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Development and validation of an instrument for student evaluation of Web -based instruction

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DEVELOPMENT AND VALIDATION OF AN INSTRUMENT FOR STUDENT EVALUATION OF WEB-BASED INSTRUCTION

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ABSTRACT

Development and Validation of an Instrument for Student Evaluation of Web-Based Instruction

by

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The current study attempted to develop an instrument to be used by instructors to conduct a comprehensive Web-based course evaluation. Four phases of instrument development were implemented. Phase I, involved the development if items through a review of the literature and the opinions of instructors and students enrolled in four Web-based mathematics courses. After the items were formulated and a response format was established, a questionnaire blueprint was developed. An item review, a content validation study, and an item tryout were conducted.

In Phase II, the initial questionnaire was placed on the World Wide Web together with a cover letter containing all required elements of informed consent as outlined by the Institutional Review Board of the University of Nevada, Las Vegas. All instructors identified previously to be teaching online courses were asked for help in distributing the initial questionnaire to their students. Five weeks into each school's spring 2001 semester, the researcher provided the online instructors with the URL of the

questionnaire. Ten days after the Web address of the questionnaire was mailed to the instructors, a follow up e-mail message was sent to them.

A total of 1,405 responses were used in the study stemming from students in 182 courses taught by 142 instructors at 34 institutions. The number of responses was more than enough for the statistical procedures that followed. In the current study, a minimum of 300 (i.e., 5 x 60) and a maximum of 600 (i.e., 10 x 60) would have sufficed.

In Phase III eight exploratory factor analyses were carried out. Item means, standard deviation, item discrimination index, and Cronbach's alpha were calculated. Of the eight exploratory factor analyses conducted, the principal component analysis with direct oblimin rotation revealed a structure most similar to the one that resulted in Phase I of this study.

In Phase IV, the questionnaire was revised using feedback given in Phase I and II combined with the results of Phase III. Items that were repetitive or that did not add additional information to the dimensions were deleted. The final names for the dimensions were also determined. A final version of the questionnaire, entitled Web-Based Course Evaluation, was placed on the Internet to be used by interested educators. Additionally, the code facilitating import of the questionnaire into the WebCT Survey Module and guidelines for evaluation of each item were posted to the Word Wide Web (see http://www.scsv.nevada.edu/~stewarti/mathweb/quest/intro.htm).

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I would also like to thank my son David for the sacrifices he made. He gave away some of his time with me and always understood when I was too busy to play with him.

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CHAPTER 1

INTRODUCTION

A growing number of working adults eager for various degrees or certificates are said to be driving today's market for postsecondary distance education (Galusha, 1998; Green, 1999; Paloff & Pratt, 1999). Adult learners want a high degree of flexibility because of the competing priorities of home, work, and school, and the structure of the distance learning environment has the ability to give adults control over the time, place, and pace of their education (Galusha, 1998; Green, 1999; Paloff & Pratt, 1999).

In its earliest form, distance education was synonymous with the correspondence course via the U.S. Postal Service. With the innovation of new media, distance educators began to deliver instructions via the radio, television, and, just recently, the World Wide Web. According to a survey conducted by the Postsecondary Education Quick Information System (PEQIS), course delivery via the World Wide Web seems to be well on its way to become the most popular method of conveying instruction at a distance in the 21st century (Lewis, Snow, Farris, & Levin, 1999).

Khan (1997) defined Web-based instruction as "a hypermedia-based instructional program which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported" (p. 6). Its components may include text, graphics, online audio and video presentations, and synchronous or asynchronous computer-mediated communication (Khan, 1997). To ease the burden on instructors with respect to the design of Web-based instruction, a host of non-profit and for-profit course developers have entered the distance learning

market assisting instructors in the development of state-of-the-art distance learning courses. That is, these developers created course management and/or learning content management systems that incorporate a range of tools for both students and instructors (Centre for Learning Technologies, 2000). Most systems (e.g., WebCT, Blackboard, First Class) include synchronous and asynchronous communication tools and the ability to track learner access and time on task. They also allow the creation of sophisticated Web pages using individualized color schemes, graphics, tables, and animation, as well as video, audio, and CD ROM support.

The Problem

Although the World Wide Web has been in existence since 1991, extraordinary growth in Web-based instruction did not begin to take place until after 1995 with the percentage of institutions using the World Wide Web for instruction having risen from 22% to 60% by 1998 (Lewis et al., 1999). Thus, delivery of college courses via a Web-based distance learning environment is still in its infancy at universities and community colleges in the United States. Web-based instruction is also a new experience for many instructors, as it requires a different instructional process than traditional classroom-based instruction (Paloff & Pratt, 1999; Willis, 1993). Consequently, it is the contention of this study that the novelty of Web-based instruction and its recent proliferation underscores the necessity of a systematic evaluation of its instructional process.

Effective Web-based instructors must take into account the unique properties of the World Wide Web (e.g., Driscoll, 1998; Jones & Farquhar, 1996). Educators must also be aware that Web-based instruction, with its lack of face-to-face (f2f) meetings, might not inform them when it does not accommodate the learners' needs (Thorpe, 1988; Willis, 1993). For instance, in the classroom, a glance around the room usually reveals who is diligently taking notes, internalizing a concept, or ready to ask a question. A

frustrated or confused student is also often evident (Paloff & Pratt, 1999; Willis, 1993). However, as "distant" teachers, Web-based instructors have no visual cues with regard to their students' academic well being (McIsaac & Gunawardena, 1996; Paloff & Pratt, 1999; Willis, 1993).

It is often only through students' reactions to deliberate questioning that Web-based educators can be made aware of deficiencies in the instructional process (Thorpe, 1988; Worthen & Sanders, 1987). The absence of such questioning might well prevent some students from passing the course or, at the very least, might stop them from continuing the study of the topic (Chute, Thompson, & Hancock, 1999; Dick & Reiser, 1986; Eastmond, 1994; Moore & Kearsley, 1996; Willis, 1993). For example, sustained frustration with instruction has been shown to interfere with the pursuit of goals (Reber, 1985; Sheets, 1992), motivation (Jonassen & Grabowski, 1993), the brain's capacity to store and process information (Darke, 1988a), and the making of inferences (Darke, 1988b).

A comprehensive search of the literature revealed a modest amount of research reports, project descriptions, and conference papers pertaining to Web-based course evaluation. One of the early projects discovered in the literature was a comprehensive evaluation of several teaching environments located within a computer-mediated system designed by faculty at the New Jersey Institute of Technology (Hiltz, 1994). The software used for these "virtual classrooms" was similar to a Web-based classroom management system (e.g., WebCT or Blackboard). It had the ability to administer and grade tests and provides "classroom space" where the teacher may lecture and communicate with students. However, the effectiveness of this virtual environment was evaluated using questionnaires developed for traditional classrooms. Although the items in these questionnaires were also relevant to the virtual classroom, other pertinent

questions concerning the appearance of Web pages, hyperlinks, navigation, and computer-mediated communication were not asked.

Several recent studies were also found pertaining to the evaluation of Web-based instruction using questionnaires, interviews, classroom observations, document review, or a combination of these methods. Some studies examined the appearance and structure of the Web pages, system response time, the quality of the hyperlinks, and navigation (e.g., Borges, Morales, & Rodriguez, 1998; Grose, Forsythe, & Ratner, 1998; Van Rennes & Collis, 1998; Vora, 1998). Other researchers investigated online audio and video presentations (e.g., Hecht & Klass; Wulf & Schinzel, 1998), computer-mediated communication (e.g., Kirby, 1999; Vrasidas & McIsaac, 1999), and teaching and learning in the Web-based environment (e.g., Daugherty & Funke, 1998; Hindes, 1999; Mory, Gambill, Lewis, Browning, & Burton, 1998; Newlands & Ward, 1998; Schlough & Bhuripanyo, 1998; Ward, 1999; Westbrook, 1999; White, 1999).

In a pilot study, the researcher of the current study asked students (N = 111) enrolled in four Web-based mathematics courses and their instructors (N = 3) to list the characteristics that could potentially affect the quality of a Web-based course (Stewart, 1999). Responses from participants were analyzed to determine dimensions (categories) and items falling under each dimension. After the process of category elicitation, it was found that the students and instructors were concerned about six major categories in Web-based instruction: (a) Appearance and Structure of Web Pages; (b) Hyperlinks and Navigation; (c) Technical Issues; (d) Class Procedures and Expectations; (e) Delivery of Instruction; and (f) Interaction.

In the "Flashlight" study, the "Current Student Inventory (CSI)" was created, which consists of 14 dimensions and a collection of approximately 500 items to be used by faculty and administrators to create course evaluation instruments and interviews to measure how learning is being affected by technology (Zúñiga & Derbyshire, 2001).

While the CSI was not specifically developed for Web-based course evaluation, several of its items could be used to investigate learner-learner and instructor-learner interaction, delivery of the content, and instructor feedback (Zúñiga and Pease, 1998).

Various limitations were apparent in all studies that examined the effectiveness of Web-based instruction. Most of the studies did not seek the opinion of dropouts, and no study cited evidence of reliability and criterion-related or construct validity of the questionnaires used. While some studies cited evidence of content validity, some individuals and professional organizations (e.g., American Psychological Association, 1985; Cronbach, 1984; Ebel & Frisbie, 1991; Messick ,1990) feel that criterion-related and construct validity studies are also necessary to adequately explain the meaning and consequences of instrument scores

Furthermore, this researcher was unable to find instruments evaluating Web-based instruction in which the items were gleaned from a comprehensive review of the literature and from the opinions of students enrolled in Web-based courses. However, the method of creating items from a literature review and by questioning students is strongly recommended by measurement experts (e.g., Crocker & Algina, 1986; Mueller, 1986). It is purported to have the dual advantage of characterizing a questionnaire through the eyes of the course participants and uncovering additional items from the literature which the participants could have missed or considered unimportant.

Purpose of the Study

The current study attempted to develop an instrument to be used by instructors to conduct an evaluation of their Web-based courses. Items were created with the help of both a literature review and findings from a pilot study in which instructors and students enrolled in four Web-based mathematics courses were asked to list characteristics of Web-based instruction (Stewart, 1999). The meaning, relevance, and utility of the

inferences made from the scores were also investigated through reliability and content and construct validity studies.

Furthermore, an attempt was made to capture the opinions of students before course withdrawal became a serious consideration. It is the experience of this researcher that her students usually do not withdraw from their undergraduate Web-based mathematics courses during the first six weeks of the semester. Therefore, this instrument was administered five weeks into the spring 2001 semester.

While there are some misgivings with regard to the rating qualifications of students of higher education (e.g., Bonetti, 1994; Cresswell & Hobson, 1996; Newport, 1996), they seemed to be directed mainly toward items that students might not be qualified to evaluate. These concerns were taken into consideration in the present study.

Research Phases

The objective of this study was to develop and validate an instrument designed for student evaluation of Web-based instruction. The instrument development and validation was carried out in four phases.

Phase I: Development of Initial Instrument

This phase of the study involved a review of the literature to determine the characteristics of the Web-based distance learning environment and compare them with the characteristics found in a pilot study involving instructors and students enrolled in four Web-based mathematics courses (Stewart, 1999). Subsequently, an item review, content validation, and item tryout were conducted. Specifically, the following tasks were carried out during this phase:

1. Items were developed through a review of the literature and the findings from the pilot study by Stewart (1999). The underlying dimensions of these items were configured.

2. An initial questionnaire blueprint was developed.
3. The items and their underlying dimensions in the initial blueprint were revised with respect to clarity, grammar, spelling, and level of readability as recommended by a panel of judges.
4. The items were revised again after inspection by experts in Web-based instruction. These experts determined the relevance of each item with regard to Web-based instruction and its representativeness with respect to one of the dimensions provided by the researcher.
5. The final revision of the blueprint was then converted into an interactive World Wide Web document in preparation for data collection via the Internet.
6. After the blueprint was placed on the World Wide Web, it was revised one last time after a tryout by a small group of examinees representative of the population for which the instrument was constructed. Following this revision, the blueprint was called the "initial questionnaire."

Phase II: Data Collection

This phase was concerned with data collection involving students taking Web-based courses (see details in the method section). The following tasks were carried out:

1. The initial questionnaire was distributed to the sample via the World Wide Web.
2. Instructors identified to be teaching Web-based courses were asked for help in distributing the questionnaire to their students.

Phase III: Validation

In this phase, various validation studies were conducted. The following tasks were carried out:

1. Clusters of items were identified by exploratory factor analyses. Two extraction approaches -- principal component analysis and maximum likelihood method --

were employed with both orthogonal (Varimax) and oblique (direct oblimin) rotation.

2. The factor loadings for each item were examined. The factor structure was then compared with the one determined in Phase I of this study.
3. Mean, standard deviation, and item discrimination index for each item were examined.
4. The reliability coefficients of the scale scores were computed.
5. Poor items were removed based on the findings from the analyses.

Phase IV: Development of Final Instrument

During Phase IV, the initial questionnaire was revised based on the findings of the previous three phases. The following tasks were carried out during this phase:

1. The questionnaire was revised based on the results of Phase I to III.
2. The final names for the dimensions were determined.
3. An aesthetically appealing final questionnaire was developed for the Internet.
4. A code facilitating import of the final questionnaire into the WebCT Survey Module and guidelines for evaluating each item on the questionnaire were written.

CHAPTER 2

LITERATURE REVIEW

This chapter presents a review of the literature investigating the characteristics of Web-based instruction and the steps necessary to develop a questionnaire based on psychometric principles. The characteristics of Web-based instruction proposed by Driscoll (1998) and Khan (1997) guided the literature review. Driscoll (1998) listed several principles of effective Web-based training such as multimedia (e.g., text, graphics, video, sound, and animation), easy-to-use graphic user interface (e.g., hyperlinks and navigation), attention to educational details (e.g., clear guidance and direction for each lesson clear objectives, adequate practice, and meaningful feedback), attention to technical details (e.g., free of "bugs" and the links to other Web sites work), and interaction.

The components of Web-based instruction suggested by Khan (1997) were similar to the principles proposed by Driscoll (1998), but also included synchronous and asynchronous communications tools, search engines, Web browsers, plug-ins, modems, Internet service providers, computers, and Web servers. Stewart (1999) also identified six dimensions of Web-based instruction in a pilot study, which closely matched the principles and components of Web-based instruction as proposed by Driscoll (1998) and Khan (1997). Specifically, these dimensions were: (a) the appearance and structure of Web pages, (b) hyperlinks and navigation, (c) technical issues, (d) class procedures and expectations, (e) instruction, and (f) interaction.

In light of the dimensions identified in the pilot study by Stewart (1999) and the components of Web-based instruction suggested by Driscoll (1998) and Khan (1997), the following was used as the overarching framework for this literature review:

1. Tools facilitating Web-based instruction, such as media (print, video, audio, images, and animations), synchronous and asynchronous communication software, Web browsers, search engines, plug-ins, computers, connections (e.g., dial-up modems, networks), Internet service providers, and Web servers.
2. Instruction, such as content delivery, class procedures, and content-media fit.
3. Interaction between the learner and the instructor and among learners.

Care was taken during the review of the literature to allow for dimensions and items to emerge that were not suggested by Driscoll (1998) and Khan (1997) nor identified by Stewart (1999). As the documents were examined, their reference lists were used in search of more items and additional dimensions. Also, since the focus of the current study was on Web-based course evaluation, a fourth section entitled "instrument development", was also included.

Tools Facilitating Web-Based Instruction

In the current study, the tools facilitating Web-based instruction consisted of media (print, video, audio, images, and animations), synchronous and asynchronous communication software, Web browsers, search engines, plug-ins, computers, connections (e.g., dial-up modems, networks), Internet service providers, and Web servers. A discussion of these tools was deemed necessary since inadequate design or setup of these tools may cause confusion and frustration for students. Additionally, it may affect their perceptions about the content of a Web site or provoke feelings of being lost in cyberspace (e.g., Borges et al., 1998; Nielsen, 2000; Ratner, 1998). This, in turn, can negatively affect effective learning and information retention (e.g., Darke, 1988a;

Darke, 1988b; Jonassen & Grabowski, 1993; Kruse & Keil, 2000; Ratner, 1998; Reber, 1985; Sheets, 1992; Wiebe & Howe, 1998).

Media

Web-based instruction might make use of a combination of printed materials, static images, animation, audio presentations, or full-motion video. A special type of media is included in this category, namely the Web page, which is a display of any information in text or picture form, static or dynamic on the World Wide Web. A Web page usually contains hyperlinks to other Web pages. Additionally, each Web page has its own Web address, called a Uniform Resource Locator (URL).

Web pages. Design guidelines for Web pages are constantly revised based on user experiences, though data are often not empirically derived (Nielsen, 2000; Shneiderman, 1998; Vora, 1998). As a matter of fact, Shneiderman (1998) claimed that "it may take a decade until sufficient experience, experimentation, and hypothesis testing clarify [Web page] design issues" (p. 561). A few researchers, however, have begun to show in a more scientific manner what does and does not promote user satisfaction with Web pages (e.g., Borges et al., 1998; Grose et al., 1998; Kanerva, Keeker, Risden, Schuh, & Czerwinski, 1998; Nielsen, 2000; Pacheco, Day, Cribelli, Jordan, Murry, & Persichitte, 1999; Van Rennes & Collis, 1998; Vora, 1998).

For example, in an effort to improve Web page usability and thus task satisfaction, Grose et al. (1998) combined existing Web page design guidelines and software development guidelines. Subsequently, these items were scored on eight criteria (practicality, verifiability, recognition, criticality, relevance, occurrence, clarity, and constraint) to reduce them in number. Then the researchers presented the remaining guidelines for an extensive review and refinement to human factors practitioners (i.e., professionals trained in the field of human-computer interaction). This effort resulted in a set of guidelines applicable to all Web pages, which were supported and extended by

other human factors practitioners and university researchers (e.g., Borges et al., 1998; Grose et al., 1998; Kanerva et al., 1998; Laux, 1998; Nielsen, 2000; Pacheco et al., 1999; Van Rennes & Collis, 1998; Vora, 1998). See Appendix A for a complete list of Web page design guidelines gleaned from the literature.

Vora (1998), Kanerva et al. (1998), and Nielsen (2000) drafted most of their Web page design guidelines in Web usability laboratories through observations of Web users' behavior. Borges et al. (1998), on the other hand, evaluated a sample of ten university and college Web sites from a pool of more than 1000 using the three heuristics of aesthetic and minimalist design, match between system and the real world, and consistency and standards. They tested their guidelines by first asking designers to revise three home pages using the new guidelines, and then observing ten users perform five task involving the original and revised home pages. The results indicated that the average time to perform the tasks was significantly reduced on the revised home page. This, in turn, can reduce user frustrations and encourage exploration (Borges et al., 1998).

Other researchers assessed students' perception of the usability of Web sites through interviews or questionnaires (e.g., Hindes, 1999; Mory et al., 1998; Pacheco et al., 1999; Schlough & Bhuripanyo, 1998; Van Rennes & Collis, 1998; Ward, 1999). In particular, the efforts of Van Rennes and Collis (1998) and Pacheco et al. (1999) resulted in useful guidelines.

Static images. One of the appealing characteristics of the WWW is its capability to display both text and images. However, it is exactly this flexibility that might make the viewing of Web pages inefficient or frustrating (Omanson, Lew, & Schuhmacher, 1998). For example, images should be pleasing to the eye and not overwhelm the viewer (Vora, 1998). They should also be displayed with a text HTML tag, the "alt" tag, so that they are decipherable by screen readers used by vision-impaired users (Laux, 1998).

Furthermore, to alleviate user frustration, the number of large image files attached to a Web page should be restricted to the ones most pertinent to the content of the Web page because of the long download time that they require (Nielsen, 2000; Vora, 1998). If, however, a sizable number of large image files become necessary to explain the content of a Web page, high quality hyperlinked thumbnails for speedy downloads of pertinent images should be provided. This avoids a lengthy download of all images and gives the user a choice to view one full-size image at a time.

When contemplating the use of three-dimensional images, Web designers should be aware of the fact that travel through a primarily three-dimensional Web site can become extremely confusing to users, thus cause disorientation and a feeling of being lost in hyperspace (Nielsen, 2000). However, 3D images can also be helpful, especially when users need to understand objects in their solid form (Nielsen, 2000). For example, individuals who may benefit from three-dimensional images might include biology students trying to identify an organ in the human body, engineering students designing a widget, or chemistry students investigating the shape of a molecule.

Animations. Like still images, complex animated images can also require a lengthy download time. Furthermore, Web animations significantly affect human peripheral vision, thus dominating the user's awareness (Nielsen, 2000). For example, it is quite difficult to concentrate on reading the content of a Web page if there is a moving image in the peripheral field of vision. Nielsen (2000) claimed that during his Web usability studies most users seemed annoyed by animations, particularly with moving, blinking, or zooming text.

While Nielsen (2000), in general, does not recommend the use of animations, he conceded that some animations do serve a useful purpose. For example, animations might be used to illustrate transitions between two or more altered states of a still image to allow visualization of three-dimensional structures on two-dimensional computer

screens, or to attract attention to new or important items (Nielsen, 2000; Wiebe & Howe, 1998). Anglin, Towers, and Levie (1996) identified several other important uses for animations, such as: (a) to guide and direct the viewer's attention; (b) to model complex systems (e.g., blood flowing through the heart); and (c) to allow for understanding of abstract processes (e.g., velocity). But even in these cases, experts strongly recommended one-time animations or animations on demand instead of continuous movement (e.g., Nielsen, 2000; Wiebe & Howe, 1998).

Web-based audio and video presentations. According to Johnson (1998), there is a lack of a theoretical framework and applicable empirical research to guide the development of Web-based video materials. He stated that the available literature consists mostly of recommendations and guidelines stemming from direct user trials and classroom experiences. This also seemed to be the case for audio presentations.

Download time seemed to be the major concern associated with audio and video presentation, but quality was a close second. For example, to facilitate faster and easier retrieval times of video clips over the Internet, the number of frames per second is usually reduced. However, with reduced frame size poor quality of motion and sound becomes a distinct possibility rendering video clips intending to display rapid movement (e.g., running horse) or close-ups of a complex object (e.g., sculpture) quite useless (Johnson, 1998).

With regard to audio presentations, file size reduction might not only make it more difficult to hear sounds appropriately, but it might also make it harder to evaluate any accompanying text, graphics, or video (Nielsen, 2000). In one study, individuals were asked to evaluate the same graphics first displayed with poor quality sound, then with good quality sound (Nielsen, 2000). Users insisted that the graphics were better when viewed with the good quality sound.

On the other hand, not reducing frame size enough can result in another factor associated with decreased task satisfaction – a lengthy download time (Johnson, 1998). Johnson and Kavanagh performed an evaluation of casual browsers and observed that only two out of ten individuals were actually willing to wait for 90 seconds while a video file downloaded to their computer (as cited in Johnson, 1998). The remaining individuals decided to interrupt the download. None of these users bothered to fully retrieve a video file with a download time of over three minutes. Clearly, this type of behavior might negatively affect learning if students refuse to wait until some of their materials are fully downloaded.

In contrast, Johnson found that adults with a clear task are more tolerant of retrieval delays than casual browsers (as cited in Johnson, 1998). Johnson and Kavanagh, however, cast some doubt on this finding when they noticed generally negative attitudes toward a lengthy download time in children, even in children deemed task-oriented (as cited in Johnson, 1998). Johnson (1998) defended his earlier findings by suggesting the possibility of a difference in adult and children's attitude toward retrieval delays. But he admitted that with so little research available in this area, it is dangerous to generalize beyond the experimental conditions of the investigations.

