educational Technology Research and Development, 42(2), 7-19.

Ley, K. L. (1989). The effects of attitude modeling and skill modeling on learner instructional motives. Doctoral dissertation, The Florida State University

Main G. R. (1993). Integrating motivation into the instructional design process. Educational Technology, 33 (12), 37-42.

McDaniel, T. R. (1985). The ten commandments of motivation: Self-management and self-regard. Review of Educational Research, 50, 213-240.

McManus T. F. (1996). Delivering instruction on the World Wide Web.[Online]. Available: http://ccwf.cc.utexas.edu/~mcmanus/wbi.html#Why

McMillan, J. H. (1996). Educational Research: Fundamentals for the Consumer. N. Y. Harper Collins College Publishers.

Means. T. B., Jonassen, D. H. & Dwyer, F. M. (1997). Enhancing relevance: Embedded ARCS strategies vs. purpose. Educational Technology & Research. 45(1) 5-17.

Moller, L. & Russell, J. D. (1994). An application of the ARCS model design process and confidence-building strategies. Performance Improvement Quarterly, 7(4), 54-69.

Naime-Diefenbach, B. (1991). Validation of attention and confidence as independent components of the ARCS motivational model. Unpublished doctoral dissertation, Florida Sate university, Tallahassee.

Nichols. G. (1997). Formative Evaluation of Web-Based Training. Khan, B. H. Web-Based Instruction, Englewood Cliffs, N.J. : Educational Technology Publications, 369-372.

Okey, J. R., & Santiago, R. S. (1991). Integrating instructional and motivational design. Performance Improvement Quarterly. 4(2), 11-21.

Oliver R. , Herrington J., & Omari A. (1997). Creating effective instructional materials for the World Wide Web. [Online] Available: http://elmo.scu.edu.au/sponsored/ausweb/ausweb/ausweb96/educn/oliver

Owston, R. D. (1997). The World Wide Web: A technology to enhance teaching and learning? Educational Research, 26(2), 27-33.

Parson R. (1997). An investigation into instruction available on the World Wide Web. [Online]. Available: http://www.oise.utoronto.ca/~rparson/abstract.htm

Polyson S., Saltzberg S. & Jones R. G. (1996). A practical guide to teaching with the World Wide Web.[Online]. Available: http://www.umuc/iuc/cmc96/papers/poly2-p.html

Price, C. B. (1990). Affective and cognitive influences of textual display in printed instruction. Proceedings of Selected Paper Presentations at the Convention for Educational Communications and Technology.

Randall, R. H. (1994). Utilizing intrinsic motivation in the design of instruction. Proceedings of Selected Research and Development Presentations at the 1994 National Convention of the Association for Educational Communications and Technology sponsored by the Research and Theory Division (16th, Nashville, TN)

Reigeluth. C. M. (1983). Instructional-design theories and models: An overview of their current status. Hillsdale, N., J. : Lawrence Erlbaum Associates.

Reigeluth, C. M., & Curtis, R. V. (1987). Learning Situation & Instructional Models. In R. M. Gagne (Ed.), Instructional Technology: Foundations. Hillsdale, NJ: Erlbaum.

Relan & Gillani. (1997). Web-Based Instruction and the Traditional Classrooms: Similarities and Differences. Khan, B. H. Web-Based Instruction. Englewood Cliffs, N.J. : Educational Technology Publications.

Reeves & Reeves. (1997). Effective Dimensions of Interactive Learning on the World Wide Web. Khan B. H. Web-Based Instruction. Englewood Cliffs, N.J. : Educational Technology Publications.

Ritchie D. C. & Hoffman B. (1997). Incorporating Instructional Design Principles with The World Wide Web. Khan B. H. Web-Based Instruction. Englewood Cliffs, N.J. : Educational Technology Publications.