The new streaming media (video with sound), such as RealProducer (RealNetworks Incorporated, 2000) is designed to make video and sound available instantly without forcing the user to wait until the move or audio clip has fully loaded to the computer. This reduces the response time significantly, but it is still limited to the data delivery rates of the Internet connection (e.g., dial-up or cable modem).

Hecht and Klass (1999) conducted a case study in two research classes at Illinois State University to determine whether streaming audio and video technology could be used for primary instruction in off-campus classes. One class exhibited a host of technical problems such as blank screens, lack of audio, power outages, and server

crashes. This course was a doctoral-level research design and statistics class divided into two sections, with 25 students from Thailand in one section and 14 distance education students from the United States (U.S.) in the other one.

A combination of Real Player (RealNetworks Incorporated, n. d.) and Multichat (MultiSoft Corporation, n. d.) was used to transmit audio and video, as well as synchronous communication between students and instructor. While technology problems for the group from Thailand appeared to have been related mostly to power outages and server crashes, some of the students from the U.S. experienced a host of network congestion problems which prevented smooth streaming of the class videos (Hecht & Klass, 1999).

On the other hand, a graduate-level qualitative research class exhibited relatively few technology glitches and most students were satisfied with the mode of delivery (Hecht & Klass, 1999). This was a course delivered simultaneously to 20 on-campus and 20 off-campus students using RealPlayer (RealNetworks Incorporated, n.d.). The off-campus students had the option to either join the class in real-time over the Internet or watch a video of the class at a later time, also over the Internet. According to the researchers, the reason this course exhibited fewer technical problems might have been due to the instructor's experience with this type of technology (Hecht & Klass, 1999).

In general, due to the level of technology available on most home computers, some experts recommend limiting online video clips to less than one minute in length, or using print or audio narration together with pictures or slide shows (Kaplan, 1998; Kruse & Keil, 2000; Nielsen, 2000). Should, however, lengthy video presentations become necessary, it is best to segment the presentation into individual topics that can be accessed by the users in the order and at the time desired (Nielsen, 2000).

Kruse and Keil (2000) and Johnson (1998) further caution that video and audio presentations should not be used unless they add significant value. For example, many

times video clips only contain "talking heads" and audio presentations consisting of the instructor merely reading the already printed material (Mason, 1997).

Web Browsers and Related Tools

Many students first become familiar with the WWW through Web-based instruction (Ratner, 1998); therefore, technology must be incorporated with the novice user in mind. Novice Web users need to be instructed on how to use a Web browser, a search engine, or how to install a plug-in. They also need to be shown how to recognize and deal with Internet connection problems (Ratner, 1998).

Web browsers and search engines. Web browser features are not always intuitive, and novices accessing Web-based instruction can exhibit decreased levels of comprehension because many do not know how to use a browser efficiently (Ratner, 1998). For example, Ratner (1998) evaluated the usability of Netscape Navigator by asking participants to perform certain tasks. Undergraduates and postgraduate students (N = 97) at the University of New Mexico (UNM) interacted with five features of the browser starting on the UNM home page. Only about one-third of the subjects had prior experiences with the World Wide Web. The results indicated that the participants' actual performance was low, although, perception of usability was very high. Even the more experienced Web users had problems with the two more difficult tasks - increasing the size of the display font to large and looking for Web sites related to "Psychology" (Ratner, 1998). Both novices and experts did not know that in order to change display features the "Preferences" option in the "Edit" menu has to be accessed. Furthermore, novices and experts alike could not distinguish between a search on the university Web site and one on the World Wide Web. Thus, when looking for Web sites relating to "Psychology", most participants searched the university site. Only a very few actually found the browser's search icon to access the search engines (e.g., Yahoo, AltaVista, Lycos, Google) which facilitate a WWW search (Ratner, 1998).

Other problems which prevented novice Web users from focusing on the tasks included computer failures, broken Internet connections, and unfamiliarity with technical jargon such as browser, Web address, navigate, hyperlink, and home page (Ratner, 1998). In general, novices had to have an experienced user nearby to assist them with their tasks because they did not feel confident using the WWW without help.

Plug-ins. In order to play video and/or sound clips, view special documents, or access proprietary databases and graphing tools, plug-ins are usually required (Kruse & Keil, 2000). Web browsers, generally, allow the download and installation of plug-ins to individual computers. Plug-ins act as a separate application and even open a second browser window. They are automatically used by the Web browser whenever necessary. Among popular plug-ins are Acrobat Reader (Adobe Systems Incorporated, n. d.) to present original documents, RealPlayer (RealNetworks Incorporated, n. d.) to accommodate streaming video and audio, or Shockwave Player (Macromedia Incorporated, n. d.) to allow for sophisticated animation, multi-user games, and sound.

Johnson and Kavanagh recommended furnishing links to the appropriate plug-in and providing users with directions on how to set it up on their computer (as cited in Johnson, 1998). The reasoning for this is that a search for the appropriate plug-in and for set-up directions might reduce the user frustration substantially, especially if the task is important to success in the course.

Computers, Connections, Internet Service Providers, and Servers

Occasionally, students encounter technical issues related to hardware and their own level of expertise. For relatively nontechnical students, the frustrations involved in solving technical problems may seem overwhelming (Bischoff, 2000). Students may become so discouraged with their inability to set up an Internet connection to the school's server, for example, that they simply give up entirely instead of reaching out for technical assistance. Technical issues can often be resolved by the instructor or by the

school's technical staff. However, the students have to know that individuals are available to help them in case of technical problems.

Most technical problems occur at the beginning of the semester. Therefore, Fullmer-Umari (2000) suggested giving the students enough time to become familiar with the new environment prior to the start of instruction. This might ultimately contribute to a decrease in the attrition rate.

Communication Software for Web-Based Instruction

Communication software is designed both by for-profit companies (e.g., Netscape, Microsoft) and public universities (e.g., University of Washington). In Web-based instruction, asynchronous and synchronous communication tools are also often provided through professionally developed course management systems (e.g., WebCT, Black Board).

Asynchronous computer-mediated communication software. Web-based instruction using asynchronous communication permits users, often miles apart, to read and respond to messages. It utilizes electronic mail (e-mail) accounts or bulletin boards. While only registered users can access an electronic mail account, any individual belonging to a particular group (e.g., all students in a Web-based course) can access a bulletin board. Most asynchronous communication tools are quite easy to use, however, sometimes frustrations may arise due to Internet outages or messages getting lost in cyberspace (Burden & Davies, 1998).

Synchronous computer-mediated communication software. Synchronous computer communication, such as interactive chat or interactive computer video conferencing, requires students to interact at the same time (e.g., Kruse & Keil, 2000; Romiszowski, 1997). This in itself can become a problem, if students in other time zones or students who have other obligations at the time of the scheduled chat are required to attend (Paloff & Pratt, 1999).

Interactive chat allows users to write each other text-based messages while connected in a chat room. Chat room software is relatively simple to use as long as students possess adequate computer technology. Interactive chat, however, does require adherence to some protocol, such as "..." and "over", to indicate when the speaker is finished (over) or when the speaker has more to say (...). Without a protocol, chats can be confusing and chaotic. Contributions may end up out of sync as participants respond to comments made several lines earlier but were unable to post their response immediately due to a slow Internet connection speed (Kirby, 1999; Paloff & Pratt, 1999).

Interactive computer video conferencing provides the opportunity for students to see, hear, as well as interact with their instructor and each other. That means students can observe the instructor demonstrate the operation of tools and equipment, show skills that the students are required to emulate, conduct experiments, as well as do just about anything else they would normally do in a classroom-based course (Oliver, 1994). Although, interactive computer conferencing software is improving all the time, slow dial-up modems and microprocessors still severely limit the quality of picture and sound on home computers (Abrams & Haefner, 1998; Driscoll, 1998).

Hecht and Schoon (1998) conducted a case study in an off-campus research and statistics course in which the interactive computer conferencing software CUseeMe version 3 (CUseeMe Networks Incorporated, n. d.) was used to conduct class. Although the off-campus students used state-of-the-art school district computers with a high speed connection to the Internet, the first four months of the course were still plagued with non-transmitting audio, out-of-sync audio, and slow transmission speeds degrading the audio and video quality to a point where neither was coherent. While later sessions were running quite smoothly due to better technology support, minor software glitches,

such as computers disconnecting from the conference or system crashes, continued to interrupt the presentations (Hecht & Schoon, 1998).

Wulf and Schinzel (1998) also experimented with interactive computer video conferencing by attempting to teach a course enrolling students from five German universities with a videoconferencing tool. Likewise, uncountable technical problems occurred which "challenged the patience and motivation of the participants" (p. 2). This occurred despite the fact that the course was presented at each university with adequate Internet access available (Wulf & Schinzel, 1998). In summation, the researchers blamed a "deficiently designed" tool and wondered whether the technological problems of this particular videoconferencing tool can ever be overcome.

Instruction

The following elements of Web-based instruction are discussed in this section: (a) content-media fit, (b) class procedures and expectations, and (c) delivery of the content.

Content-Media Fit

Moore and Kearsley (1996) claimed that the instructor's decision of what parts of the Web-based course to teach in print, audio, or video will have a significant impact on learning. Since different courses may require several media to effectively convey the content, media selection should be content-driven and not technology-driven (Carlson, Downs, Repman, & Clark, 1998).

In general, courses requiring mostly reading, writing, and solving computational problems can be entirely presented in print (Driscoll, 1998). One concern with this approach, however, is that a textual presentation alone will eventually lead to boredom and decreased motivation (Moore & Kearsley, 1996; Ritchie & Hoffman, 1997). Therefore, color, pictures, graphs, animation, video, or sound should be used to liven up a text-based course (Moore & Kearsley, 1996; Nielsen, 2000; Ritchie & Hoffman, 1997).

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Other features that might break the monotony of text are applets created with the Web programming languages JavaScript or Java (Negrino & Smith, 1999). Designing a self-test, integrating a calculator into an algebra Web page, or creating a rotatable three-dimensional molecule for a chemistry Web page are examples of applets that can be designed. However, some students might not have the most up-to-date Web browser, or might not have enabled their browser to receive scripts written in Java or JavaScript. These are definitely issues that the instructor has to keep in mind when developing instructional materials (Berge, Collins, & Dougherty, 2000).

While some courses do not necessarily require video and sound, there are others that cannot do without them. In foreign language instruction, for example, using only documents on the Web together with computer mediated communication would preclude the students from hearing the language being spoken. Therefore, at least audio presentations must be provided in foreign language distance learning courses (Earp, 1997; Kuntz, 1998).

Other courses requiring more than just textual materials are the ones teaching psychomotor skills, such as inserting an intravenous drip or dissecting a frog. Actually, these courses require an environment where hands-on demonstrations and coaching can take place via sophisticated simulations or video presentations in addition to textual materials (Driscoll, 1998).

Class Procedures and Expectations

Every instructor should provide written guidelines detailing class procedures specific to the distance education course (Moore & Kearsley, 1996; Paloff & Pratt, 1999). Many education institutions already demand that various guidelines be provided to their students. For example, information necessary for both distance education and on-

campus courses is generally a course description, the instructor's name, room and phone number, and office hours. A description of course objectives, required or recommended materials (e.g., textbooks, journals, computers, calculators), attendance policies, and evaluation procedures are also usually an institutional requirement. Furthermore, required field trips, tasks to be completed; assignment due dates, test dates, and other key dates (e.g., withdrawal, holidays, breaks) should be described for both distance and on-campus learners.

However, students in distance education courses also should be told what to do in case of technical problems, given detailed written instructions concerning assignments and subject matter, and provided with a thorough introduction to the structure of their course (Moore & Kearsley, 1996; Paloff & Pratt, 1999). The importance of the instructor assisting with technical problems and providing detailed written instructions was illustrated in a case study by Hara (1998) conducted with eight graduate students in a computer-assisted language learning course. Using interviews and review of course documents and assignments, Hara (1998) found that a lack of technology support and unclear directions from the instructor concerning the subject matter and assignments were a major source of on-going frustration for the students.

Delivery of the Content

More so than in face-to-face instruction, the way the subject matter is presented must entice students in Web-based courses to become interested and learn (Holmberg, 1995; Moore & Kearsley, 1996). While some distance instructors believe that textbooks are sufficient to facilitate learning, some experts dispute this belief (e.g., Holmberg, 1995; Moore & Kearsley, 1996). They feel that textbooks only give facts, but are not designed to guide or teach. Therefore, in addition to the textbook, distance instructors must develop their own instructional materials to simulate the presence of a human guide and teacher (Holmberg, 1995). Specifically, instructional materials should be

written in clear, somewhat colloquial language to promote feelings of empathy, consideration, and personal relations between the instructor and the students (Holmberg, 1995; Moore & Kearsley, 1996).

There are many models describing how to develop instructional materials to facilitate learning. However, it is Robert Gagné's model that distance educators such as Holmberg (1995) and Moore and Kearsley (1996) point. It includes the following instructional events: (a) gaining attention; (b) specifying what is to be leamed; (c) reminding learners of past knowledge; (d) presenting the content; (e) providing guidance; (f) requiring practice; (g) giving feedback; (i) enhancing retention and transfer; and (h) testing comprehension (Gagné, 1985). While instructional events should be used in all courses regardless of delivery mode, a concentrated effort must be made in a Web-based course to include them. The reason for this is that one or more events may be forgotten especially during Web-based course development because the instructor's focus is often heavily skewed toward technology aspects of the course (Downs, Carlson, Repman, & Clark, 1999).

With respect to gaining students' attention, lesson-related links to relevant Web pages or linking the course to real-life work might be one way to achieve this goal in Web-based instruction (Dick & Reiser, 1989; Ritchie & Hoffman, 1997). Furthermore, learners in both the classroom and the Web-based environment should be told the purpose of a lesson and what they have to know by the end of the instruction. By making clear learning outcomes, students will significantly improve their performance in many cases (Dick & Reiser, 1989).

For all learners to retain information in long-term memory, they must link new information with related information stored in long-term memory (Dick & Reiser, 1989; Gagné, 1985). Therefore, if prerequisite knowledge is readily available to students, the learning of new tasks is often much simpler. In the Web-based classroom this can be

accomplished by providing online tutorials or lecture notes from earlier chapters (Ritchie & Hoffman, 1997).

After new knowledge has either been presented or students have been inspired to discover the knowledge, examples to illustrate the concepts should be provided, and the students must get the chance to apply the new information (Dick & Reiser, 1986). Finally, students should get feedback on how well they have learned a skill. In Web-based instruction, weekly online quizzes could be conducted or at least questions should be asked to determine how well students have learned the material (Ritchie & Hoffman, 1997). Feedback should be conducted in a timely, clear, and diplomatic manner from the teacher and peers (Holmberg, 1995; Moore & Kearsley, 1996).

Feedback is an important part of instruction because if students internalize a wrong idea or process, learning will have been compromised (Bischoff, 2000; Dick & Reiser, 1986; Mory 1996; Schwartz & White, 2000). According to Moore and Kearsley (1996) "lack of sufficient relevant feedback is one of the most common sources of dissatisfaction and frustration for distance learners" (p. 119).

The importance of feedback in Web-based courses was illustrated in a case study by Hara (1998) who found that technology problems, ambiguous instruction, and inadequate feedback were a major source of on-going frustration for the students. She concluded that in at least four students these frustrations may have inhibited their educational opportunity based on the facts that two students claimed that they would not take another distance course in the future; while two other students withdrew from the course. Stevenson, Sander, and Naylor (1996) also supported Hara's findings. They concluded that timely and encouraging feedback on assignments directly affected distance education students' general sense of satisfaction with the course.

Instructors must also provide remedial activities for the unsuccessfu. rners, as well as enrichment for those who are successful, if appropriate (Dick & Reiser, 1986).

The remedial activities should be directly geared toward difficulties the students have with the original instruction. The enrichment activities, on the other hand, should extend the learner's knowledge of a topic, but should not be portrayed as punitive. In the Web-based environment, remediation may be achieved by referring students to online tutorials or tutors or simply back to the lesson, provided appropriate hyperlinks exist. Enrichment, on the other hand, may consist of nothing more than lesson-related links to relevant Web pages (Ritchie & Hoffman, 1997).

It is also recommended that students are tested to find out to what degree they have internalized new knowledge (Dick & Reiser, 1986). Asking questions during the course of a lecture, assigning projects, or conducting formal testing are common assessment procedures. In Web-based instruction, asking questions and assigning projects can be accomplished via bulletin board and e-mail, and formal testing can be carried out online using documents written in JavaScript or in a face-to-face environment with the instructor or a proctor present.

A discussion of learning styles was also deemed appropriate for the present study because the development of Web-based course materials should be based on knowledge of how human beings learn (James & Gardner, 1995). There exists no universally accepted definition for learning style; however, the way individuals react to their learning environment is an essential component (James & Gardner, 1995). For example, James and Blank (1993) defined learning style as "the complex manner in which, and conditions under which, learners most efficiently and most effectively perceive, process, store, and recall what they are attempting to learn" (p. 47).

In the current study, a learning style model presented by James and Gardner (1995) consisting of the perceptual, cognitive, and affective dimension was investigated to determine if it could be used in the design of Web-based instruction. The perceptual dimension identifies information that is to be integrated into an individual's brain through

the senses. Subsequent processing of this information then occurs in the cognitive dimension. The affective dimension deals with that part of an individual's personality that relates to emotion.

James and Gardner (1995) presented several strategies to Web-based instructors to compensate for differences in learning styles among students. For example, to address the perceptual dimension, instructors might want to supplement printed materials with pictures or graphs, or provide opportunities for learners to interact with other learners. Several strategies are also available for addressing the cognitive dimension, such as structuring of content into small units, requiring active learner participation, supplying learners with a flowchart illustrating the major components of the course, and providing easy-to-use study guides. Lastly, to attend to the variations among students in the affective dimension, instructors may want to: (a) introduce themselves and the students in the course; (b) use an empathetic and informal communication style; (c) keep up consistent interaction with and among students; and (d) provide for personalized communication (Holmberg, 1995; James & Gardner, 1995; Moore & Kearsley, 1996).

Interaction

Holmberg's (1995) theory of distance education suggests that good distance education resembles a guided didactic conversation, and that specific traits of this conversation facilitate learning. He claimed that there must be continuous interaction (conversation) between the learner and the supporting organization accomplished through interaction with the content (simulated conversation), as well as real conversation through written and/or telephone interaction with the instructor.

According to Holmberg (1983), the characteristics of guided didactic conversation are:

1. easily accessible presentations of study matter: clear somewhat colloquial language, in writing that is easily readable; moderate density of information;
2. explicit advice and suggestions to the student as to what to do and what to avoid, what to pay particular attention to and consider, with reasons provided;
3. invitation to an exchange of views, to questions, to judgments of what is to be accepted and what is to be rejected;
4. attempts to involve the student emotionally so that he or she takes a personal interest in the subject and its problems;
5. personal style including the use of the personal and possessive pronouns; and
6. demarcation of changes of themes, through explicit statements, typographical means or, in recorded spoken communications, through a change of speakers, e.g. male followed by female, or through pauses (p. 48-49).

Holmberg (1983) and others tested the united influence of these characteristics in three different studies on German, British, and Swedish distance education students between 1980 and 1982. Specifically, in these studies the course content was rewritten in the style of guided didactic conversation. Holmberg (1983) noted that the students taking part in the studies were positively disposed toward the treatment, and that in one of the studies the students in the experimental group did slightly better than the students in the control group. However, the results were not statistically significant. Nevertheless, Holmberg decided to advance his theory until it can be disproved. To this day, however, no one seemed to have found negative effects of guided didactic conversation on student motivation and learning. Despite the fact that Holmberg (1983) could not statistically corroborate his recommendations with regard to guided didactic

conversation in distance education, it is felt in the present study that guided didactic conversation can be an effective component of Web-based instruction.

Learner-Instructor Interaction

In most Web-based courses, e-mail, bulletin boards, and/or chat rooms facilitate communication. The crux of this type of communication is the nature of the messages that are exchanged between the instructor and students. Online communication is particularly prone to difficulties because it excludes body language and eye contact (Lewis, 2000; Paloff & Pratt, 1999). Messages can quickly take on a negative connotation. Conversation that might be perfectly acceptable in face-to-face situations can turn into insulting, blunt, and sarcastic exchanges in written communication if individuals are not aware of this phenomenon (Lewis, 2000; Paloff & Pratt, 1999). This type of communication is usually referred to as "flaming" (Lewis, 2000). To prevent "flaming", instructors should model online communication by being warm, responsive, inquisitive, tentative, empathetic, and considerate (Holmberg, 1995; Lewis, 2000; Moore & Kearsley, 1996; White, 2000b). Additionally, it is recommended that they introduce the use emoticons such as the smiley and winky, that is, :-) or ;-), to show how to convey intended humor or to tease in a nonthreatening way (Hiss, 2000; Lewis, 2000).

Stein (cited in Holmberg, 1995) found that the percentage of completers in one distance education course doubled when a "cold, subject-oriented man" was replaced by a tutor with a warm and friendly attitude. Holmberg (1995) also mentioned a study by Torstein Rekkedal in which a control group taught in an "impersonal way" was compared to an experimental group given more personal attention that included an introductory letter by the instructor, short turn-around times for assignments, and frequent telephone contact. The results produced a significant statistical difference between the two groups with respect to persistence in the course and the number of units completed.

Moore and Kearsley (1996) suggested other practices that may prevent "flaming" as well as provide a more responsive and considerate communication style:

1. keep messages brief and to the point;
2. quote relevant passages or summarize it for those who may have missed it if responding to a message;
3. ask permission before publishing private e-mail;
4. avoid typing everything in all caps because this is considered like shouting;
5. acknowledge every message so the sender knows that it was received;
6. avoid sarcasm and insults; and
7. use spaces to break up paragraphs to improve readability (p. 173).

Regardless of the type of distance education, one element that is always difficult to achieve is student involvement (Holmberg, 1995; Moore & Kearsley, 1996, White, 1999). Holmberg (1995) offered one possible explanation with regard to students' hesitancy to communicate with their instructor. He indicated that some students simply feel that their problem is not worthy of their instructor's attention, and, therefore, they are not willing to waste their teacher's time. Wulf and Schinzel (1998) recounted a student comment illustrating this concern. In their study, one student stated "that he did not want to disturb all the participants at the different locations by posing a question" (p. 4). Other factors that influence learner-instructor interaction as well as learner-learner interaction have been found to be the overall course design, nature of the assignments, quality of the feedback, and prior experiences with computer-mediated communication (Vrasidas & McIsaac, 1999).

Fortunately, no matter what factors might inhibit communication, it can be achieved as long as it is planned and encouraged by the instructor (Holmberg, 1995; White, 1999). Suggestions for promoting communication included: (a) presenting questions to students; (b) removing the name from a question sent to the instructor's e-mail address

and then share the question on the bulletin board; or (c) asking different students to present items of interest to the class (e.g., technology, troubleshooting, subject matter, study, or Web resources tips) (Bischoff, 2000; Kirby, 1999; White, 2000a). Paulsen (1995) made one more recommendation by suggesting that instructors pose as students and ask questions in order to encourage discussions.

Further examination of the construct of interaction revealed that high "visibility" of the instructor also greatly contributes to a student's perception of course effectiveness (Bischoff, 2000). Bischoff (2000) came to this conclusion while conducting informal interviews with students and examining end-of-course student questionnaires. Consequently, she recommended that Web-based instructors establish "visibility" by sending on a daily basis one or more of the following types of messages to students:

1. content-related messages (lectures, handouts, clarification of points in the text, discussion questions, synthesis of discussion);
2. process-related messages (order of assignments, directions for sending assignments, description of the flow of the class, guidance when students become confused);
3. technical tips (software tips, information about how to send attachments, discussion of how to format notes, URLs);
4. protocol guidelines (code of conduct, plagiarism statement, netiquette, online tone); and
5. responses (answers to student questions, feedback on work submitted) (p. 60).

Activities similar to the ones designed to increase communication might also increase Web-based students' awareness of the presence of their instructor, as well as the instructor's active participation in all scheduled bulletin board discussions and online chats (Bischoff, 2000). Another approach that might enhance instructor "visibility" is the exchange of biographical sketches between students and instructor including their hopes

and expectations for the course (Fullmer-Umari, 2000; Paloff & Pratt, 1999). However, just like for other postings, it is imperative that Web-based instructors respond to students within 24 hours (Kirby, 1999; Paloff & Pratt, 1999).

Learner-Learner Interaction

While Moore (1989) agreed and supported learner-content and learner-instructor interaction, he added a third form of interaction, which he labeled learner-learner interaction. This refers to interaction that can be carried out between one learner and other learners, alone or in a group, brought about by the advent of electronic mail, bulletin boards, and chat rooms (Moore, 1989). It has been deemed a valuable resource for learning, and, in some cases, has even been described as essential interaction (e.g., Moore, 1989; Phillips, Santoro, & Kuehn, 1988).

Apart from teaching group interaction itself, learner-learner interaction is also useful for creating an increased awareness of the presence of peers. For example, Bischoff (2000) felt that high student "visibility" might even contribute to a reduced sense of isolation prevalent in many distance education students. Several suggestions to promote learner-learner interaction were offered by Kirby (1999), such as requiring student teams to present different topics on the Web; asking students to work in teams on assignments and projects; or directing teams to critique each others work.

With regard to the success of team activities, Paloff and Pratt (1999) strongly suggested to describe in detail how to select a leader, the role of the leader, and how grades pertaining to team tasks are assigned to individual members. Additionally, Kirby (1999) advised not to schedule too many interaction activities since this may become overwhelming for the students and the instructor. In the case of the instructor, this may then lead to delayed and limited feedback.

Group size must also be taken into account if the learner-learner interaction is to be successful. Both in synchronous and asynchronous communication, large groups can

be overwhelming for the participants and might lead to information overload. Paloff and Pratt (1999) suggest five to ten participants when conducting chat sessions or interactive computer video conferences. Asynchronous communication, on the other hand, can often facilitate the interaction between twenty or more participants, particularly in the case of individual or group presentations. However, in certain instances, a smaller group size is also advisable in asynchronous communication, specifically when students are required to post papers for discussion or are asked to collaborate on assignments.

In addition to meeting together on the bulletin board or in the chat room, course participants should also be encouraged to get together in other ways. For example, instructors could suggest to their students to exchange private e-mails in order to continue to discuss an assignment, to share information, or to study for tests.

Depending on the nature of the class, instructors could also require that students give each other useful feedback on their work, such as in English composition courses, or to collaborate with students from similar courses, such as in laboratory courses required in the study of biological, physical, or computer science. In general, courses in mathematics, the sciences, art, and music do not lend themselves well to the discussion format (Paloff & Pratt, 1999). However, instructors may still initiate discussions by requiring students to pose questions about the material to other students.

Instrument Development

Since the focus of the current study is on Web-based course evaluation, specifically, the development and validation of an instrument designed for student evaluation of Web-based instruction, the process of instrument development and validation was also of interest. Thus, following are the steps recommended to ensure that instrument scores possess the technical qualities required to produce useful measurement as

recommended by many test and measurements experts (e.g., Crocker & Algina, 1986; Gable & Wolf, 1993; Mueller, 1986; Worthen, Borg, & White, 1993):

1. identify items to represent the construct under investigation;
2. select a response format;
3. construct an initial item pool;
4. carry out an item review;
5. conduct a content validation study;
6. hold an item tryout;
7. field-test the items on a large sample;
8. conduct other validity studies (i.e., criterion-related or construct validity);
9. determine statistical properties of item scores; and
10. conduct a reliability study.

Identify Items to Represent the Construct under Investigation

The first step in any instrument development process is necessarily always the translation of the construct under investigation into a set of questionnaire items and their underlying dimensions. According to Biner, Dean, and Mellinger (1994), a division of the items into major dimensions has several practical implications. For example, it might allow researchers to identify more clearly which areas of the course under investigation need improvement. Furthermore, the dimensions would also be suited for future research, such as attempting to identify facets of student satisfaction predictive of course achievement or other relevant criteria.

To develop questionnaire items, Gable and Wolf (1993) recommended the careful examination of relevant literature. This is an important step in the instrument development process, since it provides the theoretical base underlying the instrument (Gable & Wolf, 1993). To broaden the item pool found through the literature review, other measurement experts (e.g., Crocker & Algina, 1986; Mueller, 1986) recommend

that characteristics of Web-based instruction be collected by questioning students familiar with the object under investigation. This method has the dual advantage of characterizing the questionnaire through the eyes of the participants and capturing additional items which they could have missed or considered unimportant (Crocker & Algina, 1986; Mueller, 1986). In the current study, characteristics of Web-based instruction gleaned from a literature review and from responses of students familiar with Web-based instruction were utilized to develop a comprehensive item pool.

Select a Response Format

Worthen et al. (1993) claim that "perhaps the most commonly used rating scale is the five-point Likert scale presented in a format where the five choices are abbreviated response options" (p. 357) such as "SA" for "Strongly Agree", "A" for "Agree", "U" for "Undecided", "D" for "Disagree", and "SD" for "Strongly Disagree." With regard to the middle option, various other labels can also be used, including "don't know", "not sure", "uncertain", or "neither agree nor disagree" (Worthen et. al, 1993).

Even-numbered response options (e.g., four or six choices) are also frequently used in attitude measures, specifically when there is a concern that respondents may use the neutral middle option to avoid making up their mind (Nunnally, 1978). On the other hand, Nunnally (1978) argues that respondents with a neutral reaction to a questionnaire item should be allowed to express this opinion and not be forced to make a different choice. In the present study, a five-point rating scale with the middle position "undecided" was used primarily to make the respondents feel more "comfortable" in making choices.

Construct an Initial Item Pool

An instrument using a Likert scale requires the development of a collection of statements pertaining to the object of interest. Several guidelines must be observed, which were taken into consideration in the current study. Most importantly, the

instrument should be designed with approximately the same number of positive (favorable) and negative (unfavorable) statements (Crocker & Algina, 1986; Guilford, 1954; Mueller, 1986; Worthen et al., 1993). Statements should also appear as a proper grammatical sentence written in the present tense, not exceed 20 words, be free of spelling errors, and be easily understood by the population for which the instrument is intended (Crocker & Algina, 1986).

While creating the questionnaire items, a concentrated effort should be made to avoid statements capable of being interpreted as factual, statements that have more than one interpretation, and statements to which all respondents may possibly make the same response. For example, the factual statement, "The course utilizes the World Wide Web" would be difficult to refute by anyone in a Web-based course. Also, the statement "The instructor gives three tests", is either true or false, therefore, the respondents would either say "strongly agree" or "strongly disagree" depending on whether or not they have read their syllabus. If all statements were of these two types, there might not be any discrimination between satisfied and dissatisfied respondents whatsoever, and the questionnaire would be useless (Crocker & Algina, 1986; Mueller, 1986; Worthen et al., 1993).

Furthermore, care must be taken not to use absolutes such as "always", "never", "all", or "none"; indefinite qualifiers such as "only", "just", "merely", "many", "few", or "seldom"; or negatives such as "not", "none", or "never" because such statements might introduce ambiguity (Crocker & Algina, 1986; Mueller, 1986). Additionally, statements that contain two opinions (e.g., "The tests are difficult and not related to the lessons") or "if" or "because" clauses should be avoided.

Several researchers (e.g., Bonetti, 1994; Cresswell & Hobson, 1996; Newport, 1996) also voiced concerns with regard to responses given by untrained, amateur student raters, especially to questions pertaining to teaching performance and effectiveness.

Thus, as suggested by Newport (1996), the following types of questions were avoided in the present study because in those cases the rating qualifications of students may be questionable:

1. The instructor demonstrates a thorough knowledge of the subject matter.
2. The instructor is well-informed in related fields.
3. The instructor keeps lecture material updated.
4. The instructor was skilled at observing student reactions and modified his instructional strategies when needed.
5. The instructor used appropriate teaching techniques to individualize instruction.
6. The instructor served as a good model of a reflective decision-maker?
7. The instructor used effective teaching methods.
8. The instructor got the students intellectually involved by asking higher order questions.
9. The instructor responded appropriately to students' cognitive processing. (p. 18-19)

Furthermore, with respect to teaching materials in distance education, Cresswell and Hobson (1996) felt that students neither possess the objectivity, the knowledge of the subject, nor the universally-agreed upon notions of relevance when judging whether the study materials present a balanced representative view of developments in the area. These researchers also declared that instrument items must be formulated in a manner as to exclude the possibility that the students may not have made a conscientious effort to understand the content on their own or to seek help from the instructor. Cresswell and Hobson (1996) also cautioned against the use of evaluation items that are too general in nature or items that imply that all learners have the same educational goal. For example, the statement: "The textbook is useful" may be of limited use because a textbook could be useful in many ways, such as in enhancing understanding of the

subject or in promoting the interest in the subject. On the other hand, the statement: "The subject has motivated me to want to explore this area further" implies that any course should lead to a continued interest in the subject area. However, there are many degrees which demand familiarity only with certain subjects (e.g., mathematics for history majors), in which case the students may not be interested in conducting further explorations (Cresswell & Hobson, 1996).

When constructing an attitude instrument, it is also important to be aware of measurement errors due to a response pattern called response set (Guilford, 1954). According to Guilford (1954), some test examinees have a tendency to respond in a certain way to test items regardless of item content. It is these tendencies that are called response sets. Two response sets that often affect the scores of inventories are acquiescence and social desirability (Mueller, 1986). Acquiescence is the error of the examinee who favors positive responses over negative ones or vice versa, and social-desirability refers to individuals who want to make a good impression at the expense of responses based on their true beliefs.

Using positively and negatively stated questionnaire items could control the response set of acquiescence. Mueller (1986) stated that this practice will not eliminate acquiescence, but it will cancel out its effect. The social desirability response set, on the other hand, is not as easy to control. The most commonly used procedure is to try to make the examinees feel unthreatened by the measurement process (Mueller, 1986). Assuring respondents of anonymity and confidentiality of responses might bring about more open and honest responses.

Carry out an Item Review

After the researcher develops questionnaire items, an independent review panel should conduct an item review. Its task would be to examine the items with respect to clarity, grammar, spelling, and level of readability (Crocker & Algina, 1986; Gable & Wolf,

1993). At the same time, the panel members might also be asked to contribute additional questionnaire items.

To determine the composition of the review panel, several studies concerned with instrument development were investigated (e.g., Greer, Hudson, & Wiersma, 1999; Guan, Wang, Gable, & Young, 1998; Harris, 1998; King, Harnar, & Mayall, 1999; Rezendes & Gable, 1997). It was found that the panel members were usually selected from three groups familiar with the field of study, (a) research methodologists, (b) faculty members who are experts in the field under investigation, and (c) graduate students familiar with the field under investigation. Their numbers ranged from four to twelve. The item review panel in the present study consisted of two faculty members from the field of tests and measurement and two doctoral students from the field of educational technology and with experience in Web-based instruction.

Conduct a Content Validation Study

Next, an independent content validation panel should carry out a content validation study. The panel's task would be to investigate the relevance of each item with regard to the object under investigation and its representativeness with respect to one of the dimensions (Crocker & Algina, 1986; Gable & Wolf, 1993). At the same time, the panel members might also be asked to contribute additional questionnaire items.

Again several studies concerned with instrument development were investigated (e.g., Greer et al., 1999; Guan, Wang, Gable, & Young, 1998; Harris, 1998; King et al., 1999; Rezendes & Gable, 1997) to determine the composition of the content validation panel. It was discovered that the panel members were usually selected from two groups familiar with the field of study, (a) faculty members who are experts in the field under investigation, and (b) graduate students familiar with the field under investigation. The content validation panel in the current study was comprised of four university professors from the field of educational technology with experience in Web-based instruction.

Content validation should receive the "highest priority during the process of instrument development" because the relevance and representativeness of the instrument's items with regard to the object under investigation does ultimately influence inferences derived from instrument scores (Gable & Wolf, 1993; Messick, 1990). Two approaches to content validity were identified in the literature. The first approach involved instructing a review panel to try to place each individual item into one of the given dimensions (e.g., Greer et. al, 1999; Guan et al., 1998; Harris, 1998; King et al., 1999; Rezendes & Gable, 1997). The second approach consisted of asking the panel to report on the relevance of each item with regard to the objective of the study (e.g., Greer et. al, 1999; Shoemake, 1998). It was found that items with an average relevance rating of at least 50% agreement and a representativeness rating of at least 75% agreement were retained for placement on the initial questionnaire (e.g., Bednarski, 1999; Greer et al., 1999; Resendez & Gable, 1997; Shoemake, 1998). It was recommended that items not fitting this description should either be rewritten or dropped (Gable & Wolf, 1993; Mueller, 1986).

In the current study, in order for an item to remain on the initial questionnaire, at least two panel members had to pair it up with the same dimension otherwise it was rejected. Additionally, items were rejected if more than two reviewers felt that a particular item was not relevant to the study.

Hold an Item Tryout

Prior to finalizing the initial instrument for a field test, several measurement experts recommend that a draft of the initial questionnaire be tried out on examinees representative of the population for which the instrument is being constructed (e.g., Crocker & Algina, 1986; Gable & Wolf, 1993). This allows the test developer to elicit comments with respect to the look and feel of the questionnaire and assess the clarity of

directions, as well as item clarity and readability. The students might also be asked to contribute additional questionnaire items.

Test and measurements experts suggested at least ten examinees for item tryout purposes (e.g., Crocker & Algina, 1986; Gable & Wolf, 1993). However, in the current study only eight community college students from an available pool of 32 students could be recruited to examine the questionnaire.

Conduct Other Validation Studies

Besides content validity studies, the other two major types of validity that should be examined in a newly developed instrument are criterion-related and construct validity. In criterion-related validity studies, the instrument developer wants to draw an inference from examinees' scores to a specific performance (i.e., college admission test scores predicting academic performance or paper-and-pencil test predicting hands-on performance). In construct validity, on the other hand, the instrument developer wants to find evidence that the instrument items actually reflect constructs (dimensions) that have been previously established by the instrument developer.

Data collected for a criterion-related validity study can be analyzed by using correlation or regression analysis. Construct validity studies, on the other hand, are varied, and often are limited only by the creativity and ingenuity of the test developer (Messick, 1990; Popham, 2000). Below are several types of studies that might be conducted to support construct validity as suggested in the literature (e.g., Crocker & Algina, 1986; Cronbach & Meehl, 1996; Gable & Wolf, 1993):

1. Group Differences - the ability of items to discriminate between individuals who are known to differ on the dimensions of the object under investigation.
2. Factor analysis - to determine if items "cluster" together in patterns reasonable in light of the theoretical structure of the construct of interest.

3. Multitrait-Multimethod Matrix - as described by Campbell and Fiske (cited in Crocker & Algina, 1986). It consists of discriminant and convergent validity. Discriminant validity is an examination of correlations between measures of different constructs using the same measurement method (e.g., true-false, forced choice or incomplete sentences) or correlations between different constructs using different measurement methods. Convergent validity examines the correlations between measures of the same construct using different methods of measurement.

Since the second construct validity study (i.e., factor analysis) was of primary interest in this study, a detailed investigation of factor analysis will follow.

Factor analytic procedures "decompose" the item-level intercorrelation matrix into a set of roots (eigenvalues) and vectors (eigenvectors) using complex mathematical procedures. These roots and vectors are then multiplied together to generate a matrix, usually called a factor loading matrix, which contains the same number of rows as there are items and the same number of columns as there are factors derived from the mathematical procedures. Ideally, the factor analysis should reflect the decisions made during the content validity study by the panel of experts (Gable & Wolf, 1993). When this is not the case, the instrument's construct validity should be questioned.

The term "factor", as used in factor analysis, refers to the dimensions of an instrument that are qualitatively different from one another. "Factor loading" is the correlation between each item of the instrument and its respective factor.

There are two types of factor analyses, exploratory and confirmatory. Crocker and Algina (1986) suggested that a confirmatory factor analysis should be used as soon as the test developer has even a vague hypothesis concerning the number or nature of the factors measured by the instrument. However, other measurement experts (e.g., Comrey & Lee, 1992; Gable & Wolf, 1993; Gorsuch, 1974) feel that exploratory factor

analysis should always be used when verifying literature-derived conceptual dimensions until the factors seem well established through "rotations" and a series of studies. Then confirmatory factor analysis procedures can be used for a more precise statistical test of the degree of fit.

Exploratory factor analysis includes several procedures such as principal component analysis (PCA), maximum likelihood method (ML), principal axis factoring (PAF), unweighted and generalized least squares, and alpha and image factoring (Tabachnick & Fidell, 2001). Any of these procedures can be carried out using either the listwise or the pairwise data exclusion method. The listwise method was designed to use only cases with complete data. It eliminates all incomplete records. The pairwise method, on the other hand, was developed to use all cases with complete data for each pair of variables. For example, given 1,405 records with 1,206 containing "Not Applicable" responses, the correlation between variable A and B may be based on 500 cases, the correlation between variable B and C on 1,405 cases, the correlation between variable A and C on 734 cases, and so on.

Regardless of which procedure is used, either an orthogonal or oblique rotation or both must always follow it (Comrey & Lee, 1992; Crocker & Algina, 1986; Gable & Wolf, 1993; Gorsuch, 1974). Rotations have been found to be necessary because the factor structure in an unrotated matrix is rarely useful in scientific work due to the way most factor extraction methods are designed. By "rotating" the factor matrix into another form that is mathematically equivalent to the unrotated matrix, factor structures can be found, which are often much more insightful.

Several mathematical procedures have been developed to accomplish rotations (Comrey & Lee, 1992; Gable & Wolf, 1993; Harman, 1976). Varimax is the most popular method for orthogonal rotations followed by the Equamax and Quartimax methods (Comrey & Lee, 1992). The suggested methods for carrying out oblique rotations are

Promax, Quartimin, Biquartimin, or direct oblimin (Comrey & Lee, 1992; Harman, 1976). For the direct oblimin rotation Harman (1976) recommended a parameter entitled "delta (δ)" of less than or equal to zero. When δ = 0, the factors are most oblique. As δ gets smaller, the factors get less oblique.

When an initial factor matrix is rotated orthogonally, an attempt is made to locate clusters of items near a set of axes that are at right angles. Each factor describes the items that correlate "highly" with it. Only items with factor loadings greater than .30 should be taken into consideration when contemplating permanent placement of the items with their factors (Comrey & Lee, 1992). Gable and Wolf (1993) even suggested that only items with factor loadings greater than .40 should be considered. Table 1 shows item-factor correlations for judging the potential usefulness of an item for factor interpretation purposes (Comrey & Lee, 1992).

In an oblique rotation, the axes can be at less than a 90° angle to each other. In this case, the rotation results in two matrices, a pattern and a structure matrix. The factor loadings in the pattern matrix are regression weights. They can be interpreted similarly to the loadings in an orthogonally rotated matrix, which are, however, equal to the correlations of the items with the factors (Comrey & Lee, 1992; Gable & Wolf, 1993). In an oblique rotation, it is the structure matrix that shows the correlation of the items with the factors. However, both the factor loadings in the pattern matrix and the correlation of the items with the factors found in the structure matrix should be considered in factor interpretation.

If an item has its principal oblique factor loadings on a particular factor, the correlation of this item with that factor can then be used to evaluate the usefulness of the item for factor interpretation (see Table 1) (Comrey & Lee, 1992). Factor interpretation based on items with only "poor" and "fair" ratings must be made very cautiously and with every expectation that revisions may be necessary in the future. If items have loadings

in the "good" to "excellent" range they probably contribute more to the interpretation of the factor than lower ratings. However, even here, subsequent work may establish that that some aspects of the factor have not been represented (Comrey & Lee, 1992).

Table 1

Scale of Variable-Factor Correlations

Orthogonal Factor Loading	Percentage of Variance	Rating
.71	50	Excellent
.63	40	Very Good
.55	30	Good
.45	20	Fair
.32	10	Poor

With regard to the number of factors to be extracted from the factor analysis solution for both rotations, all factors with eigenvalues greater than or equal to 1.0 should be examined. After examining the results, a specific number of factors may be extracted to match the hypothesized factor structure. However, some researchers feel that this may artificially produce the intended factor structure (Gable & Wolf, 1993).

A final step in the factor analysis process might be to describe the intercorrelations among the factors. The factor correlations show the extent to which the factors are related. This information is given in the factor correlation matrix, which is generated for the oblique rotation. No such matrix exists for the Varimax rotation because its off-diagonal entries are always zero (Gable & Wolf, 1993). A correlation between the

factors of .30 or higher might indicate the possibility of collapsing the factors. However, this decision should be based on whether or not this action is conceptually meaningful (Gable & Wolf, 1993).

Determine Statistical Properties of Item Scores

To further refine the item pool, an analysis of the items should also be performed. Several procedures were recommended by instrument developers for determining statistical properties of item scores, including the calculation of the mean and standard deviation and the construction of an item discrimination index (e.g., Crocker & Algina, 1986; Gable & Wolf, 1993; Mueller, 1986). These procedures were carried out in the present study.

Item discrimination index. In the case of a Likert scale, the Pearson product moment correlation coefficient must be used to correlate each item score with its dimension score for item discrimination index purposes. This is done to illustrates the extent to which an item represents its underlying dimension (Mueller, 1986). A high positive correlation indicates that the item in question represents the dimension. A negative correlation sometimes signals a miskeyed item (Mueller, 1986). Items correlating less than .20 with their respective dimension indicate that they do not represent the dimension (Gable & Wolf, 1993). These items should be removed or rewritten.

Mean and standard deviation. The means and standard deviation should be calculated for each item to determine whether there is sufficient variation in the responses. Items with either high or low means and a low standard deviation should be rewritten or removed (Gable & Wolf, 1993; Mueller, 1986).

Conduct a Reliability Study

The final analysis of the data consists of investigating the internal-consistency reliability of the item clusters defining each dimension. When developing an attitude instrument, it is of importance to determine the internal consistency of the instrument

since a low internal consistency coefficient may point out potential instrument construction flaws. Examples of construction flaws might include a sample homogeneous in response, items assigned to a category that do not adequately represent it, poorly written items subject to misinterpretation, or an inadequate number of items per category (e.g., Crocker & Algina, 1986; Gable & Wolf, 1993).

There are three methods available to estimate internal consistency, the split-half, Kuder-Richardson 20, and Cronbach's alpha method. Cronbach's alpha was used in the majority of instrument development studies to estimate reliability (e.g., Bednarski, 1999; Greer et. al, 1999; Guan et al., 1998; Harris, 1998; King et al., 1999; Rezendes & Gable, 1997; Shoemake, 1998) and will also be used in the present study. While there are no set standards for determining whether a reliability coefficient is high enough, Gable and Wolf (1993) suggested that the internal-consistency reliability of scores on attitude inventories should be at least 0.70.