Saltzberg S. & Polyson S. (1995). Distributed learning on the World Wide Web.[Online]. Available: http://www.umuc/iuc/cmc96/papers/poly-p.html

Shotsberger P. G. (1996). Instructional uses of the World Wide Web: Exemplars and precautions. Educational Technology. 36 (2) , 48-55,

Small. R. V. (1994). The relationship of motivational conditions to effective instructional attributes: A magnitude scaling approach. Educational Technology. October, 1998.

Small, R. V. (1996). Dimensions of interest and boredom in instructional situations. Proceedings of Selected Research and Development Presentations at the 1996 National Convention of the Association for Educational Communications and Technology (18th, Indianapolis, IN, 1996).

Small, R. V. (1997a). Motivation in instructional digest. ERIC Digest. (ED 409 895)

Small R. V. (1997b). Assessing the motivational quality of World Wide Websites. (ED 407 930)

Snellbecker, G. (1985). Learning theory, instructional theory, and psychoeducational design. New York: University Press.

Spitzer, D. R. (1996). Motivation: The neglected factor in instructional design. Educational Technology. 36 (3), 45-49.

Tilaro, A. & Rossett, A. (1993). Creating motivating job aids. Performance & Instruction, 32, 13-20.

Trochim W. M. K. (1996) Evaluating Websites. [Online]. Available: http://trochim.human.cornell.edu/webeval/webintro/webinto.htm

Visser J. & Keller, J. M. (1990). The clinical use of motivational messages: an Inquiry into the validity of the ARCS model of motivational design. Instructional Science. *19, 467-500.*

Yang, Y. C. & Chin W. K. (1996). Motivational analyses on the effects of type of instructional control on learning from computer-based instruction. Journal of Educational Systems, *25(1), 25-35.*

APPENDICES

APPENDIX 1

INSTRUCTIONAL MATERIALS MOTIVATION SURVEY (IMMS)

JOHN KELLER

FLORIDA STATE UNIVERSITY

The Instructional Materials Motivation Survey is intended to be a situational measure of students' motivational reactions to instructional material. It was designed in accordance with the theoretical foundation represented by the ARCS Model (Keller, 1987a. 1987b).

1. There are 36 statements in this questionnaire. Please think about each statement in relation to the instructional materials you have just studied, and indicate how true it is. Give the answer that truly applies to you, and not what you would like to be true, or what you think others want to hear.
2. Think about each statement by itself and indicate how true it is. Do not be influenced by your answers to other statements.
3. Record your responses on the answer sheet that is provided, and follow any additional instructions that may be provided in regard to the answer sheet that is being used with this survey. Thank you.

1 (or A) = Not true

2 (or B) = Slightly true

3 (or C) = Moderately true

4 (or D) = Mostly true

5 (or E) = True

1. When I first looked at this website, I had the impression that it would be easy for me. (C)
2. There was something interesting at the beginning of this website that got my attention. (A)
3. This material was more difficult to understand than I would like for it to be. (C)
4. After reading the introductory information, I felt confident that I knew what I was supposed to learn from this website. (C).
5. Completing the exercises in this website gave me a satisfying feeling of accomplishment. (S)
6. It is clear to me how the content of this material is related to things I already know. (R).
7. Many of the pages had so much information that is was hard to pick out and remember the important points. (C)
8. These materials are eye-catching. (A).
9. There were stories, pictures, or examples that showed me how this material could be important to some people. (R)
10. Completing this lesson successfully was important to me. (R)
11. The quality of the writing helped to hold my attention. (A)
12. This website is so abstract that it was hard to keep my attention on it. (A)
13. As I worked on this website, I was confident that I could learn the content. (C)
14. I enjoyed this website so much that I would like to know more about this topic. (S)
15. The pages of this look dry and unappealing. (A)

16. The content of this website is relevant to my interests. (R)

17. The way the information is arranged on the website helped keep my attention. (A).

18. There are explanations or examples of how people use the knowledge in this website. (R).

19. The exercises in this website were too difficult. (C)

20. This website has things that stimulated my curiosity. (A)

21. I really enjoyed studying this website. (S).

22. The amount of repetition in this website caused me to get bored sometimes. (A)

23. The content and style of writing in this website convey the impression that its content is worth knowing. (R)

24. I learned some things that were surprising or unexpected. (A)

25. After working on this website for awhile, I was confident that I would be able to pass a test on it. (C)

26. This website was not relevant to my needs because I already knew most of it. (R)

27. The wording of feedback after the exercises, or of other comments in this website, helped me feel rewarded for my effort. (S).