CHAPTER 3

METHODOLOGY

This chapter discusses the research methods and procedures used in the current study. Details describing the participants and setting and the research phases are outlined in the following sections.

Participants and Setting

The 15 member states of the Western Interstate Commission for Higher Education (WICHE) were considered for the selection of participants. The WICHE member states are Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming.

A list was created consisting of 183 public universities and colleges in the WICHE member states that were also licensed to use WebCT as reported by the WebCT developers (WebCT, n. d.). The Web sites of institutions on a semester system were then investigated to determine if Web-based courses were being taught in the spring of 2001.

If a site provided a search feature, it was utilized using the keywords "WebCT", "online", "Internet", and "distance." Otherwise, the researcher examined the hyperlinks on a site for descriptions such as "distance learning", "distance education", "online courses", "Internet courses", or "WebCT." Every time evidence of Web-based courses was found, a bookmark was created in the researcher's Web browser and the name of the school was typed into a computer file.

In this manner, 52 institutions were identified to be teaching Web-based courses possibly utilizing WebCT with spring 2001 semester starting dates of January 8, January 15, January 22, and January 29. Subsequently, a message was sent via electronic mail (e-mail) to the distance education departments of these colleges asking for help in identifying Web-based instructors who matched certain criteria. Specifically, instructors were sought who were teaching semester-based undergraduate courses that primarily used instructor-designed materials and WebCT and required at most one face-to-face lecture or orientation meeting not counting face-to-face assessment.

If the e-mail address of the distance education departments could not be located on an institution's Web site, the letter was sent to the vice president of academic affairs. Ultimately, 30 schools (43%) responded. Seven distance education administrators supplied e-mail addresses of faculty, six referred to their Web-based course listings, and fourteen stated that they forwarded the message to their faculty. The latter produced three responses.

To expand the potential pool of study participants, instructors identified to teach Web-based courses at the 52 institutions were directly asked for help in distributing the initial questionnaire to their students. The instructors were told that in order to participate in the study they must be teaching semester-based undergraduate courses using instructor-designed materials and WebCT and have at most one face-to-face lecture or orientation meeting not counting face-to-face assessment. Web-based courses that did not meet these criteria were excluded from the current study.

It was the intention of this study to find an appropriate number of respondents to accommodate a successful factor analytic study. Recommendations with respect to the number of respondents required tended to vary in this regard depending on the textbook consulted. Ratios (N: p) of between 5:1 and 10:1 were suggested, where N is the

number of observations for each questionnaire item and p is the number of questionnaire items (Gable & Wolf, 1993).

Ultimately, a total of 1,405 participants were used for this study. Of this number, 1,058 (75%) were female and 345 (25%) were male. Two respondents skipped the gender question by inserting "don't know." With regard to the question concerning the location of the computer used for the course, 1,183 students (84%) replied that they were using a home computer. The remaining 222 (16%) used school or work computers.

Table 2 indicates that the ages of the respondents were diverse. The ages 57, 61, 63, 65, 67, 68 were not represented. The youngest individual was 15 years old and the oldest was 69. By far the largest age group taking Internet courses were 18-22 years old. Over half of the sample revealed that they never took an Internet course utilizing WebCT prior to the course that was surveyed and only 96 individuals (7%) admitted to not having taken the course prerequisites. Almost half of the courses did not seem to require a prerequisite course at all.

Research Phases

The questionnaire was developed by the following procedures: (a) development of initial instrument, (b) data collection, (c) validation, and (d) development of final instrument.

Phase I: Development of Initial Instrument

This phase of the study presents the method for generating questionnaire items and their underlying dimensions through a literature review and a pilot study (Stewart, 1999). The process of initial questionnaire development included development of a questionnaire blueprint, an item review, a content validation study, an item tryout, and conversion of the initial questionnaire into an HTML document.

Table 2

Age of Respondents

Class Limits	Frequency	%
13 - 17	11	0.78
18 - 22	498	35.44
23 - 27	271	19.29
28 - 32	181	12.88
33 - 37	117	8.33
38 - 42	121	8.61
43 - 47	88	6.26
48 - 52	56	3.99
53 - 57	19	1.35
58 and above	11	0.78
Missing	32	2.28

Item development in a pilot study. The sample for the pilot study conducted by the current investigator (Stewart, 1999) included students (N = 111) and instructors (N = 3) from four Web-Based courses of College Algebra, Precalculus I, Finite Mathematics, and Fundamentals of College Mathematics. The current investigator taught two of the courses. All four courses utilized the WebCT course management system. The courses were taught in the fall semester of 1999 at a community college in a large metropolitan area.

For the pilot study, preliminary questionnaires for students and instructors were developed for the purpose of generating items and dimensions for an instrument that

can be used for student evaluation of Web-based instruction. Initially, only one question was created for both the student and instructor questionnaires. It was adapted from Biner (1993), who, in his questionnaire, asked students to carry out the following task: "List as many factors as you can think of that you personally believe could potentially affect the quality of a televised course in any way. Try to be as specific as possible" (p. 64). In the pilot study the question was formulated as follows:

1. List as many factors as you can think of that you personally believe could potentially influence the effectiveness of your Web-based mathematics course in any way. (An effective web-based course is a course that allows students to acquire skills, knowledge, and positive attitudes toward learning.)

   You may want to consider:

   a. Instructional practices (e.g., online tests and quizzes, guidance and direction, interaction with instructor and/or other students, feedback)
   b. Course design features (e.g., hyperlinks, screen layout and color, text readability, page length, graphics, video, sound, animation, WebCT™ tools)
   c. Other

One student with experience in Web-based learning was asked to complete the question. Due to the paucity of her response, the researcher decided to add several other questions to the student and instructor questionnaires:

2. What WebCT tools are you satisfied with and why?
3. What WebCT tools are you NOT satisfied with and why?
4. What do you like about WebCT and why?
5. What do you NOT like about WebCT and why?
6. What do you like about a Web-based course and why?
7. What do you NOT like about a Web-based course and why?

One Web-based mathematics instructor was then asked to evaluate the preliminary instructor questionnaire. He did not suggest any changes nor did he add more questions.

Of the 61 students (55%) who returned the completed preliminary questionnaire, 16 (26%) were enrolled in College Algebra, 18 (30%) in Precalculus, 9 (15%) in Finite Mathematics, and 18 (30%) in Fundamentals of Mathematics. All three instructors also completed their questionnaire including the investigator of the pilot study, who is also the researcher in the current study.

Items for an instrument for student evaluation of Web-based instruction were then developed as follows. First, all subjects received an identification number. Next, a computer file was created containing all of the responses for each question from both the student and instructor preliminary questionnaires. Each sentence in a subject's response was then judged and was assigned to a tentative item. Statements were assigned to an existing tentative item only if it was obvious to the researcher that the subject was referring to that item. Otherwise another tentative item was created. During this process, several wording changes were made to the tentative items. In this manner, 44 items were identified.

The items were then analyzed to determine common dimensions. After the item and dimension elicitation process, it was found that the students and instructors were concerned about six major categories in Web-based instruction: (a) Appearance and Structure of Web Pages; (b) Hyperlinks and Navigation; (c) Technical Issues; (d) Class Procedures and Expectations; (e) Delivery of Instruction; and (f) Interaction. The questionnaire resulting from the pilot study is presented in Appendix B.

Item development based on literature review. An in-depth literature review was conducted using various resources. First, the computerized AskERIC database (Information Institute of Syracuse, n. d.) was used. AskERIC is a component of the

Information Institute of Syracuse at Syracuse University and encompasses the resources of the entire Educational Resource Information Center (ERIC) system.

ERIC descriptors used in the search were "distance education" paired with "World Wide Web", "Internet", "teleconferencing", "telecommunications", and "computer mediated communication." The keywords "online", "virtual", and "Web-based" were also paired with the ERIC descriptor "distance education." Research reports, project descriptions, and conference papers relating to teaching and learning on the World Wide Web were chosen for the literature review. In light of the dimensions identified in the pilot study by Stewart (1999) and the components of Web-based instruction suggested by Driscoll (1998) and Khan (1997), the following was used as the overarching framework for the literature review: (a) tools facilitating Web-based instruction, (b) class procedures and expectations, (c) instruction, and (d) interaction.

Care was taken during the review of the literature to allow for dimensions and items to emerge that were neither suggested by Driscoll (1998) and Khan (1997) nor identified by Stewart (1999). Specifically, as the documents were examined, their references, additional reading lists, and suggested Web sites were used in search of more items and additional dimensions. The following documents were found during a search of the AskERIC database:

1. Discussions of the look and feel of the display screen, layout of the Web page, Web document download times, the hyperlink system, or navigation (e.g., Baylor, 1999; Frick, Monson, Xaver, Ilie, Conley, & Wamey, 1999; Pacheco et al., 1999; Van Rennes & Collis, 1998).
2. Investigations of audio and video presentations in with Web-based instruction (e.g., Abrams & Haefner, 1998; Hecht & Klass, 1999; Hecht & Schoon, 1998; Mason, 1997; Wulf & Schinzel, 1998).

3. Examinations of teaching and learning in the Web-based environment (e.g., Berge, 1999; Carlson et al., 1998; Daugherty & Funke, 1998; Downs et al., 1999; Hara, 1998; Hindes, 1999; Mory et al., 1998; Newlands & Ward, 1998; Schlough & Bhuripanyo, 1998; Ward, 1999; Westbrook, 1999; White, 1999).
4. Explorations of the characteristics of online interaction (e.g., Gunawardena, 1994; Jiang & Ting, 1998; Kirby, 1999; Mahesh & McIsaac, 1999; Vrasidas & McIsaac, 1999).

Next, the Web site of the online bookstore amazon.com was searched for books pertaining to teaching and learning on the World Wide Web. The descriptors and keywords used in the ERIC search were also used for this search. In this manner, the following books were acquired and studied: (a) Web-Based Instruction by Khan (1997), (b) Designing Web Usability by Nielsen (2000), (c) Building Learning Communities in Cyberspace by Palloff and Pratt (1999), (d) Teaching Online by Draves (2000), (e) Using the World Wide Web to Build Workplace Learning Environments by Beer (2000), (f) Adult Learning and the Internet by Cahoon (1998), (g) The Online Teaching Guide by White and Weight (2000), (h) Technology-Based Training by Kruse and Keil (2000), (i) Web-Based Training by Driscoll (1998), (j) Human Factors and Web Development by Forsythe et al. (1998), (k) Distance Education: A Systems View by Moore and Kearsley (1996), and Distance Education: A Practical Guide by Willis (1993).

Finally, again using the same descriptors and keywords, a search of the online library catalog of the University of Nevada, Las Vegas also yielded books that were deemed appropriate for the current research. Specifically, the following books were studied: (a) The McGraw-Hill Handbook of Distance Learning by Chute et al. (1999), (b) Distance Education: Strategies and Tools by Willis (1994), (c) The Virtual Classroom: Learning without Limits via Computer Networks by Hiltz (1994), (d) Theory and Practice of Distance Education by Holmberg (1995), Handbook of Research for Educational

Communications and Technology by Jonassen (1996), Computer-Mediated Communication and the Online Classroom by Berge and Collins (1996), Designing the User Interface by Shneiderman (1998).

A manuscript was prepared detailing the findings of the literature review. This manuscript was analyzed to find dimensions and characteristics of Web-based instruction not found from the pilot study (Stewart, 1999). It was discovered that all characteristics of Web-based instruction found from the pilot study were also identified in the literature. However, several new characteristics and one new dimension were also found.

Each new characteristic was typed into a computer file, judged, and assigned to a new tentative questionnaire item. Characteristics were assigned to an existing tentative questionnaire item only if it was obvious to the researcher that the characteristic was referring to that item. Otherwise another tentative item was created. During this process, several wording changes were made to the tentative items.

The items were then analyzed to determine common dimensions. It was found that most items should be placed with one of the dimensions established in the pilot study. The items that did not fit with the existing dimensions were thought to address the new dimension found in the literature.

Before the new items were placed under their respective dimensions, some revisions were made to the questionnaire developed in the pilot study (Stewart, 1999). That is, several items were removed from one dimension and placed under the newly created dimension. All dimensions contained between seven and ten items with a total item count of 65.

Development of a questionnaire blueprint. A five-point Likert scale was used in this study. Response choices were: 1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, 5 = Strongly Agree. The five-point rating scale with the middle position

"undecided" was used primarily to make the respondents feel more comfortable in making choices. The response choice 9 = Not Applicable was also included for all items to take into account the diversity of the sample courses.

As the items were written the general guidelines recommended for writing items for the Likert format were followed (Crocker & Algina, 1986; Guilford, 1954; Mueller, 1986; Worthen et al., 1993). Several types of questions were also avoided because they might put into question the qualifications of untrained, amateur student raters (e.g., Bonetti, 1994; Cresswell & Hobson, 1996; Newport, 1996). Furthermore, items were formulated in a manner as to exclude the possibility that the students may not have made a conscientious effort to understand the content on their own or to seek help from the instructor.

To minimize the error created by some examinees who favor positive responses over negative ones or vice versa, an attempt was made in the current study to avoid this response set called "acquiescence" (Guilford, 1954). Specifically, 42 positively and 24 negatively stated questionnaire items were used to control for acquiescence.

An opportunity for optional and required student comments was also provided on the blueprint. A free-response comment box was deemed optional. The required comments included age, gender, exact name of Web-based course and institution, academic and Web-based course background, and whether or not the course is being completed on a home computer. Additionally, three required forced-choice questions regarding course prerequisites, the number of Internet courses taken, and the location of computer were added.

Item review. Two university professors from the field of tests and measurements and two doctoral students from the field of educational technology with experience in Web-based instruction carried out a review of the blueprint items. These reviewers checked the items for clarity, grammar, spelling, and level of readability (Crocker & Algina, 1986).

They were also encouraged to provide additional items and dimensions, if deemed necessary. An opportunity for optional comments was also provided.

All reviewers were e-mailed the same "Item Review Worksheet" (see Appendix C) and were given the Web address of the blueprint. They had five days to complete the worksheet and e-mail their responses back to the researcher. All reviewers were given either a $5 Blockbuster or Starbucks gift certificate.

After the return of the reviewers' responses, a computer file was created containing a copy of the "Item Review Worksheet." Subsequently, all recommendations were typed under the appropriate worksheet questions. If it was obvious to the researcher that a recommendation was similar to one already listed, it was not included again. Suggestions pertaining to the same item were clustered together. The completed document was then used to revise the items in the blueprint.

Content validation. Four university professors from the area of educational technology carried out a content validity study given the revised blueprint items. All panel members were e-mailed the same "Content Validation Worksheet" (see Appendix D) and the Web address of the revised blueprint without dimensions. The order of the items was not changed in this blueprint to ensure that the panel would not become overwhelmed by the task of placing items under their respective dimensions. However, the order of the dimensions on the worksheet did not match the order of the item clusters on the blueprint.

The content validation panel was asked to assess the relevance of every item with respect to Web-based instruction, as well as its representativeness with regard to its respective dimension (e.g., Crocker & Algina, 1986; Cronbach, 1984; Messick, 1990). Specifically, the panelists' task was to place each item into one of the dimensions listed on the worksheet. The panel members were also asked to identify any items that they thought were not relevant to the study of Web-based instruction or did not pertain to all

subject areas. The panelists were also encouraged to provide additional items and dimensions, if deemed necessary. An opportunity for optional comments was also provided. The content validation panel had five days to complete the worksheet and e-mail their responses to the researcher. All panelists were given either a $5 Blockbuster or Starbucks gift certificate.

After the return of their responses, the questionnaire items were copied to a computer file into the first column of a table, one item to a row. The table also contained nine additional columns. One column for each of the dimensions (Appearance and Structure of Web Pages, Hyperlinks and Navigation, Class Procedures and Expectations, Instruction, Quality of Interaction, and Presence of Instructor and Peers), an "Other Dimension" column, and a column named "Relevance." Next, each panel member was assigned a color (blue, red, green, and purple). Then each panelist's worksheet was examined.

Using the color assigned to each panelist, a hash mark was placed into the appropriate row and column of the table to indicate item-dimension placement and item relevance as suggested. If a panel member placed an item under more than one dimension, a hash mark was placed into all columns that were involved. If an item was placed under a newly created dimension, a hash mark was placed in the "Other Dimension" column together with the name of the dimension as suggested by the panelist. Furthermore, if a panelist thought that an item was irrelevant to the study of Web-based instruction, a hash mark was placed into the "relevancy" column.

Finally, below the table a list was created of recommended additional items with each item placed under the appropriate dimension as recommended by the panel members. Lastly, optional comments were added to the document.

Prior to the content validation study, it was determined that an item might be rejected or restated unless at least two out of four panelists place it into the same dimension as

the researcher. It was further decided that an item might be rejected or restated if at least three out of four panelists felt that it was not relevant to the evaluation of Web-based instruction. Subsequently, the researcher and a professor with expertise in the area of tests and measurements revised the blueprint by taking into account the recommendations of the content validation panel using the rules established previously.

Converting the blueprint into HTML documents. The second revision of the blueprint was converted into four interactive HTML (hypertext markup language) documents for display on the World Wide Web (WWW). An effort was made to design aesthetically pleasing documents to stimulate response. A participant's first impression is often a deciding factor of whether or not the questionnaire will be completed (Berdie, Anderson, & Niebuhr, 1986).

After the HTML conversion, the four pages were connected by Common Gateway Interfaces (CGIs) to capture the individual student responses from the Web questionnaire and to route this information via electronic mail (e-mail) back to the researcher. A form validation routine written in the programming language JavaScript 1.1 (Netscape Communications Corporation, n. d.) was added to each page to prevent examinees from skipping or missing a question. In an effort to deter examinees from submitting more than one completed questionnaire, the JavaScript code on each page cleared the responses immediately after they were submitted to the researcher. No allowances were made for non-JavaScript supported browsers, which were deemed negligible in number by the researcher.

Furthermore, it was decided that the questionnaire responses would not be encrypted. Encryption is accomplished by special software that protects data from being viewed by anyone for whom it is not intended, such as the employees of Internet service providers (Dyson, 1995). It was thought in this study that the additional work involved in

planning an encryption process is not necessary since only responses in the form of numbers will be transmitted via the Internet.

Item tryout. After the interactive questionnaire documents were placed on the World Wide Web, their content was revised one last time after a tryout by eight volunteers, who were representatives of the population for which the instrument was constructed. The volunteers were selected from four fall 2000 Web-based courses in psychology and mathematics at the community college of a large metropolitan area.

All volunteers were e-mailed the same "Item Tryout Worksheet" (see Appendix E) and were given the Web address of the interactive questionnaire documents. Questions concerning the clarity of directions and items, grammar, spelling, and level of readability were posed. Furthermore, the volunteers were encouraged to provide additional items and dimensions, if deemed necessary. One question was asked pertaining to potential problems encountered with the Internet design. The volunteers were also invited to read the letter introducing the questionnaire and to comment on its ability to persuade a potential examinee to complete the questionnaire. An opportunity for optional comments was also provided.

The volunteers had five days to complete the worksheet and e-mail their responses back to the researcher. As in the case of the item reviewers and the content validation panelists, the volunteers were also given either a $5 Blockbuster or Star Bucks gift certificate.

After the return of their responses, a computer file was again created containing a copy of the "Item Tryout Worksheet". All recommendations were typed under the appropriate worksheet question. If it was obvious to the researcher that a recommendation was similar to one already listed, it was not included again. Suggestions pertaining to the same item were clustered together. The completed document was then used to revise the items one last time.

Phase II: Data Collection

The initial questionnaire was placed on the World Wide Web together with a cover letter (see Appendix F) containing all required elements of informed consent as outlined by the Institutional Review Board of the University of Nevada, Las Vegas. The participants were informed of the purpose of the questionnaire and why they should participate. They were also told that their participation is voluntary, that all information gathered in this study is kept completely confidential, and that no reference will be made in written or oral materials that could link them to this study. It was hoped that this might also control the social desirability response set, which refers to individuals who want to make a good impression at the expense of responses based on their true beliefs (Guilford, 1954).

The expression "Please complete as soon as possible" was used instead of a specific time limit because deadlines might actually give "procrastinators" a reason for not responding (Berdie et al., 1986). Additionally, the word "questionnaire" was avoided because it might deter some individuals from participating. Instead, the participants were asked "to give their opinion." To stimulate favorable feelings toward the questionnaire an attempt was made to design an aesthetically pleasing cover.

The current study adhered to the following mailing schedule, which included three steps:

Sending a pre-letter to instructors. Three weeks into each respective spring semester, the researcher sent a message (see Appendix G) via e-mail to all instructors identified to be teaching Web-based courses. They were asked for help in distributing the initial questionnaire to their students, provided they taught semester-based undergraduate courses, used primarily instructor-designed materials and WebCT to convey instruction, and required at most one face-to-face lecture or orientation meeting not counting face-to-face assessment.

The instructors were assured that their name and course will not be connected with student responses in any way, that the questionnaire is confidential and will only be seen by the researcher, and that student responses will in no way adversely affect their standing with the institution. To personalize the message, it also contained the address of a Web site containing more detailed information about the study, as well as personal information and pictures of the researcher and her family (see Appendix H).

Sending the Web address of the questionnaire to instructors. Five weeks into each school's spring 2001 semester, the researcher e-mailed a brief message (see Appendix I) to all Web-based instructors again asked for their help in distributing the questionnaire to their students. The message also included a short paragraph introducing the study to the students and providing the Web address of the questionnaire. The instructors were asked to copy this paragraph to their WebCT bulletin board.

Sending a follow-up message to instructors. Ten days after the Web address of the questionnaire was mailed to the instructors, a follow up e-mail message was sent to them (see Appendix J). This message asked instructors to post another notice announcing the availability of the questionnaire to their WebCT bulletin board. The last day of data collection was March 25, 2001.

Phase III: Validation

Phase III describes the methods employed to assess construct validity via factor analysis, to carry out an item analysis, and to measure the reliability of the instrument scores.

Factor analysis. Exploratory factor analyses was carried out using the computer software package SPSS 10.0 (SPSS Incorporated, n. d.) to statistically substantiate the dimensions (factors) found in Phase I of this study. Principal component analysis (PCA) and the maximum likelihood (ML) method were explored to determine the factor structure that describes the data. In PCA, linear combinations of the variables or items

are used to account for the variation of each dimension in a multivariate space. However, some of the loadings in the PCA often remain sizable for more than one factor. Thus, a maximum-likelihood method of factor extraction was also chosen in the current study to possibly find more variables that load strongly on a single factor.

A Varimax (orthogonal) and direct oblimin (oblique) rotation were carried out for each extraction method to determine empirically whether the factor correlations are substantive. For the direct oblimin rotation a parameter of $\delta = 0$ was used to investigate the case in which the factors are most oblique. In the current study both rotations were carried out to see which one resulted in a more meaningful solution. Since "not applicable" responses were used in 29 out of 60 variables, both the pairwise and listwise methods in the SPSS (SPSS Incorporated, n. d.) factor analysis procedure were investigated.

Two additional criteria were used in extracting the factors: (1) eigenvalues greater than 1.0 and (2) number of factors equal to seven. The first criterion is the default method widely used in exploratory factor analysis. Eigenvalues are obtained when factor analytic procedures "decompose" the item-level intercorrelation matrix into a set of roots (eigenvalues) and vectors (eigenvectors) using complex mathematical procedures. The second criterion was employed following the results from Phase I where seven factors were determined.

Additionally, only correlations between each item of the instrument and its respective factor (i.e., factor loadings) greater than .30 were interpreted (Comrey & Lee, 1992). Items with factor loadings greater than .30 on more than one factor were temporarily assigned to all these factors. After a review of each factor's item content, items were permanently placed with the most appropriate factor.

Item Analysis. An item-total correlation coefficient was computed between each item and its dimension established in Phase I to determine the extent to which the item

represents its underlying dimension. It was decided that items showing coefficients equal to or less than .20 would be removed or rewritten (Gable & Wolf, 1993). The standard deviation and mean were also calculated for each item. Items with relatively high or low means associated with low standard deviations were sought for possible rewording or removal (Gable & Wolf, 1993).

Reliability. Cronbach's alpha was used to estimate test score reliability to determine potential instrument construction flaws. Reliability estimates greater than 0.70 were sought. The alpha coefficient calculated by eliminating each item in turn from its scale was also investigated to determine if removal of certain items would significantly increase the reliability of their respective dimension.

Phase IV: Development of Final Instrument

In this phase, the initial questionnaire was revised using feedback given in Phase I and II combined with the results of Phase III. Items that were repetitive or that did not add additional information to the dimensions were deleted. The final names for the dimensions were also determined. A final version of the questionnaire, entitled "Web-Based Course Evaluation (WBCE) was placed on the Word Wide Web together with the code facilitating import into the WebCT Survey Module and guidelines for evaluating each item (see http://www.scsv.nevada.edu/~stewarti/mathweb/survey/intro.htm).

CHAPTER 4

RESULTS

The presentation of the results is divided into four phases: (a) Development of Initial Instrument, (b) Data Collection, (c) Validation, and (d) Development of Final Instrument.

Phase I: Development of Initial Instrument

Phase I deals item development, item review, content validation, item tryout, and conversion of the initial questionnaire into an HTML document.

Item Development Based on Pilot Study and Literature Review

A total of 21 additional items were gleaned from the literature review that were not previously identified in the pilot study (Stewart, 1999). These items together with their underlying characteristics of Web-based instruction are provided in Appendix K. Each item is followed by a list of those characteristics of Web-based instruction that were decisive in shaping the item.

The six dimensions extracted from the pilot study (Stewart, 1999) covered the majority of items discussed in the literature on Web-based instruction. These dimensions were (a) Appearance and Structure of Web Pages, (b) Hyperlinks and Navigation, (c) Technical Issues, (d) Class Procedures and Expectations, (e) Delivery of Instruction, and (f) Interaction. The items that did not fit with the existing dimensions were thought to address the new dimension found in the literature. This dimension was named "Presence of Instructor and Peers."

Before each new item was placed under its respective dimension, some revisions were made to the questionnaire developed in the pilot study which can be found in Appendix B (Stewart, 1999). Specifically, seven out of eight items were removed from the interaction dimension and placed under the newly created "Presence of Instructor and Peers" dimension. They were:

1. I can count on my instructor to quickly clear up confusion with new topics.
2. I get useful feedback from the instructor on my performance.
3. We are strongly urged to get in touch with our instructor in case of questions or concerns.
4. We are encouraged to communicate with our peers.
5. We receive timely instructor feedback with respect to our concerns and questions.
6. Our instructor is difficult to reach outside of the WebCT course management system.
7. The instructor's participation in mandatory communication activities is very poor.

Subsequently, the "Interaction" dimension was renamed "Quality of Interaction." The only pilot study item to remain in the "Quality of Interaction" dimension was "Interaction with our instructor reflects kindness and consideration."

Each new item was then mapped onto its respective dimension below the items identified in the pilot study (see Table 3). The only dimension not receiving new items was "Class Procedures and Expectations."

Development of a Questionnaire Blueprint

A five-point Likert scale was used in this study. Response choices were: 1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, 5 = Strongly Agree. The five-point rating scale with the middle position "undecided" was used primarily to make

Table 3

New Items Mapped to their Respective Dimensions

Dimension	New Items
Appearance and Structure of Web Pages	Course Web pages are dominated by of Web pages overly bold graphics or text. Important information is easy to find on course Web pages.
Hyperlinks and Navigation	It is easy to locate a particular course Web page from any other page. I often get feelings of disorientation within the course Web site. Menus and buttons in the WebCT course management system readily indicate what function they perform.
Technical Issues	Due to a slow system there are times when I cannot access course components. Some information visible on the screen is missing on printed copies. Helper applications (plug-ins) are difficult to install.
Delivery of Instruction	There are too few examples to show how to properly apply or use what I have learned. Instructional methods used in this course allow me to learn. We are given little opportunity to apply or use new topics. We are given sufficient resources to provide extra practice or to expand our knowledge. The materials used to present the subject matter reflect the personal touch of the instructor.
Quality of Interaction	Messages from my instructor precisely address the issues. The instructor uses a lively writing style. I am unsure how to properly express my questions in writing. Our instructor makes every effort to promote positive interaction among students. Our chat room discussions are confusing. Technology problems make our interactive computer video conferences frustrating.
Presence of Instructor and Peers	The instructor is concerned with our progress. Our instructor makes a continued effort to stay "visible."

the respondents feel more comfortable in making choices. The response choice 9 = Not Applicable was also included for all items to take into account the diversity of the sample courses.

The items developed from the literature review and the pilot study (Stewart, 1999) were examined with respect to general guidelines established for writing items for the Likert format (Crocker & Algina, 1986; Guilford, 1954; Mueller, 1986; Worthen et al., 1993). For example, every item was inspected to determine whether it had more than one interpretation or contained two opinions (e.g., "The tests are difficult and not related to the lessons"). The items were also checked to ensure that they did not contain absolutes such as "always", "never", "all", or "none"; indefinite qualifiers such as "only", "just", "merely", "many", "few", or "seldom"; or negatives such as "not", "none", or "never" because such statements might introduce ambiguity. In the end, it was determined that all items adhered to the general guidelines.

Since several researchers (e.g., Bonetti, 1994; Cresswell & Hobson, 1996; Newport, 1996) voiced concerns with regard to responses given by untrained, amateur student raters, the items were also inspected to ensure that they were not too general in nature. For example, a statement such as: "The instructional methods are adequate" would be of limited use because the word "adequate" could be interpreted differently by the participants. Some students may feel that "adequate" instructional methods should help them understand the subject while others may expect them to primarily promote interest in the subject. In the current study, no items were thought to be too general in nature.

To prevent the tendency of participants to respond in a certain way, an attempt was also made to avoid a response set called acquiescence, which is the error of examinees who favor positive responses over negative ones or vice versa (Guilford, 1954). Specifically, 38 positively and 27 negatively stated questionnaire items were used to control for acquiescence.

Finally, an opportunity for optional and required student comments was added to the blueprint. A text area was provided for participants to type any optional comments they might have. Age, gender, and exact name of Web-based course and institution were required. Additionally, the following three forced-choice questions were added:

1. Have you taken the prerequisite(s) for this course?

   Yes No Prerequisite(s) not required I don't know

2. How many Internet courses utilizing WebCT have you taken prior to this course?

   0 1 2 or more

3. Are you predominantly using a home computer for this course?

   Yes No

The blueprint is provided in Appendix L. It contains 65 items excluding the background questions. A copy of the blueprint was placed on the World Wide Web to be used by the item review panel.

Item Review

Two university professors from the field of tests and measurements and two doctoral students from the field of educational technology with experience in Web-based instruction carried out a review of the blueprint items. An "Item Review Worksheet" (see Appendix C) and the Web address of the blueprint were sent to them by e-mail. Five questions were included in the worksheet:

1. Are there any statements that are not clear?
2. Are there any statements that contain spelling or grammatical errors?
3. Are there any statements that use words that might not be familiar to others?
4. Based on you knowledge of Web-based courses, list any additional statements that should be included on the questionnaire.
5. Do you have any other comments?

The reviewers had five days to complete the worksheet and e-mail their responses back to the researcher. After the return of the reviewers' responses, the initial blueprint was revised as described below.

Task one: Are there any statements that are not clear? Based on the response of the reviewers the following changes were made:

1. The word "uninspiring" in the item "Course Web pages are uninspiring" was changed to "dull" because one of the reviewers thought that "uninspiring" is subject to multiple interpretations.
2. The item "the color scheme of course Web pages interferes with the readability of the text" was changed to "The color scheme of Web pages interferes with text comprehension" since the word "readability" in the original item was thought to be unclear. For the same reason, the phrase "lively writing style" in the item "The instructor uses a lively writing style" was changed to "informal conversational style."
3. The item "Our chat room discussions are confusing" was changed to "The dialogue in chat room discussions is difficult to follow." This was done because one panel member was unsure whether the original item, "Our chat room discussions are confusing", refers to the discussion format or to the topic.

Task two: Are there any statements that contain spelling or grammatical errors? While no spelling mistakes were found, many suggestions were made with respect to grammar. Subsequently, only seven items were not revised. All other items were either changed grammatically or words were added or taken out as recommended by one or more reviewers and as deemed appropriate by the researcher.

Task three: Are there any statements that use words that might not be familiar to others? None of the item reviewers provided responses to this question.

Task four: Based on you knowledge of Web-based courses, list any additional statements that should be included on the questionnaire. The only suggestion was to add the statement "Please list any topics you believe were not effectively presented for your learning in the design of the Web-based instruction" to the dimension called "Instruction." However, this statement was not included since it was thought that the phrase "effectively presented for your learning" would be subject to multiple interpretations.

Task five: Do you have any other comments? The reviewers provided several suggestions for improvement when asked for optional comments. One recommendation was to re-examine all items with respect to the "Not Applicable" response option and to eliminate this option unless it is deemed to be a reasonable choice. Consequently, the "Not Applicable" option was removed from those items that the researcher believed would be answerable by all respondents given the response choices "Strongly Disagree" to "Strongly Agree." The "Not Applicable" option was retained for 28 items.

The instructions pertaining to classroom procedures and expectations, as well as presence of the instructor and peers were revised as recommended by the review panel. The new instructions were, respectively,

a. The following questions pertain to class procedures and expectations. These items refer specifically to the procedures used in the course and the instructor's expectations of you.
b. The following questions pertain to the social presence of instructor and peers. These items refer to how close you feel to other people in the course.

Additionally, the items "Assigned tasks are relevant and appropriate to the course" and "Our instructor makes a continued effort to stay "visible" were removed from the questionnaire because one expert in tests and measurements thought that they were vague.

Finally, one of the tests and measurements experts stated that mixing negative and positive statements might confuse the respcndents. Therefore, three negatively stated items were rewritten to express positive feelings:

1. The item "We were given an insufficient amount of time to become familiar with the technology" was changed to "In the beginning of the semester, we were given enough time to become familiar with the technology."
2. The item "There are too few examples to show me how to properly apply or use what I learned" was changed to "The instructor provides examples so I can better understand the subject matter."
3. The item "We are given little opportunity to apply or use new topics" was changed to "We are given opportunity to practice what we learn."

The first revision of the blueprint entitled "Blueprint Developed after Item Review" is provided in Appendix M. It contains a total of 63 items excluding the background questions. A copy of this blueprint without dimensions was placed on the World Wide Web in preparation for the content validation study.

Content Validation

Four university professors from the area of educational technology participated in validating the content of revised questionnaire items. A "Content Validation Worksheet" (see Appendix D) and the Web address of the blueprint without dimensions were sent to them by e-mail. The worksheet consisted of five tasks as follows:

1. Categorize each statement into one of the seven dimensions listed.
2. Please identify any statements that you feel are not relevant to the study of Web-based instruction.
3. Please identify any statements that you feel do not apply to all subject areas.
4. Please list any additional statements that you feel should be included in the questionnaire.

5. Do you have any other comments?

The panel members had five days to complete the worksheet and e-mail their responses back to the researcher. After the return of the panelists' responses, the blueprint was revised a second time as described below.

Task one: Categorize each statement into one of the seven dimensions listed. At least two of the four panel members placed the items written for the "Appearance and Structure of Web Pages", the "Hyperlinks and Navigation", the "Technical Issues", and the "Instruction" dimensions into their intended dimension. Three out of four panelists placed two items written for the "Class Procedures and Expectation" dimension into different dimensions. Thus, several changes were made to the items as follows.

The item "I know whom to turn to when technology-related problems arise" was restated in order for it to remain on the initial questionnaire in the "Class Procedure and Expectations" dimension because three panelists paired it up with "Technical Issues." Specifically, it was changed to read: "I know exactly what actions to take in the event of technology-related problems."

The item "The instructor makes an effort to provide alternatives to scheduled 'fixed time' activities" was kept in the "Class Procedures and Expectation" dimension as stated despite the fact three panelists placed it into the "Instruction" dimension. It was, however, restated to read, "We are given reasonable alternatives to scheduled 'fixed time' activities."

The justification for keeping this item in the "Class Procedures and Expectation" dimension was that there seemed to have been an overall confusion stemming from the dimension names "Class Procedures and Expectations" and "Instruction." Subsequently, the "Instruction" dimension was renamed "Content Delivery", which better described the items assigned to it.

One panelist placed three items into a dimension called "Learner Support." However, this recommendation was not followed because a subsequent factor analysis necessitated at least six items per dimension. Additionally, the majority of the panelists placed all items assigned to the "Presence of Instructor and Peers" dimension under the "Quality of Interaction" dimension. Again, there seemed to have been an overall confusion stemming from the name of the "Quality of Interaction" dimension. Consequently, this dimension was renamed "Quality of Communication", which more accurately described the items assigned to it. It was thought that the revised title would not have invited placement of items meant for the "Presence of Instructor and Peers" dimension.

Task two: Please identify any statements that you feel are not relevant to the study of Web-based instruction. Two items were removed from the questionnaire because at least three of the four panel members thought that these items were not relevant to the evaluation of Web-based instruction. They were:

1. "We are given opportunity to practice what we learn." It was thought that all students should practice what they learn without being asked to do so by the instructor.
2. "I have a hard time expressing my questions in writing." The panel thought that this was more of a personal characteristic and not something the instructor can easily influence.

Task three: Please identify any statements that you feel do not apply to all subject areas. The panelists thought that all of the existing statements applied to all subject areas.

Task four: Please list any additional statements that you feel should be included in the questionnaire. Fourteen new items were recommended for inclusion in the questionnaire, however, only one new item, "The grading procedures are clearly stated",

was added to the questionnaire. No other items were added to the questionnaire. Some items were either deemed to be too vague (e.g., Lessons are of appropriate length to be handled in a reasonable amount of time) or too similar to existing items (e.g., I can call on my peers for help). Several other items were thought to be too specific to a particular instructional method (e.g., Discussions are used effectively to foster communication in the course) or student group (e.g., The Web pages are accessible to the disabled students).

Task five: Do you have any other comments? Two of the panelists stated that three items were similar to existing items and, therefore, should be removed. They were:

1. "I have a clear understanding of how to use the course components" which was deemed similar to the item "It is easy to locate a particular course Web page from any other page."
2. "The testing arrangements fit my schedule" which was deemed similar to the item "The process in place for submitting assignments is unacceptable to me."
3. "I get useful feedback from the instructor on my performance" which was deemed similar to the item "I can count on my instructor to quickly clear up confusion with new topics."

These three items were subsequently removed from the blueprint after ensuring that each dimension was still described by at least six items to facilitate adequate results of subsequent factor and item analyses (Comrey & Lee, 1992; Gable & Wolf, 1993). Also, two negatively stated items were rewritten to express positive feelings because one of the content experts thought that mixing positive and negative statements might confuse participants. They were:

1. "I seem to get lost in the course Web site" which was changed to "The layout of the course Web site is clear to me."

2. "Due to a slow system there are times when I cannot access course components" which was changed to "The school's computer consistently allows me access to the course components."

Twelve additional items were also rewritten for clarification purposes without changing their orientation by taking into account the recommendations and concerns of the panelists. The second revision of the blueprint entitled "Blueprint after Content Validation" is provided in Appendix N. It contains a total of 59 items excluding the background items.

Converting the Blueprint into HTML Documents

After content validation, the blueprint was converted into four interactive HTML (hypertext markup language) documents for display on the World Wide Web (WWW). An effort was made to design aesthetically pleasing documents to stimulate response. The colors purple and deep mustard were used on each page to offset a brief message to the respondents and an introduction to each dimension, respectively. Explanations of some phrases within the items were also written in deep mustard. The background of the questionnaire documents was white, and the items were displayed in black with font type "Times Roman" and font size "3." An ornate purple and blue vertical rule separated the introduction from the items. A red five-point star preceded the name of each dimension, which was written in black.

The message to the respondents at the top of each page contained words of encouragement in the hopes of keeping the respondents focused. Furthermore, at the bottom of each page the respondents were informed how many more pages they had to complete as well as the number of remaining items. Instructions on how to use the computer mouse to respond to each item accompanied the introduction of each dimension.

The items under each dimension were placed into a table, one item per row, with the response choices following each item in five or six successive columns (depending on whether or not the "Not Applicable" option was used). The response buttons were labeled SA for "Strongly Agree", A for "Agree", U for "Undecided", D for "Disagree", SD for "Strongly Disagree", and NA for "Not Applicable." A key to the symbols SA, A, U, D, SD, and NA was placed above each table with the direction to use NA only if an item does not pertain to the course that the respondents are currently taking.

The first page of the questionnaire contained the "Appearance and Structure of Web Pages" and the "Hyperlinks and Navigation" dimension. On the second page the "Technical Issues" and "Class Procedures and Expectations" dimension could be found. The third page displayed the items pertaining to the "Content Delivery" and "Quality of Communication" dimension. Lastly, the fourth page contained the "Presence of Instructor and Peers" dimension, the student background questions, and an optional comment box. As soon as the respondents submitted the questionnaire to the researcher by pressing the button entitled "Click Here to Send the Questionnaire to Me!" they were sent to a Web page thanking them for their participation. The thank-you page provided the respondents with the option to connect to the researcher's main Web site. The respondents were further informed that the final questionnaire would eventually be accessible from this site.

A form validation routine written in the programming language JavaScript 1.1 (Netscape Communications Corporation, 2000) was added to each page to prevent examinees from skipping or missing a question. As soon as an examinee misses a question a Web browser specific alert box would let the respondents know that they failed to respond to one or more items. The message in the alert box was written in such a manner as to encourage the respondents to not give up at this point. The

message "PLEASE, PLEASE HANG IN THERE!!!" was prominently displayed in the alert box.

Item Tryout

After the interactive questionnaire documents were placed on the World Wide Web, the content was revised one last time after a tryout by eight volunteers representative of the population for which the instrument was constructed. An "Item Tryout Worksheet (see Appendix E) and the Web address of the questionnaire documents were sent to them by e-mail. The worksheet consisted of eight tasks as follows:

1. Is the letter to the students enticing enough for someone to want to complete the questionnaire?
2. Are the directions clear for completing the questionnaire?
3. Do you know exactly what each statement wants to find out?
4. Are there any statements that use words that might not be familiar to some people?
5. Are there any statements that you feel should be added to the questionnaire?
6. Is there anything that bothers you with the Internet design of the questionnaire?
7. Are there any spelling mistakes?
8. Do you have any other comments?

The tryout panel had five days to complete the worksheet and e-mail their responses back to the researcher. After the return of the reviewers' responses, the interactive Web questionnaire was revised as described below.

Task one: Is the letter to the students enticing enough for someone to want to complete the questionnaire? According to the recommendations of the panelists several changes were made. For example, the sentence "I really appreciate your willingness to help. Thank you so very much!" was added to the student letter above the researcher's signature. Also, one volunteer stated that she would only be enticed to complete the

questionnaire given a statement similar to the following: "Now students have a chance to give some input on their classes." Subsequently, the researcher added the following paragraph:

> "I am offering YOU the unique opportunity to voice your opinion concerning Internet courses. Your input will actually be used in the development of guidelines for the purpose of maintaining and improving the quality of Internet courses."

Task two: Are the directions clear for completing the questionnaire? Several suggestions pertaining to the improvement of readability were followed. Subsequently, all directions were shortened and reworded. Also, an introduction to the background questions was recommended by one panelist. Subsequently, the following introduction to the background questions was added to the questionnaire:

> "Thank you for completing the questionnaire. Your responses will be very helpful in my attempt to improve the quality of Web-based instruction. The following background questions will help me to present a valid and reliable evaluation form."

Task three: Do you know exactly what each statement wants to find out? The volunteers stated that they knew exactly what each item wanted to find out.

Task four: Are there any statements that use words that might not be familiar to some people? Several panelists claimed that they were not familiar with certain words and phrases. Specifically named were "interactive computer video conferencing", "brainstorming", "plug-ins", and "hyperlinks." Subsequently, the word "brainstorming" was removed from item 35, and an explanation was added to the words "plug-ins" and "hyperlinks." The researcher did not find it necessary to explain the phrase "interactive computer video conferencing." It was thought that anyone utilizing this method of communication would know what the item was referring to. However, "(for example, CUseeMe)" was added at the end of the two items containing this phrase to point out the name of a software used to facilitate interactive computer video conferencing.

Task five: Are there any statements that you feel should be added to the questionnaire? One new item was included in the questionnaire as recommended by one volunteer. It was placed in the "Presence of Instructor and Peers" dimension and stated, "The instructor confirms in a timely manner that assigned tasks have been received."

Task six: Is there anything that bothers you with the Internet design of the questionnaire? No comments were received for this question.

Task seven: Are there any spelling mistakes? Again, no comments were received for this question.

Task eight: Do you have any other comments? The item "Some information visible on the screen is missing on printed copies" was changed to "Information visible on the screen is clearly displayed on printed copies" because one of the item tryout panelists felt that it a negatively stated item would confuse participants. Another panelist suggested that all items written in the first person plural should be changed to the first person singular. This was also done.

In summary, Phase I resulted in seven dimensions containing a total of 60 items. Eight items each were in the "Appearance and Structure of Web Pages", "the Class Procedures and Expectations", the "Content Delivery", and the "Presence of Instructor and Peers" dimension. The "Hyperlinks and Navigation" dimension contained seven items, the "Quality of Communication" dimension six items, and there were fifteen items in the "Technical Issues" dimension. The final revision of the blueprint, which will be referred to as the initial questionnaire, is provided in Appendix O.

Phase II: Data Collection

The initial questionnaire was placed on the World Wide Web together with a cover letter containing all required elements of informed consent as outlined by the Institutional

Review Board of the University of Nevada, Las Vegas (see Appendix F). Subsequently, 506 online instructors at 52 institutions in the WICHE states were sent an e-mail message introducing this study, a message containing a letter to the student and the Web address of the questionnaire, and a follow-up message. The last day of data collection was March 25, 2001.

During data collection, 20 instructors (3.95%) of the 506 contacted informed the researcher that they would not participate because their course failed to meet the study's criteria and 28 (5.53%) were unwilling to burden their students with extra work. Ultimately, 1,545 students responded to the questionnaire.

Although the instructors were informed of the criteria necessary for participation, some instructors seemed to have ignored them. Through the open-ended question and two strategically placed "Not Applicable" responses for two items pertaining to WebCT, it was found that several participants attended courses that required more than one face-to-face meeting, were televised, or did not utilize WebCT. The responses from these participants (n = 123) were not included in the study.