28. The variety of reading passages, exercises, illustrations, etc., helped keep my attention on this website. (A).

29. The style of writing is boring. (A).

30. I could relate the content of this website to things I have seen, done, or thought about in my own life. (R)

31. There are so many words on each page that it is irritating. (A)

32. It felt good to successfully complete this website. (S)

33. The content of this website will be useful to me. (R)

34. I could not really understand quite a bit of the material in this website. (C)

35. The good organization of content helped me be confident that I would learn this material.(C)

36. It was a pleasure to work on such a well-designed website. (S)

II. Open-Ended Questions

Please tell us what you consider as the problems about the web site

Please suggest aspects of the web site that need improvement.

III. Demographics

What is your gender?

Female? Male?

APPENDIX 2 BASELINE DATA FROM THE RESERACHER

The website evaluated was one under the subject area "Computer Science" from the World Lecture Hall. This was an undergraduate computer graphics course of a university. The site won the 1996 ACM SIGUCCS Web Education Competition. The total score obtained from the evaluation by the researcher was 19:

ATTENTION: 5

Perceptual Arousal: 1.

The title page had a picture, which was a novel example of computer graphics, with some uncertain features. However, the rest of the design on the page didn't provide any surprise or novelty, either in content or layout skills.

Inquiry Arousal: 2.

Very specific, hands-on problems were listed in "Exercises" format for students to solve: e.g. building polygon objects, procedural textures etc.

Variability: 2.

A variety of techniques were applied: instructor's detailed instruction in writing and by graphic examples; students' performance in writing or hands-on activities, downloadable files; different requirements for different graphic techniques; and evaluation by outsiders.

RELEVANCE: 4

Goal Orientation: 1.

Specific instructions were available for students to conduct the projects successfully by themselves. But objectives were not stated or emphasized.

Motive Matching: 1.

All the instructions matched perfectly with the desired projects. But there's no indication to know students' needs.

Familiarity: 2.

Content and instruction were very understandable.

CONFIDENCE: 6

Learning Requirement: 2.

The purpose, performance requirements and assessment for each individual project or design were all very clearly stated.

Success Opportunities: 2.

The performance requirements for students were presented in a way that was challenging and meaningful, e.g. "Be prepared to demo the program in section. You will also need to demonstrate a mpeg movie of one particular cannon shot into the water. You should be able to explain your programs. You should use transmitters/receivers, macros, and comments in the "Notation" field of each module so that you and the grader can understand the program. Control panels, if any, should be well organized, labeled, and with the appropriate numeric ranges."

Personal Responsibilities: 2.

The grading and performance requirements showed that students would succeed only by considerable effort.

SATISFACTION: 4

Natural consequences: 1.

The assignments and instruction provided chances for students to apply what they've learnt but no obvious evidence to "show" what they've learnt.

Positive Consequences: 1.

Some past projects done by students were provided to give some kind of motivational feedback. However, positive reinforcement was not an obvious feature on this site.

Equity 2:

The grading criteria were very consistent with instructional objectives with all learners.

The resulting score (19) is high on the 0-24 continuum. Therefore it indicated that this web-based instructional materials had relatively high motivational design quality and Attention and Confidence strategies were used more effectively than the other two strategies according to John Keller's criteria.

APPENDIX 3 SCORING GUIDE

Website URL _____

Rate each strategy using a 0-1-2 score. Put a 1 if a strategy is present, a 0 if it not and 2 if it used effectively.