Furthermore, several participants indicated that their evaluation is based on combined experiences from several online courses although the introduction to the questionnaire indicated that respondents must complete a separate questionnaire for each online course that they are currently taking. The responses from these participants (n = 17) were also not included in the study. Lastly, the data records were examined for response patterns that may indicate "no sincerity" (i.e., all 5s, 4s, 3s, 2s, or 1s), but none were found. In the end, of the 1,545 participants 140 were not included in this study.

Thus, responses from 1,405 participants were used in the current study stemming from 182 courses taught by 142 instructors at 34 institutions located throughout the WICHE states. The courses were from a variety of fields (see Table 4). The greatest number of participants (70%) came from the fields of humanities, social science, and

Table 4

Courses Providing Questionnaire Participants

Field	Subject Area
Business	Accounting, Management, Economics, Marketing
Science	Agriculture, Astronomy, Biology, Chemistry, Environmental Science, Fire Science, Geology, Engineering, Construction Management, Veterinary Technology
Mathematics	Algebra, Trigonometry, Calculus, Arithmetic, Statistics
Humanities	Anthropology, Art, Music, Family Environments, Geography, History, Political Science, Philosophy
Education	Child Development, Special and Vocational Education
Computers	Information Systems, Computer Office Technology, Computer Programming
Health	Dental Hygiene, Dietetics, Health Information Technology, Nursing
English	Composition, Reading, Writing, Journalism, Literature
Social Science	Sociology, Social Work, Psychology
Foreign Language	Japanese
Other	Library Science, Paralegal Studies, Parks and Recreation, Religion

English. The fields of foreign language, mathematics, and science were notably underrepresented (9%).

Student Comments to Open-ended Question

The reason for the open-ended question "Type any comments you might have!" was to find items that were not discovered in the pilot study (Stewart, 1999) or in the literature review. Many online students revealed that they are mothers with young children,

working adults with erratic schedules, or geographically handicapped. Most respondents were quite thankful for the opportunity to continue their education without leaving the home. However, numerous students stated that mandatory group work, "live" chats, or bulletin board discussions placed an extra burden on students' busy lives.

Several respondents also complained about endless bulletin board discussions that added nothing but busy work to the course. There were also a few student comments concerning lack of instructor feedback. It was thought that these concerns could be addressed by items "The instructional methods used in this course help me learn the subject matter" and "I can count on the instructor to clear up quickly any confusion that I may have with a topic."

There were also some complaints pertaining to a lack of procedures to follow when the network crashes while taking online quizzes and to unorganized and cluttered bulletin boards that don't allow students to quickly find important information (e.g., assignments, explanation from instructor). It was thought that items "I know exactly what actions to take in the event of technology-related problems" and "The messages from the instructor are clear to me" would address these concerns.

Phase III: Validation

The findings of factor analysis, item analysis, and reliability of the instrument scores are reported in this section.

Factor Analysis

Exploratory factor analyses were carried out to statistically substantiate the dimensions (factors) found in Phase I of this study. Two factor extraction methods, principal component analysis (PCA) and the maximum likelihood (ML) method, were explored. A varimax (orthogonal) and direct oblimin (oblique) rotation ($\delta = 0$) were

employed for each extraction method to judge the potential usefulness of each item for factor interpretation.

Since "Not Applicable" responses were used in 29 out of 60 items, both the pairwise and listwise missing data exclusion methods were examined. However, the listwise method indicated that only 199 cases (of 1,405 cases) were complete, which could produce inadequate factor analytic results (Comrey & Lee, 1992; Gable & Wolf, 1993).

Next, response frequency tables were calculated for each item to investigate the extent to which "Not Applicable" responses were used. Then, exploratory factor analyses using the listwise data exclusion method were considered for a questionnaire in which all the items that had more than 30% "Not Applicable" responses were eliminated (see Table 5). This resulted in 46 items with 645 complete cases. However, only four items each remained in the "Technical Issues" and "Quality of Communication" dimension. This again could produce inadequate factor analytic results (Comrey & Lee, 1992; Gable & Wolf, 1993).

In light of the problems encountered with the listwise data exclusion method, the pairwise method was used for a total of eight factor analyses including all 60 items. See Table 6 for the sample size used for each item.

Following are the results of the four analyses in which all factors with eigenvalue greater than 1.0 were extracted containing factor loadings of .30 and higher.

Maximum likelihood extraction with varimax rotation. During computation several communality estimates greater than 1.0 were encountered. This meant that the items accounted for more than 100% of the variances in the factors. Since this is not possible, the results of this analysis were not used.

Maximum likelihood extraction with direct oblimin rotation. Again, several communality estimates greater than 1.0 were encountered. Thus the results of this analysis were also not used.

Table 5

Items Containing Over 30% "Not Applicable" (NA) Responses

Item	Number of NA Responses	Percentage (N = 1,405)
16. The following online course media quickly loads to my home computer:		
a. Video Presentations	826	59%
b. Audio Presentations	833	59%
c. Pictures or Animations	464	33%
17. The technical quality of the following online course media is good:		
a. Video Presentations	877	62%
b. Audio Presentations	879	63%
c. Pictures or Animations	491	35%
d. Interactive Computer Video Conferencing	977	70%
20. The Web pages contain unnecessary hyperlinks.	814	58%
21. Overall, the following software is easy to use:		
a. Online Video or Audio Players	854	61%
b. Interactive Computer Video Conferencing	1004	71%
c. Applications Requiring User Input	610	43%
42. The dialogue in chat room discussions is difficult to follow.	544	39%
43. I have a hard time following the conversation during interactive computer video conferences.	1062	76%
50. The instructor's participation in mandatory discussions is poor.	432	31%

Table 6

Descriptive Statistics with Means in Descending Order

Item Number	Sample Size	Mean	Standard Deviation
1	1405	4.6107	.6039
47	1405	4.2157	.8597
9	1379	4.2132	.7924
39	1405	4.1246	.8775
48	1405	4.1203	.9423
28	1405	4.1181	.9437
8	1186	4.0877	.8138
38	1405	4.0875	.9207
15	1380	4.0862	.8578
7	1209	4.0496	.8462
51	1405	4.0192	.9572
18	1405	4.0014	.9622
4	1405	4.0014	.8042
5	1405	3.9836	.8966
32	1398	3.9828	.8848
26	1405	3.9751	1.0233
45	1405	3.9744	.9954
19	1405	3.9722	.9229
36	1405	3.9594	.8468
16d	1405	3.9423	.8869
14	1405	3.9409	.9900
17c	914	3.9223	.7856
29	1405	3.9210	1.1024
3	1405	3.9160	.7809
12	1344	3.9025	.8429
21d	1206	3.8905	.8755
30	1405	3.8754	.8702
11	1366	3.8653	.8801
50	973	3.8623	1.0847
10	1329	3.8600	1.0216
41	1405	3.8370	.9805
37	1405	3.8363	.9490
6	1405	3.7950	.9925
21c	795	3.7786	.8316
44	1355	3.7764	1.1712
35	1405	3.7594	.9647
40	1405	3.7473	1.0680
25	1220	3.7377	1.0135
34	1338	3.7287	.9916
49	1029	3.7240	1.0257
2	1405	3.7217	.9223

(table continues)

Table 6 (continued)

Item Number	Sample Size	Mean	Standard Deviation
31	1370	3.6650	1.1148
16c	941	3.6567	1.0274
21a	551	3.6316	.8720
23	1405	3.5957	1.1248
17b	526	3.5513	.9300
27	1405	3.5431	1.0960
13	1405	3.5395	.9671
17d	428	3.4533	.9284
17a	528	3.4508	.9864
21b	401	3.3840	.8787
42	861	3.3786	1.0743
33	1396	3.3388	1.1387
20	591	3.3384	1.0385
43	343	3.2945	.9133
16b	572	3.2850	1.1202
24	1405	3.2797	1.1282
16a	579	3.1744	1.1921
22	1405	3.1530	1.1510
46	1405	3.0875	1.1948

Principal component analysis with varimax rotation. Eleven factors were extracted. Only the items from the "Content Delivery" dimension established in Phase I loaded on one factor (i.e., seven of the eight items). Items from all other dimensions established in Phase I loaded on several different factors in groups of two, three, or four. This factor analysis made no conceptual sense in light of the literature review.

Principal component analysis with direct oblimin rotation. Again eleven factors were also extracted. The rotated pattern matrix was similar to the factor loading matrix that resulted from the varimax rotation. The only noteworthy difference between these two matrices was that Factor 4 was divided into two factors in the rotated pattern matrix. Again, this factor analysis made no conceptual sense in light of the literature review.

Next, the factor extraction and rotation procedures were repeated with the number of factors fixed to seven. Only factor loadings greater than .30 were examined.

Maximum likelihood extraction with varimax rotation. The varimax rotation resulted in a structure that made no conceptual sense in light of the literature review. Factors 1 and 2 contained items from four different dimensions established in Phase I and factor 3 contained items from six different dimensions. Only items from the "Technical Issues" dimension loaded on Factors 4, 5, and 6, and Factor 7 contained two items from the "Content Delivery" dimension. Items 1 and 18 did not load on any factor.

Maximum likelihood extraction with direct oblimin rotation. Items 1, 2, 18, 19, 22, 25 to 28, 33, and 51 did not load on any factor. Items from the "Technical Issues" dimension loaded on three different factors. Again, this factor analysis made no conceptual sense in light of the literature review.

Principal component analysis extraction method with varimax rotation. This factor analysis revealed a structure quite similar to the one that resulted in Phase I of this study. Four out of six items (38-41) from the "Quality of Communication" and all items (44-51) from the "Presence of Instructor and Peers" dimension loaded higher on Factor

1 than on any other factors. Item 37 from the "Content Delivery" dimension also loaded on this factor.

An inspection of Factor 2 revealed that item 5 and 6 from the "Appearance and Structure of Web Pages" and five out of seven items (9, 11, 13, 14 and 15) from the "Hyperlinks and Navigation" dimension loaded higher on this factor than on any other factors. In addition, this factor also contained items 18, 19, and 21d from the "Technical Issues" dimension.

Factor 3 contained eight out of fifteen items (16a-d and 17a-d) from the "Technical Issues" dimension that loaded higher than on any other factors. Item 21b from the "Technical Issues" dimension also loaded on this factor.

An examination of Factor 4 revealed that five out of eight items (2, 3, 4, 7 and 8) from the "Appearance and Structure of Web Pages" loaded higher on this factor than on any other factor. Additionally, item 24 from the "Class Procedures and Expectations" and items 10 and 12 from the "Hyperlinks and Navigation" dimension also clustered with these items.

Six out of eight items (30, 31, 32, 34, 35 and 36) from the "Content Delivery" dimension loaded on Factor 5 and seven out of eight items (22, 23 and 25-29) from the "Class Procedures and Expectations" dimension loaded on Factor 6. Item 33 from the "Content Delivery" dimension also loaded on Factor 6. All factor loadings for these items were higher in these factors than in any of the other factors.

Finally, an analysis of Factor 7 revealed that three items (20, 21a and 21c) from the "Technical Issues" dimension and two items (42 and 43) from the "Quality of Communication" dimension loaded higher on this factor than on any other factors. All the items pertained to online applications (audio and video players, chat rooms, interactive computer video conferencing, plug-ins, tutorials, and simulations).

The only item that did not load on any factor was item 1. An examination of the 11-factor structure revealed that item 1 loaded on Factor 8, which was not extracted in the second procedure.

Principal component analysis with direct oblimin rotation. This analysis revealed a factor structure that was the most similar to the one that resulted in Phase I of this study. Thus, results of the pattern, structure, and factor correlation matrix are provided below.

The factors derived from the pattern matrix with the direct oblimin rotation essentially contained the same items as have been found in the matrix resulting from the varimax rotation (see Table 7). This matrix had nine columns with the first column containing the items, one item to a row. The next column exhibited for each item the dimension it was placed into through content analysis. The remaining columns contained the seven derived factors. The column entries for the seven factors represent regression weights between each item and the factor, and we can attempt to name the factors by looking at items with the highest regression weights.

Only items 21b and 37 loaded on different factors in the direct oblimin and varimax rotations. That is, item 37 clustered with items from the "Content Delivery" dimension in accordance with Phase I of this study. In the varimax rotation, on the other hand, item 37 loaded highest on a factor containing mostly items from the "Quality of Communication" and "Presence of Instructor and Peers" dimension.

Item 21b loaded highest on a factor containing items pertaining to the ease of use of online applications. However, in the varimax rotation it loaded with items inquiring about download time and sound and motion quality. The investigation of ease of use of online applications, download time, and sound and motion quality were all grouped under a dimension entitled "Technical Issues" in Phase I of this study.

The structure matrix (see Table 8), which showed the correlations of the items with one or more factors, was used to demonstrate the usefulness of the item for factor

Table 7

Pattern Matrix Derived through PCA with Direct Oblimin Rotation

Item Number	Dimension Found Through Content Analysis [a]	Factor Loadings 1	2	3	4	5	6	7
48	7	.740						
38	6	.720						
47	7	.709						
45	7	.709						
46	7	.669						
44	7	.554						
39	6	.545						
41	7	.538						
40	6	.479						
49	7	.459						
51	7	.418						
50	7	.373					-.307	
16b	3		.870					
16a	3		.827					
16c	3		.805					
16d	3		.587					
17a	3		.581			-.348		
17d	3		.546			-.316		
17b	3		.537			-.445		
17c	3		.468					
4	1			.699				
3	1			.694				
7	1			.662				
8	1			.593				
12	2			.516				
10	2			.478				
2	1			.403				
24	4			.340				
14	2				-.702			
15	2				-.691			
11	2				-.680			
6	1				-.674			
5	1				-.634			
21d	3				-.600			
9	2				-.579			
13	2				-.577			

(table continues)

Table 7 (continued)

Item Number	Dimension Found Through Content Analysis [a]	Factor Loadings						
		1	2	3	4	5	6	7
19	3				-.400			
18	3				-.385			
1	1							
34	5					-.590		
35	5					-.560		
31	5					-.530		
36	5					-.500		
32	5					-.487		
30	5					-.467		
37	5	.360				-.446		
21a	3		.314				-.620	
43	6			.331			-.592	
20	3						-.556	
21c	3				-.393		-.481	
42	6						-.468	
21b	3		.409		-.373		-.447	
33	5							.645
23	4							.472
27	4							.458
28	4							.433
29	4							.392
22	4							.327
25	4							.326
26	4							.324

[a] 1 = Appearance and Structure of Web Pages, 2 = Hyperlinks and Navigation, 3 = Technical Issues, 4 = Class Procedures and Expectations, 5 = Content Delivery, 6 = Quality of Communication, 7 = Presence of Instructor and Peers

Table 8

Structure Matrix Derived through PCA with Direct Oblimin Rotation

Item Number	Dimension Found Through Content Analysis [a]	Factor Loadings 1	2	3	4	5	6	7
38	6	.792			-.407	-.386		
45	7	.782			-.382	-.340		.357
48	7	.763			-.375			
47	7	.756			-.345	-.347		
46	7	.718				-.389		
39	6	.700			-.481	-.407		.400
44	7	.617						.368
41	7	.613			-.440			
49	7	.510		.426			-.374	.395
40	6	.501						
51	7	.492				-.404		
50	7	.436		.355			-.379	
16b	3		.862					
16a	3		.851		-.314			
16c	3		.799		-.323			
17d	3		.720		-.578	-.500	-.347	
17a	3		.709		-.457	-.484	-.330	
17b	3		.672		-.423	-.536	-.361	
16d	3		.635		-.426			
21b	3		.631		-.577	-.334	-.583	
17c	3		.597		-.499	-.427		
7	1			.704				
4	1			.696				
3	1			.691				
8	1			.652	-.326			
12	2			.611	-.398			
10	2			.568	-.333		-.300	
2	1			.458	-.337	-.395		
24	4			.419				.338
14	2				-.750	-.300		.361
6	1	.323			-.745	-.345		.343
11	2			.318	-.695			
15	2				-.695			
5	1	.313			-.684	-.315		
21d	3		.355		-.673		-.375	
13	2				-.635			

(table continues)

Table 8 (continued)

Item Number	Dimension Found Through Content Analysis [a]	Factor Loadings 1	2	3	4	5	6	7
9	2				-.599			
19	3		.314		-.512			
18	3				-.457			
1	1			.342	-.364			
35	5	.548			-.346	-.698		
31	5	.552			-.400	-.689		
34	5	.398			-.316	-.674		
36	5	.394			-.434	-.629		
32	5	.454			-.377	-.621		
30	5	.352	.343		-.420	-.596		
37	5	.531			-.302	-.582		
21a	3		.524		-.429		-.711	
43	6	.321		.450			-.661	
20	3		.309	.352			-.638	
21c	3		.400		-.572	-.338	-.600	
42	6	.390		.384	-.305		-.551	
33	5							.661
23	4	.378			-.484			.596
27	4	.328		.383	-.398	-.332		.590
28	4	.365			-.443	-.325		.552
29	4	.451			-.422	-.405		.537
26	4	.417			-.421	-.385		.427
25	4	.379			-.370	-.390		.454
22	4				-.409		-.328	.421

[a] 1 = Appearance and Structure of Web Pages, 2 = Hyperlinks and Navigation, 3 = Technical Issues, 4 = Class Procedures and Expectations, 5 = Content Delivery, 6 = Quality of Communication, 7 = Presence of Instructor and Peers

interpretation (Comrey & Lee, 1992). Most of the usefulness ratings in the structure matrix were at least "fair", which is indicated by factor loadings of .45 or higher. Only items 22 and 24 had a usefulness rating of "poor", which is indicated by factor loadings of below .45. This matrix also had nine columns with the first column containing the items, one item to a row. The next column exhibited for each item the dimension it was placed into through content analysis. The remaining columns contained the seven derived factors.

Each item, except items 1 and 21b, loaded highest on the same factor in the structure and the pattern matrix. Item 1 did not load on any factor in the pattern matrix, but in the structure matrix it loaded on a factor containing mostly items pertaining to hyperlinks and navigation. Item 21b loaded on a factor containing items pertaining to the ease of use of online applications in the pattern matrix, but in the structure matrix it correlated highly with a factor containing items inquiring about download time and sound and motion quality.

The final matrix of interest was the one containing the correlations between the factors (see Table 9). Gable and Wolf (1993) suggested that correlation higher than .30 should be examined and collapsing of the factors considered. As can be seen in this matrix, the correlations of factor 4 with factor 1, 2, 3, and 5 and of factor 1 with factor 5 are slightly higher than .30. Upon examining the factors it was decided that collapsing would make no conceptual sense in light of the item content.

In summary, among the seven factors extracted, three essentially conformed to the hypothesized seven-dimension structure. The three factors contained items pertaining to technical issues, content delivery, and class procedures and expectations. The "Appearance and Structure of Web Page" and "Hyperlink and Navigation" dimensions discovered in Phase I were less well defined. The items from the "Quality of Communications" and "Presence of Instructor and Peers" dimension from Phase I

emerged in a single factor. Finally, there was also an indication that the evaluation of Web-based instruction should also include an investigation of a dimension containing statements pertaining to the ease of use of online applications.

Table 9

Factor Correlation Matrix

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
Factor 1	1.000	.140	.203	-.334	-.379	-.180	.292
Factor 2		1.000	.132	-.369	-.195	-.232	.140
Factor 3			1.000	-.311	-.126	-.231	.232
Factor 4				1.000	.365	.233	-.299
Factor 5					1.000	.128	-.178
Factor 6						1.000	-.159
Factor 7							1.000

Item Analysis

For the item analysis, item means and standard deviations and an item-total correlation coefficients for each item and its dimension score (item discrimination index) were also computed. For the item discrimination index the dimensions established in Phase I of this study were used. An item-total correlation coefficient was computed for each item and its dimension score. Most correlation coefficients were greater than .40 and less than or equal to .77. The items that showed correlation coefficients equal to or less than .40 were items 1 (.36), 10 (.38), 20 (.40), 24 (.28), 33 (.30), 43 (.36), and 50

(.38). No item correlated less than .20 with their respective dimension, in which case an item should be removed or rewritten (Gable & Wolf, 1993).

Items with relatively high or low means associated with low standard deviations were also sought for possible rewording or removal (Gable & Wolf, 1993). Item means ranged from 3.09 to 4.61. The largest interval was between the highest item mean (4.61) and the next lower one, which was 4.22.

Standard deviations ranged from .60 to 1.19. The largest interval was between the lowest standard deviation (.60) and the next higher one, which was .78. The lowest item mean (3.09) belonged to item 46, but it had the highest standard deviation, thus it was retained. The highest item mean (4.6) belonged to item 1, which also had the lowest standard deviation. Descriptive statistics are provided in Table 6.

Reliability

Cronbach's alpha (α) was calculated for each of the seven dimensions from Phase I to estimate test score reliability (see Table 10). All alpha scores were greater than .70, which is in the acceptable range according to Gable and Wolf (1993).

Alpha coefficients, calculated by eliminating, in turn, each item from its scale, were also examined. The results indicate that there would be an increase in the alpha coefficient if item 10 were removed from the "Hyperlinks and Navigation" dimension, items 18 and 20 from the "Technical Issues" dimension, item 24 from the "Class Procedure and Expectations" dimension, item 33 from the "Content Delivery" dimension, and item 50 from the "Presence of Instructor and Peers" dimension. However, none of the increases (between .0013 and .0209) in the alpha coefficient were significant enough to warrant removal of any one of these items.

Table 10

The Dimensions from Phase I and their Alpha Coefficients

Dimension	Number of Cases	Alpha Coefficient
Appearance and Structure of Web Pages	1119	.7732
Hyperlinks and Navigation	1290	.7857
Technical Issues	301	.9201
Class Procedures and Expectations	1220	.7852
Content Delivery	1304	.8427
Quality of Communication	330	.7538
Presence of Instructor and Peers	763	.8448

Phase IV: Development of Final Instrument

In this phase, the initial questionnaire was revised using feedback given in Phase I and II combined with the results of Phase III. The first task in this phase was to seek items with factor loadings on more than one factor. After a review of each factor's item content, it was determined that all items should be permanently placed with the factor exhibiting the highest loading for each item.

With regard to the seven dimensions established in Phase I of the study, four of them were retained in the final questionnaire. One new dimension was added to the questionnaire, two dimensions were combined and the combination was given a new name, and one dimension was renamed. The final questionnaire contained seven dimensions and 59 items.

Instructor and Peer Interaction

Only items from the initial "Quality of Communication" and "Presence of Instructor and Peer" dimensions created in Phase I loaded on this factor (38 -41, and 44 - 51). All items were retained and combined into one dimension entitled "Instructor and Peer Interaction" in the final version of the questionnaire.

The items that loaded high on this factor inquired about learner-instructor and learner-learner interaction. High ratings on this factor would indicate that instructors communicate in a clear, timely, and thoughtful manner and encourage interaction with self and others.

Technical Issues

Eight items (16a-d and 17a-d) that loaded high on this factor inquired about the length of download time and sound and motion quality and were from the "Technical Issues" dimension established in Phase I. Thus, the factor was also named "Technical Issues." These items were retained in the final version of the questionnaire. High ratings on this factor would indicate that online course media (i.e., video and audio presentations, pictures, animations, interactive computer video conferencing, and Web pages) quickly loads to students' computers and its technical quality is good.

Item 21b also loaded high on this factor. It was also from the "Technical Issues" dimension established in Phase I, however, it investigated the ease of use of interactive computer video conferencing software. Subsequently, item 21b was removed from this factor and placed under a new dimension entitled "Online Applications."

Appearance of Web Pages

Five out of eight items (2, 3, 4, 7, and 8) that loaded high on this factor inquired about the appearance of Web Pages and were from the "Appearance and Structure of Web Pages" dimension established in Phase I. These items were retained in the final version of the questionnaire.

Since this factor contained no items investigating the structure of Web pages, it was named "Appearance of Web Pages." High ratings on this factor would indicate that Web pages are aesthetically pleasing and entice the reader to conduct a more in-depth investigation of the content.

This factor also contained several items pertaining to hyperlinks (items 10 and 12) and class procedures (item 24) according to the pilot study (Stewart, 1999) and the literature. It was decided to remove item 10, "A considerable number of hyperlinks connect to nonexistent Web pages", from the questionnaire because it was similar to item 13, which was "It is easy to locate a particular Web page from any other Web page." On the other hand, item 12, "The Web pages contain unnecessary hyperlinks", was retained, but it was reworded to state "The Web pages are overcrowded with hyperlinks" in the hopes of making it more of an "appearance of Web pages" item.

Item 24, "Overall, the process used for submitting assigned tasks is cumbersome", was removed from the factor, rewritten to state "I am told exactly how to turn in each assignment", and placed under the dimension entitled "Class Procedures and Expectation." The decision for this was two-fold. First, item 24 correlated poorly with the factor (.419). Second, due to the make-up of Web-based courses, submitting assigned tasks depends on resources, such as U.S. Mail, fax machines, electronic mail and bulletin boards, which might by nature be more cumbersome to use than personal delivery.

Hyperlinks and Navigation

Five out of eleven items (9, 11, 13, 14, and 15) that loaded high on this factor were from the "Hyperlinks and Navigation" dimension established in Phase I. Thus, the factor was also named "Hyperlinks and Navigation." The five items were retained in the final version of the questionnaire. High ratings on this factor would indicate that hyperlinks are clearly identifiable and important information is easy to find in the Web site.

The factor also contained items which concerned the appearance of Web pages (items 1, 5, and 6) and technical issues (items 18, 19, and 21d) according to the pilot study (Stewart, 1999) and the literature. Subsequently, it was decided to only keep item 6 in the "Hyperlink and Navigation" dimension, a decision justifiable in light of the literature.

Item 1, "I can clearly read the text on the Web pages", was removed from this factor, rewritten as "The font (type face, size, and style) used on the Web pages detracts from the content", and placed in the "Appearance of Web Pages" dimension. This item had a high mean with low standard deviation, which means that the item did not discriminate well among respondents. In addition, item 1 correlated poorly with the factor (-.364).

It was also decided to remove item 5, "The Web pages are well organized", from this factor, rewrite it as "The layout of the Web pages is uncluttered", and also place it into the "Appearance of Web Pages" dimension. This was done because the original intent of item 5 was to check for cluttered Web pages.

On the other hand, items 18, 19, and 21d were entirely removed from the questionnaire. It was thought that item 18, "The school's computer system consistently allows me access to the course components", was too vague because access problems could occur both due to slow microprocessors as well as overloaded networks.

Item 19, "Information visible on the screen is clearly displayed on printed copies", was initially placed on the questionnaire to check for Web pages that extend beyond the right margins of the computer screen. However, it was ultimately decided that item 6, "Important information is easy to find on the Web pages", would also take care of this inquiry.

Finally, item 21d, which explored the ease of use of WebCT, was removed from the questionnaire because it was thought to be too broadly defined. For example, some students might find one or more WebCT features (e.g., chat rooms, bulletin board,

private e-mail, white board, and quiz tool) easy to use, but other features very difficult to figure out. However, specific questions regarding the ease of use of the chat room, bulletin board, private e-mail, white board, and online quizzes were added to a new dimension entitled "Online Applications" (see below).

Content Delivery

All items (30, 31, 32, 34, 35, 36, and 37) that loaded high on this factor inquired about the manner in which the course content was delivered and were from the "Content Delivery" dimension established in Phase I. Thus, the factor was named accordingly. All items were retained in the final version of the questionnaire. High ratings on this factor would indicate that the course is delivered using appropriate media and instructional methods.

Online Applications

Items 20, 21a, 21c, 42, and 43 inquiring about the ease of use of online applications loaded on this factor. Three of these items (20, 21a, and 21c) were from the "Technical Issues" dimension created in Phase I. The remaining two items (42 and 43) were from the "Quality of Communications" dimension created in Phase I. Except for item 43, "I have a hard time following the conversation during interactive computer video conferences (for example, CUseeME)", all other items were retained and combined into one dimension entitled "Online Applications" in the final version of the questionnaire. However, the items were rewritten to fit the question format assigned to this dimension. Since item 21b was moved to this factor (see above), item 43 was thought to be redundant. Below are the items and response choices for the "Online Applications" dimension:

The following ONLINE applications are easy to use:

a. Video Player SA A U D S D NA

b. Audio Player SA A U D S D NA

c. Chat Rooms SA A U D S D NA

d. Interactive Computer Video Conferencing System SA A U D S D NA

e. Bulletin Board SA A U D S D NA

f. Private E-Mail System SA A U D S D NA

g. White Board SA A U D S D NA

h. Tutorials SA A U D S D NA

i. Simulations SA A U D S D NA

j. Plug-ins (other than video or audio players) SA A U D S D NA

Class Procedures and Expectations

Seven of eight items (22, 23, 25, 26, 27, 28, 29) that loaded high on this factor were from the "Class Procedures and Expectations" dimension established in Phase I. Thus, the factor was also named "Class Procedures and Expectations." The seven items were retained in the final version of the questionnaire. High ratings on this factor would indicate that due dates, deadlines, grading, directions for completing assignments, instructions in case of technology problems, and expectations with respect to student preparedness (e.g., learning style, academic and technical requirements) were clearly stated by the instructor.

The factor also contained item 33 which pertained to content delivery according to the pilot study (Stewart, 1999) and literature. This item stated, "I am overwhelmed by the number of assigned tasks." It was subsequently decided to remove this item from the questionnaire since it did not fit conceptually with other items under this factor. Furthermore, this item might have been too generally worded since it might not necessarily be the number of assigned task that overwhelms the students, but rather their busy life style.

Lastly, design considerations pertaining to the look and feel of the questionnaire were made. For the most part, the participants gave no indication that the instrument was not user-friendly or aesthetically pleasing. Only one change was made to the student background section of the questionnaire. That is, the response field requiring the name of the course to be evaluated was placed at the beginning of the questionnaire ahead of the actual questionnaire items. This was done because several participants complained that they did not know until they had completed the questionnaire that they were to evaluate one Web-based course at a time. A final version of the questionnaire, entitled "Web-Based Course Evaluation" (see Appendix P), was placed on the Word Wide Web together with the code facilitating import into the WebCT Survey Module and guidelines for evaluating each item (see http://www.scsv.nevada.edu/~stewarti/mathweb/quest/intro.htm).

CHAPTER 5

DISCUSSION

This chapter is divided into six sections, beginning with a summary of the current study. Subsequent sections include a discussion of student responses to the open-ended question, response frequencies, limitations and delimitations of the study, implications of the study, and recommendations for further study.

Summary

The current study attempted to develop an instrument to be used by instructors to conduct a comprehensive evaluation of their Web-based courses. Items were created with the help of both a literature review and findings from a pilot study in which instructors and students enrolled in four Web-based mathematics courses were asked to list characteristics of Web-based instruction (Stewart, 1999). The meaning, relevance, and utility of the inferences made from the scores were also investigated through reliability and content and construct validation studies. Furthermore, an attempt was made to capture the opinions of students before course withdrawal became a serious consideration.

The 15 member states of the Western Interstate Commission for Higher Education (WICHE) were considered for the selection of participants. The WICHE member states are Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming. The researcher sent e-mail messages that introduced the current study to 506 online

instructors at 52 institutions three weeks into their respective spring 2001 semester. The instructors were also asked for help in distributing the questionnaire to their students, provided their course met certain criteria (i.e., semester-based courses primarily utilizing instructor-designed materials and WebCT, at most one face-to-face lecture or orientation meeting no counting face-to-face assessment).

Four phases of instrument development were implemented. Phase I involved the generation of questionnaire items and their underlying dimensions, as well as the selection of a response format. Screening of the items by the item review, content validation, and item tryout panels resulted in numerous changes to the items.

Only two items were added to the questionnaire that were not found in the literature or during the pilot study (Stewart, 1999). The two items added to the questionnaire by various panelists were: (1) The instructor confirms in a timely manner that assigned tasks have been received, and (2) The grading procedures are clearly stated. A member of the item tryout panel suggested the first item. The second item was recommended by a member of the content validation panel.

Three content validation panelists also indicated that the questionnaire lacked questions concerning group work and discussions. Although learner-learner interaction should be an integral part of Web-based instruction (Moore, 1989; Paloff & Pratt, 1999), it was not the intent of this questionnaire to isolate specific methods of teaching. Rather, students were asked about the helpfulness of instructional methods in learning the subject matter.

Phase II was concerned with data collection involving students taking Web-based courses. A total of 1,545 students responded to the questionnaire. But only the responses from 1,405 participants were used in the current study. They stemmed from students in 182 courses taught by 142 instructors at 34 institutions located throughout the WICHE states. The greatest number of participants (70%) came from the fields of

humanities, social science, and English. The fields of foreign language, mathematics, and science were notably underrepresented (9%). All 506 instructors were sent a pre-letter asking them to help in distributing the initial questionnaire to their students, a letter providing the Web address of the questionnaire, and a follow-up letter.

In Phase III, various validation studies were conducted. Item means and standard deviations and an item-total correlation coefficients for each item and its dimension score (item discrimination index) were computed. With regard to item means and standard deviations, except for item 1, all items demonstrated sufficient variation in the responses (Gable & Wolf, 1993). Item 1, "I can clearly read the text on the Web pages", had the highest mean associated with the lowest standard deviation. Based on this and factor analytic results, this item was ultimately changed to "The font (type, size, style) used on the Web pages detracts from the content."

For the item discrimination index the dimensions established in Phase I of this study were used. All coefficients were greater than .20. Thus, no items were removed due to a low item-total correlation coefficient alone (Gable & Wolf, 1993). Most correlation coefficients were greater than .40 and less than or equal to .77. There were seven items (1, 10, 20, 24, 33, 43, and 50) with correlation coefficients between .40 and .28. Ultimately, all but item 50 were removed or rewritten due to factor analytic results.

Cronbach's alpha (α) was calculated for each of the seven dimensions from Phase I to estimate test score reliability. All alpha scores were greater than .70, which is in the acceptable range according to Gable and Wolf (1993). Alpha coefficients, calculated by eliminating, in turn, each item from its scale, were also examined. However, none of the increases (between .0013 and .0209) in the alpha coefficient were significant.

The principal component analysis with direct oblimin rotation revealed a factor structure that was the most similar to the one that resulted in Phase I of this study. While the factors were not identical to the dimensions found through the literature review

and the pilot study (Stewart, 1999), the placements of items defining the factors could, however, be explained in light of the literature review.

During Phase IV the initial questionnaire was revised using feedback given in Phase I and II combined with the results of Phase III. Various adjustments to the items and dimensions in the initial questionnaire were made. These were based on the results of item analyses, reliability estimates and factor analyses, and on the conceptual understanding of the characteristics of Web-based instruction as presented in the literature. The initial dimension "Appearance and Structure of Web Pages" was modified to "Appearance of Web Pages." The "Quality of Communication" and "Presence of Instructor and Peers" dimensions were removed and a dimension entitled "Instructor and Peer Interaction" was created in their place. A new dimension entitled "Online Applications" emerged through factor analysis. Its creation was justifiable in light of the literature. It included items discussing the ease of use of online applications, such as chat rooms, bulletin boards, tutorials, etc.

The final questionnaire contained seven dimensions and 59 items. The "Appearance of Web Pages" dimension, the "Class Procedures and Expectation" dimension, and the "Technical Issues" dimension contained eight items, the "Hyperlinks and Navigation" dimension six items, the "Online Applications" dimension ten items, the "Content Delivery" dimension contained seven items, and the "Instructor and Peer Interaction" dimension twelve items. These dimensions closely matched those proposed by Driscoll (1998), Khan (1997), and Stewart (1999).

Design considerations pertaining to the look and feel of the questionnaire were also made. Only one change to the student background section of the questionnaire was deemed necessary. Specifically, the response field requiring the name of the course to be evaluated was placed at the beginning of the questionnaire ahead of the actual questionnaire items. This was done because several participants complained that they

did not know until the end of the questionnaire that they were to evaluate one Web-based course at a time. A final version of the questionnaire, entitled Web-Based Course Evaluation, was placed on the Internet to be used by interested educators (see Appendix 15). Additionally, the code facilitating import of the questionnaire into the WebCT Survey Module and guidelines for evaluation of each item were posted to the Word Wide Web (see http://www.scsv.nevada.edu/~stewarti/mathweb/quest/intro.htm).

Student Responses to Open-ended Question

When evaluating the open-ended question on the questionnaire, "Type any comments you might have!" no new items were found. A recurring theme was that mandatory group work, "live" chats, or bulletin board discussions can be an extra burden on students' busy lives. Many respondents also complained about "endless bulletin board discussions that add nothing but busywork to the course" and lack of instructor feedback. This may indeed point to a problem discussed by Kirby (1999) who advised that scheduling too many interaction activities may become overwhelming not only to students, but also for the instructor, which in turn may lead to delayed and limited instructor feedback. Thus, instructors who decide to use the final questionnaire should further investigate to see if the items "The instructional methods used in this course help me learn the subject matter" and "I can count on the instructor to clear up quickly any confusion that I may have with a topic" show an unusually large number of "Strongly Disagree" or "Disagree" responses.

Two other complaints that surfaced several times pertained to a lack of procedures to follow when the network crashes while taking online quizzes, as well as unorganized and cluttered bulletin boards that don't allow students to find important information (e.g., assignments, explanation from instructor) quickly. However, it was thought that the items "I know exactly what actions to take in the event of technology-related problems"

and "The messages from the instructor are clear to me" would take care of these concerns. Again, instructors using the final questionnaire developed in the current study should investigate if a high number of "Strongly Disagree" or "Disagree" responses for these items is due to the above complaints.

Response Frequencies

Upon examination of the response frequencies per item, it was found that the majority of the participants, in general, agreed or strongly agreed with positively stated items and disagreed or strongly disagreed with negatively worded items. While every item had some disagreeable responses, there were almost always at least two times as many agreeable responses. These response patterns may indicate that the participants perceived that their courses followed an instructional process described in the literature.

A relatively high number of "Not Applicable" responses resulted for items inquiring about online applications such as audio and video presentations including interactive computer video conferencing. This appears to be consistent with the concerns in the literature about the use of such applications given the inadequacy of home computers and modem lines with regard to motion and sound (Abrams & Haefner, 1998; Driscoll, 1998).

Item 22, "I know exactly what actions to take in the event of technology-related problems", and item 46, "The instructor makes an effort to ask me how I am doing", exhibited a high number of dissatisfied responses. This may indicate that many courses surveyed in this study lacked the continuous interaction between the learner and the instructor (Holmberg, 1995).

Delimitations and Limitations of the Study

Only two- and four-year public institutions in the 15 member states of the Western Interstate Commission for Higher Education (WICHE) were considered for the current study. Since the pilot study (Stewart, 1999) involved students and instructors from Web-based undergraduate mathematics courses primarily utilizing instructor-designed materials and WebCT, and since the pilot study played an important role in the current study, only Web-based courses fitting this same description were used. Additionally, only those courses were selected that were semester-based and required at most one face-to-face lecture or orientation meeting not counting face-to-face assessment. Web-based courses that did not meet all of the above mentioned criteria were excluded from the current study.

Several potential limitations were noted in the current study. Although students were assured that the questionnaire results are confidential, some students still may only have made positive comments or may have decided not to complete the questionnaire at all because they were worried about potential retributions. Also, the researcher communicated with the students through their instructors, who, in turn, were contacted via their school's Web site. It is likely that the instructors who agreed to allow their students to participate in the survey may have been more confident about their teaching ability and more secure in their knowledge that they are teaching an effective Web-based course. This may have resulted in responses of generally satisfied students.

Also, there was no mechanism that prevented students from completing the questionnaire more than once. However, in an effort to deter respondents from submitting more than one completed questionnaire, the JavaScript code on each page cleared the responses immediately after they were submitted to the researcher. It was hoped that the thought of having to start over would stop individuals from filling out the questionnaire more than once.

There was also no way to prevent instructors from completing the questionnaire, although, they were asked not to. Additionally, family and friends of instructors and students in courses not surveyed could have accessed and completed the questionnaire without any problems, as well as anyone else in the world who stumbled upon the questionnaire using an Internet search engine. To minimize this problem, the responses to "Exact name of course" and "Exact name of institution" were verified to ensure that no data were included in the study stemming from individuals outside of the designated study population in the hopes of preventing a tainted sample.

Although the instructors were informed of the criteria necessary for participation (i.e., semester-based courses primarily utilizing instructor-designed materials and WebCT, at most one face-to-face lecture or orientation meeting not counting face-to-face assessment), some instructors seemed to have ignored them. Several participants were found who attended courses that required more than one face-to-face meeting or that did not utilize WebCT. This was accomplished through student comments and two strategically placed "Not Applicable" responses for the items "The buttons in the WebCT course management system clearly tell me what function they perform" and "Overall, the WebCT Course Management System is easy to use." It was hypothesized that if students answer "Not Applicable" to these items, the course must not have been using WebCT. The responses of these participants were not included in the study. However, it is likely that data may have been included from courses that did not meet the criteria because the respondents did not indicate otherwise.

Unfortunately, it was noted that the strategically placed "Not Applicable" responses for the two questions pertaining to WebCT also led to inconsistencies. For example, it was noted that many participants used the "NA" responses, even though most of their classmates did not. In such cases, the students' responses were not eliminated

because their "NA" responses were attributed to boredom due to the length of the questionnaire.

Lastly, despite the fact that it was indicated in the introduction to the questionnaire that respondents must complete a separate questionnaire for each online course that they are presently taking, several participants indicated that their evaluation is a combination of experiences from several online courses. The responses for these participants were also not included in the study. However, the data still might include evaluations from students combining several courses, who did not admit to having done this.

Implications of the Study

The seven dimensions extracted from the empirical data and the in-depth literature review are the most important contributions to this study. Although the seven dimensions may not constitute all aspects of Web-based course design and implementation, it appears that students and literature identify those dimensions to be the most prominent features of a Web-based course requiring evaluation. However, it is expected that with the continuous development of hardware and software useful in distance education, there would be modifications in the items and their underlying dimensions. Further research is warranted for this endeavor.

At the present time, the identified dimensions have a few practical implications. First, administrators and Web-based course developers can expeditiously measure Web-based course effectiveness by asking only seven questions that represent the seven dimensions. The Web-Based Course Evaluation (WBCE) questionnaire consists of 59 items and the length can be a burden for a quick evaluation of the Web-based course. However, if a course evaluation with the seven questions does not meet the expectation

of an effective course, a more in-depth survey can be conducted using the individual items in each dimension to investigate the source of ineffectiveness.

Second, the items of a specific dimension can be used by researchers or course designers who are interested in working on a particular dimension in greater depth. With more research on each dimension by the current and other researchers, it is hoped that each dimension of the instrument and thus, the entire instrument can be enhanced further.

Third, using only seven questions to represent the dimensions, researchers would be able to determine dimensions that significantly influence course grade or dropout. With the results of these future studies, further recommendations can be made for improving Web course design and development.

Furthermore, information received through the use of the final instrument designed in the current study can be utilized by instructors in Web-based courses to help improve learning and instruction. In turn, implementation of course revisions based on questionnaire results might foster higher levels of satisfaction among learners, and, thus, possibly prevent early withdrawal from class due to ineffective Web-based instruction.

Lastly, the final instrument might provide educational institutions with an evaluation instrument to justify the existence of Web-based instruction to legislative bodies, funding agencies, and administrators, as well as to obtain extra resources. The collected information, if favorable, could also be used as a marketing tool to attract students into Web-based courses from both within the institution and outside.

Recommendations for Further Study

This study provided the initial steps necessary in the development and validation of an instrument for student evaluation of Web-based instruction. It is important to point out that it was not the instrument that was validated, but the inferences derived from the

scores (Cronbach, 1971). Thus, in essence, instrument validation in this study was an investigation of the meaning, relevance, and utility of the inferences made from the scores.

An instrument is not certified as "valid" once and for all, rather validity is continuously evolving as new findings are brought to light (Gable & Wolf, 1993; Messick, 1990). With respect to the final instrument developed in this study, more factor analytic studies should be conducted due to the changes brought about by the current validation process. Cronbach's alpha should be calculated again to ensure satisfactory internal reliability. Further refinement of the present questionnaire should also be carried out as new findings pertaining to Web-based instruction are discovered and technological advances enhancing the delivery of information over the Internet take place (e.g., video and audio presentations).

A Multitrait-Multimethod Matrix as described by Campbell and Fiske (cited in Crocker & Algina, 1986) should also be constructed to examine the adequacy of the instrument as a measure of a construct (dimension). In order to calculate the correlation coefficients necessary for this matrix, however, other instruments would have to be used or developed measuring the same dimensions but using different measurement methods (e.g., true-false or incomplete-sentences). Thereafter, the discriminant and convergent validity coefficients should be calculated.

Criterion-related validation studies should also be performed in the final instrument developed in the current study. Specifically, studies should be conducted to draw inferences from scale scores to examine course grade and dropout.

Lastly, seven questions to represent the seven dimensions should be designed and tested to ensure that the scores derived from them are comparable to the scores for the dimension that the question represents. In other words, one would want to ensure that a question representing, for example, the "Appearance of Web Pages" dimension has the

same score consistently over several trials as the average score derived from all the items in the "Appearance of Web Pages" dimension.

APPENDIX A

DESIGNING USABLE WEB PAGES: GUIDELINES FOR WEB PAGES

Designing Usable Web Pages: Guidelines for Web Pages

1. A title should appear on all Web pages in the heading and within the "title" HTML tag (Grose et al., 1998; Kanerva et al., 1998; Nielsen, 2000).
2. All Web pages should at least provide the name, E-mail address, and phone number of a contact person (Borges et. al, 1998; Grose et al., 1998; Vora, 1998).
3. All Web pages should state the date on which they were last updated (Grose et al., 1998).
4. Web pages should look the same on any computer (e.g., fonts, colors, page layout) (Grose et al., 1998; Nielsen, 2000; van Rennes & Collis, 1998).
5. Keep in mind that Web pages look different on various monitors depending on their size and picture resolution (e.g., layouts may look cramped, users may have to use horizontal scrollbars to see all parts of the page). Web page width should be designed to adjust to various screen resolutions or monitor sizes (Nielsen, 2000; van Rennes & Collis, 1998).
6. The layout of Web pages should be balanced and uncluttered. Paragraph breaks, headings, blank lines, horizontal bars, bulleted lists, color, highlighting, bold print, images, relegating information to other pages, etc. should be used to minimize clutter or break up high text density. Although such features should not be used to the extent to where they contribute to clutter. (Borges et. al, 1998; Grose et al., 1998; Nielsen, 2000; Vora, 1998).
7. An effort should be made to allow viewing of an entire Web page in at most three consecutive screens (14-inch monitor) with browser in default setting (Grose et al., 1998; Nielsen, 2000; van Rennes & Collis, 1998). If necessary, link to other Web pages for further discussion.
8. The use of background patterns or colors that interfere with the readability of the text should be avoided (Grose et al., 1998; Nielsen, 2000; van Rennes & Collis, 1998).