Attention

___ Perceptual Arousal: Create curiosity, wonderment by using novel approaches, injecting personal and/or emotional material.

2. The site captures interest by providing unexpected, mysterious graphics and navigation.

1. The graphics show some mystery and uncertainty but the design of navigation is plain or vise versa.

___ Inquiry Arousal: Increase curiosity by asking questions, creating paradoxes, generating inquiry, and nurturing thinking challenges.

2. The site stimulates interest with challenging questions, and other experiential problem-solving activities (assignments, projects).

1. There are problem-solving activities but the nature are not very challenging.

___ Variability: Sustain interest with variations in presentation style, concrete analogies, human-interest examples, and unexpected events.

2. A variety of instructional approaches and presentation styles are applied, e.g. lecture notes, demonstration, hands-on exercises, online chats, discussion group, email, individual assignment and group activities etc.

1. There are not too much variation of methods and approaches of instruction.

Relevance

___ Goal Orientation: Provide statements or examples of the utility of the instruction, and either present goals or have learners define them.

2. Statements or examples of the goals of the course are specifically stated and the activities and contents reflect the goals.

1. Goal statements are simple and general or the activities and contents do not reflect closely the goals

___ Motive Matching: Make instruction responsive to learner motives and values by providing personal achievement opportunities, cooperative activities, leadership responsibilities, and positive role models.

2. There are good cooperative activities combined with individual competitive assignments/projects which allow for the successful completion by students.

1. There are assignments/projects which allow for the successful completion by students but no cooperative activities or vise versa.

___ Familiarity: Make the materials and concepts familiar by providing concrete examples and analogies related to the learners' work.

2. There are concrete examples, demonstrations and easily understood language to make the materials and concepts familiar.

1. There are some examples or demonstrations but some terminology are hard to understand.

Confidence

___ Learning Requirement: Establish trust and positive expectations by explaining the requirements for success and the evaluative criteria.

2. The requirements for successful performance and evaluative criteria are clearly explained and consistent.

1. Requirements and evaluative criteria are not clear or not consistent.

___ Success Opportunities: Increase belief on competence by providing many, varied, and challenging experiences which increase learning success.

2. Many varied, and challenging assignments or exercises are provided.

1.Assignments is not very challenging or varied.

___ Personal Control: Use techniques that offer personal control (whenever possible), and provide feedback that attributes success to personal effort.

2. There are open-ended, flexible activities and corrective feedback that allow for personal control.

1. Activities are not so flexible to allow for individual personal control.

Satisfaction

___ Natural Consequences: Provide problems, simulations, or work samples that allow students to see how they can now solve "real-world" problems.

2. Problems and activities are provided that allow students to apply what they have learnt from the course.

1. Learners do not have too many chances to apply what they have learnt.

___ Positive Consequences: Use verbal praises, real or symbolic rewards, and incentives, or let students present the results of their efforts ("show and tell") to reward success.

2. Formative feedback or student presentation opportunities are provided to reward success.

1. There is some formative feedback but students don't have the opportunity to present their results or vise versa.

___ Equity: Make performance requirements consistent with stated expectations, and provide consistent measurement standards for all learners' tasks and accomplishment.

2. Performance requirements and measurement standard are consistent with stated expectations and with all learners.

1. Requirements and measurement are not closely consistent with stated expectations.

VITA

Jun Wang was born in Changsha, Hunan, China on Feb. 19, 1963. She entered HuaZhong Normal University during Sept. of 1979 where in May, 1983 she received the Bachelor of Arts in English. While teaching English at Hunan University, she attended a non-thesis graduate program in Applied Linguistics. After teaching for nearly nine years at Hunan University, she went to America. Teaching English as Second Language was the graduate program she entered at the University of Tennessee, Knoxville in January 1993. Having received the Master's degree in December 1994, she switched to Instructional Technology program to pursue her Doctoral degree. The doctoral degree was received May, 2000.

She is presently working as an Instructional Designer at Motorola University, Beijing Branch, China.