9. If feasible, information should be presented in order of importance (Grose et al., 1998).
10. Let the user know what is new on the Web site (Vora, 1998).
11. All pages belonging to a Web site should have common headers, footers, and navigational controls (Nielsen, 2000; Kanerva et al., 1998; Vora, 1998).
12. All pages belonging to a Web site should have a common look and feel (Nielsen, 2000; Kanerva et al., 1998; van Rennes & Collis, 1998; Vora, 1998).
13. Specify tables as percentage of available space because fixed width tables may cause info to be chopped off when printed (Nielsen, 2000).
14. Intrapage links should be avoided (Kanerva et al., 1998).
15. If possible, avoid frame pages that might cause printing or search problems. If frames are used, provide a "no frames" option for users employing screen readers (Nielsen, 2000).
16. Allow ample "white space" to avoid overloading the user with too much information at one time (Nielsen, 2000).
17. Text colors should be selected so that pages are readable when copied to black and white displays (e.g., default in Microsoft Word) or black and white printers) (Borges et. al, 1998).
18. Pages should download in ten seconds or less since most users cannot keep their attention focused longer (Nielsen, 2000).
19. Word processor fonts smaller than 12 points or HTML fonts smaller than H5 should be avoided. A smaller font size would be illegible on high-resolution screens (Grose et al., 1998; Nielsen, 2000; Pacheco et al., 1999).
20. Do not use more than two fonts in a Web page (Nielsen, 2000).
21. Avoid all capital letters (Nielsen, 2000).

22. Use the default font if at all possible because a different font specified in the Web page may not be available on visitors' computers, thus rendering information illegible (Nielsen, 2000).
23. Use only serif or sans serif typeface for text. Most people prefer reading serif typeface, but on a computer screen it is extremely difficult to read when small. Therefore, use serif typeface for big text, but sans-serif typeface for small text. Avoid script or other decorative typeface because they are difficult to read unless extremely large (Nielsen, 2000).
24. Text should be left justified for easier scanning (Nielsen, 2000).
25. Text colors must contrast sharply with the background (Nielsen, 2000).
26. All links, whether text, buttons, or images, should be readily apparent to visitors (Grose et al., 1998; Kanerva et al., 1998).
27. All hyperlinks should connect to existing Web pages (Borges et. al, 1998; Grose et al., 1998; Kanerva et al., 1998).
28. File size should be offered if an audio, video, or image file to be downloaded is larger than 65 KB to warn of a possibly lengthy system response time (Grose et al., 1998; Johnson & Kavanagh, 1996; Nielsen, 2000; Ratner, 1998).
29. Users should be warned of links that launch applications (e.g., video, audio, etc.) or open a new browser window (Grose et al., 1998).
30. Hyperlinks, whether text, buttons, or images, should provide a hint of the content of the page they connect to. Textual descriptions should be clear and concise (Borges et. al, 1998; Grose et al., 1998; Kanerva, et al., 1998; Nielsen, 1998; Vora, 1998).
31. Avoid making a link every time another Web page is mentioned in the text (Borges et. al, 1998).
32. Linking images or icons should display a distinctive feature of the page they link to (Borges et. al, 1998; van Rennes & Collis, 1998).

33. All pages belonging to a Web site should contain a link to the home page on top and bottom on the right side (Borges et. al, 1998; Nielsen, 2000).
34. Linking images and labels should be consistent. The same image or label should always connect to the same Web page (Borges et. al, 1998; Kanerva et al., 1998; Vora, 1998).
35. Web pages should not be overcrowded with links (Borges et. al, 1998; Kanerva, et al., 1998; Nielsen, 2000).
36. The home page should primarily contain links to other areas of the Web site. Explanatory comments should be kept to a minimum (Borges et. al, 1998; Nielsen, 1998).

APPENDIX B

QUESTIONNAIRE DEVELOPED IN PILOT STUDY

Questionnaire Developed in Pilot Study

The following questions pertain to the appearance and structure of Web pages. A Web page is any information with its own Web address that appears on your computer screen. *Please circle the response that best describes how you feel about each statement.*

1. Text on course Web pages is clearly readable.

1	2	3	4	5	9
strongly disagree				**strongly agree**	**not applicable**

2. Course Web pages are uninspiring.

1	2	3	4	5	9
strongly disagree				**strongly agree**	**not applicable**

3. The color scheme of course Web pages interferes with the readability of the text.

1	2	3	4	5	9
strongly disagree				**strongly agree**	**not applicable**

4. Course Web pages are cluttered.

1	2	3	4	5	9
strongly disagree				**strongly agree**	**not applicable**

5. The course Web pages contain unnecessary animated or blinking graphics.

1	2	3	4	5	9
strongly disagree				**strongly agree**	**not applicable**

6. Pictures or animations that were supposed to be on the Web pages are missing.

1	2	3	4	5	9
strongly disagree				**strongly agree**	**not applicable**

The following questions pertain to hyperlinks and navigation. Hyperlinks are the buttons, graphs, or phrases that connect one course Web page with another. Navigation is defined as the movement between course Web pages. *Please circle the response that best describes how you feel about each statement.*

7. The hyperlinks are clearly identifiable on the course Web pages.

1	2	3	4	5	9
strongly disagree				**strongly agree**	**not applicable**

8. The hyperlinks connect to nonexistent Web pages.

1	2	3	4	5	9
strongly disagree				**strongly agree**	**not applicable**

9. The hyperlinks provide a clear hint of the content they connect to.

1	2	3	4	5	9
strongly disagree				**strongly agree**	**not applicable**

10. The course Web pages contain unnecessary hyperlinks.

1	2	3	4	5	9
strongly disagree				**strongly agree**	**not applicable**

The following questions pertain to technical issues. Specifically, they try to detect any problems you might have with the access and viewing of course content. *Please circle the response that best describes how you feel about each statement.*

11. The following online course media requires an unreasonably long time to load to my home computer: (Use a scale of **1 = strongly disagree to 5 = strongly agree, 9 = not applicable**)

a. Video Presentations	1	2	3	4	5	9
b. Audio Presentations	1	2	3	4	5	9
c. Pictures or Animations	1	2	3	4	5	9
d. Web Pages	1	2	3	4	5	9

12. The technical quality of the following online course media is good: (Use a scale of **1 = strongly disagree** to **5 = strongly agree**, **9 = not applicable**)

a. Video Presentations	1	2	3	4	5	9
b. Audio Presentations	1	2	3	4	5	9
c. Pictures or Animations	1	2	3	4	5	9
d. Interactive Computer Video Conferencing	1	2	3	4	5	9

13. The following software is easy to use: (Use a scale of **1 = strongly disagree to 5 = strongly agree**, **9 = not applicable**)

a. Online Video or Audio Players	1	2	3	4	5	9
b. Interactive Computer Video Conferencing	1	2	3	4	5	9
c. Applications Requiring User Input (tutorials, simulations, etc.)	1	2	3	4	5	9
d. WebCT Course Management System	1	2	3	4	5	9

The following questions pertain to class procedures and expectations. Specifically, the procedures in place that govern the course, as well as the instructor's expectations of you will be investigated. *Please circle the response that best describes how you feel about each statement.*

14. I know whom to turn to in case of technology-related problems.

1	2	3	4	5	9
strongly disagree				strongly agree	not applicable

15. We were given an insufficient amount of time to become familiar with the technology.

1	2	3	4	5	9
strongly disagree				strongly agree	not applicable

16. The process in place for submitting assignments is unacceptable to me.

1	2	3	4	5	9
strongly disagree				strongly agree	not applicable

17. Our instructor makes every effort to provide alternatives to scheduled "fixed time" activities (chats, tests, field trips, etc.).

1	2	3	4	5	9
strongly disagree				strongly agree	not applicable

18. I have a clear understanding of how to use the course components to learn effectively.

1	2	3	4	5	9
strongly disagree				strongly agree	not applicable

19. The instructions for completing assigned tasks are confusing.

1	2	3	4	5	9
strongly disagree				strongly agree	not applicable

20. The testing arrangements fit my busy schedule (time, place, etc.).

1	2	3	4	5	9
strongly disagree				strongly agree	not applicable

The following questions pertain to interaction. Specifically, the manner in which you and your instructor and peers communicate with each other will be investigated. *Please circle the response that best describes how you feel about each statement.*

28. Interaction with our instructor reflects kindness and consideration.

1	2	3	4	5	9
strongly disagree				strongly agree	not applicable

29. I can count on my instructor to quickly clear up confusion with new topics.

1	2	3	4	5	9
strongly disagree				strongly agree	not applicable

30. I get useful feedback from the instructor on my performance.

1	2	3	4	5	9
strongly disagree				strongly agree	not applicable

31. We are strongly urged to get in touch with our instructor in case of questions or concerns.

1	2	3	4	5	9
strongly disagree				strongly agree	not applicable

32. We are encouraged to communicate with our peers.

1	2	3	4	5	9
strongly disagree				strongly agree	not applicable

33. We receive timely instructor feedback with respect to our concerns and questions.

1	2	3	4	5	9
strongly disagree				strongly agree	not applicable

34. Our instructor is difficult to reach outside of the WebCT course management system.

1	2	3	4	5	9
strongly disagree				strongly agree	not applicable

35. The instructor's participation in mandatory communication activities is very poor.

1	2	3	4	5	9
strongly disagree				**strongly agree**	**not applicable**

STUDENT BACKGROUND

Gender (Male/Female) _____ Age _____

Please insert the exact title of your course:

_____

Please insert the exact name of your institution:

_____

For the next three questions, please make a check mark (✓) to the left of the response that best describes you.

Have you taken the prerequisite course?

_____ Yes _____ No _____ No required prerequisite _____ I don't know

How many Internet courses utilizing WebCT have you taken prior to this course?

_____ 0 _____ 1 _____ 2 or more

Are you predominantly using a home computer for this course?

_____ Yes _____ No

Please make any comments you might have! (optional)

_____

_____

APPENDIX C

LETTER TO ITEM REVIEW PANEL MEMBERS AND ITEM REVIEW WORKSHEET

Dear [Professor/Student]:

You graciously agreed to help me with the development of an instrument designed for student evaluation of Web-based instruction.

Unfortunately, I have to set a due date for your responses otherwise I will not be able to adhere to my questionnaire mailing schedule. THE DUE DATE IS JANUARY 23, 2001.

Below please find a worksheet and the Web site address for the questionnaire items. PLEASE PRINT THE WORKSHEET AND SAVE THE CURRENT E-MAIL MESSAGE!!!

(1) On the printed copy RESPOND TO ALL THE QUESTIONS AND TASKS STATED ON THE WORKSHEET (nice backup in case of later transmission problems).

(2) After you have responded to all tasks and questions, retrieve the current message, click on "Reply", and then insert your answers directly into the worksheet below. Be sure to click on "Send" when you are done.

As a token of my appreciation, I will give you either a Blockbuster or Starbucks gift certificate. At the time you submit your responses, please let me know which gift certificate you want -- Blockbuster's or Starbucks'? Also, let me know how I can get the gift certificate to you.

Thanks again for helping me out,
Ingrid Stewart

****

ITEM REVIEW WORKSHEET

Please go to http://www.scsv.nevada.edu/~stewarti/item.html which is the Web address of the questionnaire questions. As you read each questionnaire item, please answer the following questions:

(1) Are there any statements that are not clear? If yes, I would appreciate your recommendations below:

(2) Are there any statements that contain spelling or grammatical errors? If yes, I would appreciate your corrections below:

(3) Are there any statements that use words that might not be familiar to others? If yes, I would appreciate your recommendations below:

(4) Based on you knowledge of Web-based courses, list any additional statements that should be included in the questionnaire. For example, is this questionnaire adequate for various subject areas (e.g., science and mathematics, humanities, social sciences, etc.)? Please categorize your statements into one of the following areas:

Appearance and Structure of the Course Web Pages:

Hyperlinks and Navigation:

Technical Issues:

Class Procedures and Expectations:

Delivery of Instruction:

Quality of Interaction:

Presence of Instructor and Peers:

Other (specify): _____

(5) Do you have any other comments (optional)?

APPENDIX D

LETTER TO CONTENT VALIDATION PANEL MEMBERS AND CONTENT VALIDATION WORKSHEET

Dear [Professor]:

You graciously agreed to help me with the development of an instrument for student evaluation of Web-based instruction.

Unfortunately, I have to set a due date for your responses otherwise I will not be able to adhere to my questionnaire mailing schedule. THE DUE DATE IS JANUARY 30, 2001.

Below please find a worksheet and the Web site address for the questionnaire items. PLEASE PRINT THE WORKSHEET AND SAVE THE CURRENT E-MAIL MESSAGE!!!

On the printed copy RESPOND TO ALL THE QUESTIONS AND TASKS STATED ON THE WORKSHEET (nice backup in case of later transmission problems).

After you have responded to all tasks and questions, retrieve the current message, click on "Reply", and then insert your answers directly into the worksheet below. Be sure to click on "Send" when you are done :-)

Thanks again for helping me out,
Ingrid Stewart

****

CONTENT VALIDATION WORKSHEET

Please go to http://www.scsv.nevada.edu/~stewarti/content.html which is the Web address of the questionnaire blueprint. As you read each questionnaire item, please do the following:

(1) Categorize each statement into one of the seven areas listed below. Place the number of the statement below the appropriate category.

Presence of Instructor and Peers:

#

Technical Issues:

#

Appearance and Structure of the Course Web Pages:

#

Class Procedures and Expectations:

#

Hyperlinks and Navigation:

#

Delivery of Instruction:

#

Quality of Interaction:

#

Other (specify): _____

#

(2) Please identify any statements that you feel are not relevant to the study of Web-based instruction. Please explain below.

#

Explanations:

(3) Please identify any statements that you feel do not apply to all subject areas. Please explain below.

#

Explanations:

(4) Please list any additional statements that you feel should be included in the questionnaire. You might want to consider various subject areas (e.g., the sciences, mathematics, English, the humanities, the social sciences, foreign language, health, etc.)? Please categorize your statements into one of the following areas:

Appearance and Structure of the Course Web Pages:

Hyperlinks and Navigation:

Technical Issues:

Class Procedures and Expectations:

Delivery of Instruction:

Quality of Interaction:

Presence of Instructor and Peers:

Other (specify): _____

(5) Do you have any other comments (optional)?

APPENDIX E

LETTER TO ITEM TRYOUT PANEL MEMBERS AND ITEM TRYOUT WORKSHEET

Dear [Student]:

You graciously agreed to help me with the development of an instrument for student evaluation of Web-based instruction.

Unfortunately, I have to set a due date for your responses otherwise I will not be able to adhere to my questionnaire mailing schedule. THE DUE DATE IS FEBRUARY 8, 2001.

Below please find a worksheet and the Web site address for the questionnaire. PLEASE PRINT THE WORKSHEET AND SAVE THE CURRENT E-MAIL MESSAGE!!!

On the printed copy RESPOND TO ALL THE QUESTIONS AND TASKS STATED ON THE WORKSHEET (nice backup in case of later transmission problems).

After you have responded to all tasks and questions, retrieve the current message, click on "Reply", and then insert your answers directly into the worksheet below. Be sure to click on "Send" when you are done.

At the time you submit your responses, please let me know whether you want a Blockbuster or Star Bucks gift certificate (unless you already told me). Also, let me know how I can get the gift certificate to you.

Thanks again for helping me out,
Ingrid Stewart

****

ITEM TRYOUT WORKSHEET

Please go to http://www.scsv.nevada.edu/~stewarti/survey/ which is the Web address of the questionnaire.

Please consider the questions below. If you do not find any problems, just say so below each question (e.g., very clear or everything is fine, etc.). However, if you find a problem area, please be sure to tell me what it is and how you would correct it.

Also, you must respond to the questionnaire items because the program won't let you go on otherwise. Any response! It does not matter right now!

1) Please read the first page, that is, the letter to the students. Is this letter enticing enough for someone to want to complete the questionnaire? Remember that the participants won't get paid for their efforts (I don't have any money!). If not, what should I do differently?

2) Are the directions clear for completing the questionnaire? If not, I would appreciate your recommendations below.

3) As you read each statement, do you know exactly what the statement wants to find out? If not, I would appreciate your recommendations below.

4) Are there any statements that use words that might not be familiar to some people? If yes, I would appreciate your recommendations below.

5) Based on your experience with Web-based instruction, are there any statements that you feel should be added to the questionnaire? If yes, I would appreciate your recommendations below. For example, is this questionnaire adequate for various subject areas (e.g., science and mathematics, humanities, social sciences, etc.)?

6) Is there anything that bothers you with the Internet design of the questionnaire? If yes, I would appreciate your recommendations below.

7) Are there any spelling mistakes?

8) Do you have any other comments (optional)?

APPENDIX F

STUDENT INFORMED CONSENT FORM

Dear Research Participant

★★ I am offering YOU the unique opportunity to voice your opinion concerning Internet courses. Your input will actually be used in the development of guidelines for the purpose of maintaining and improving the quality of Internet courses.

Click Here to Give Your Opinion

I'd really appreciate it if you would give me your opinion as soon as possible. It'll only take 10 minutes of your time and you don't even have to tell me your name!

Ingrid Stewart
Doctoral Candidate
University of Nevada
Las Vegas
Department of Curriculum and Instruction

Better yet, why don't you just do it RIGHT NOW? Just click on the button!

Click Here to Give Your Opinion

Contact me at:
stewarti@nevada.edu

Your participation includes responding to questions about the Internet course that you are presently taking. If you received information about my study in more than one of your courses, please feel free to complete a separate opinion form in each course!

Remember . . . this is for an extremely worthy cause!!! Should these guidelines become a yardstick on which to measure the quality of Internet courses you would have the comfort of knowing that you helped shape the future of Internet instruction.

All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link you to this study. So please be as honest as possible!!! Your responses will be stored for three years in a locked file

cabinet in the office of one of my faculty advisors located at the University of Nevada, Las Vegas.

Your input is completely voluntary and you may withdraw from participation at any time. But as soon as you submit your opinion to me it will be considered as permission to use your responses in the development and validation of guidelines for Internet courses. There are no risks associated with this research other than maybe boredom while answering the survey questions.

If you have any questions about this research please contact me. You may also contact my advisors Dr. Eunsook Hong at **ehong@nevada.edu** or Dr. Neal Strudler at **strudler@nevada.edu**. If you have any questions about the rights of research subjects please contact the University of Nevada, Las Vegas, Office of Sponsored Programs at (702) 895-1357.

I really appreciate your willingness to help. Thank you so very much!

Ingrid Stewart

Click Here to Give Your Opinion

APPENDIX G

LETTER INTRODUCING THE INSTRUCTORS TO THE QUESTIONNAIRE

Dear Dr. [Name]:

In two weeks, would you please consider helping me with my dissertation research project?

My name is Ingrid Stewart. I am a mathematics instructor at the Community College of Southern Nevada in Las Vegas where I teach several Web-based courses. However, I am also a doctoral student at the University of Nevada, Las Vegas.

Please be assured that helping me will take just a few minutes of your time. I simply need for you to distribute the Web address of my questionnaire to your online students.

If I may be so bold, in two weeks I will go ahead and send you the information to give to your students unless you tell me otherwise. However, I would really, really be grateful for your assistance, specifically if you:

1) teach undergraduate semester-based online courses;
2) primarily use instructor-designed materials and WebCT; and
3) require ONE or NO face-to-face lecture or orientation meeting. Course assessment activities may be coordinated online or face-to-face.

****

The purpose of my study is to DESIGN AN INSTRUMENT that can be used by Web-based instructors to gauge the effectiveness of their online instruction. The instrument is not intended for administrative purposes!!!

I saw the need for such an instrument when I began to teach online mathematics courses, and there were no guidelines available to help me develop and effectively teach such courses. I felt like a newborn baby! That's when I decided that most instructors new to the online environment probably would appreciate a little help in getting started. I sure would have liked that!

Let me assure you that I only want to question your students to develop relevant guidelines and not because I want to analyze their reactions to your course!

All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link you to this study. The questionnaire responses will only be seen by my dissertation co-chairs and me. If you want the responses from your class, let me know and I will send them to you. I do not ask the students for their names.

After completion of my project, I will make the final questionnaire available on my Web site so that interested instructors can copy it and use it in their Web-based courses.

If you are interested in finding out more about my research and me, please visit my Web site at http://www.scsv.nevada.edu/~stewarti/mathweb/quest/intro.htm. NOTE: This is NOT the site containing the questionnaire for your students to take!

The Institutional Review Board of the University of Nevada, Las Vegas approved my study. If you have any questions about the rights of research subjects please contact

the board at (702) 895-1357. If you have any other questions you may also contact me or my dissertation co-chairs Dr. Eunsook Hong at ehong@nevada.edu or Dr. Neal Strudler at strudler@nevada.edu.

I thank you so much in advance for your willingness to help me with my research.

Ingrid Stewart

APPENDIX H

WEB PAGES INTRODUCING THE STUDY

The title of the research study is "Development and Validation of an Instrument for Student Evaluation of Web-based Instruction."

The purpose of the study is to design an instrument for student evaluation of Web-based courses by adhering to psychometric principles of test construction. Specifically, items will be developed through a literature review and by questioning Web-based students and instructors (pilot study). Evidence of validity and reliability will also be provided.

THE FINAL QUESTIONNAIRE IS NOT INTENDED FOR ADMINISTRATIVE PURPOSES but as an aid to instructors teaching courses in the Web environment to maintain and improve the quality of instruction. After completion of my dissertation, I will make the final survey available on my Web site at http://www.scsv.nevada.edu/~stewartl/mathweb/ so that interested instructors can copy it and use it in their Web-based courses.

- What is the purpose of the research?
- Why am I interested in this topic?
- Who will see the questionnaire results?
- How did I come up with the questionnaire items?
- Who approved my study?
- What population am I using?
- What do I do with the student comments?

Major is a Border Collie. He is probably the most cowardly dog on the planet! But he loves his tennis balls and Frisbees.

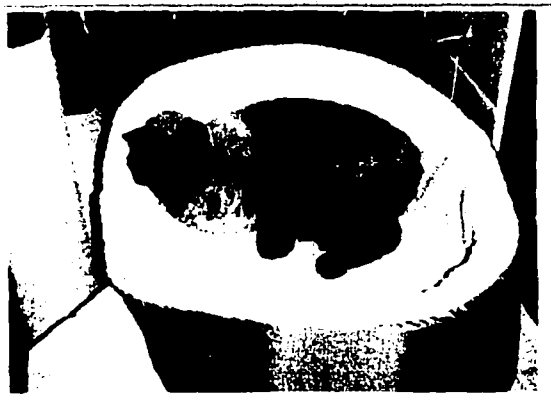
When I started developing and subsequently teaching a Web-based College Algebra course I felt like a newborn baby. I cannot even begin to describe the feeling! I didn't know how to best design my Web pages, how to present the pages in an organized manner, how to effectively deliver the instruction, or how to create a warm classroom environment.

I would have welcome any type of guidance to help me with the instructional design of my Web-based course!!! That is why I came up with the idea of creating a questionnaire for instructors to help them deal with instructional design issues. Who better to ask than the students if Web-based courses are effective.

- What is the purpose of the research?
- Why am I interested in this topic?
- Who will see the questionnaire results?
- How did I come up with the questionnaire items?
- Who approved my study?
- What population am I using?
- What do I do with the student comments?

The questionnaire is confidential, and the responses will only be seen by my dissertation co-chairs and me. YOUR COURSE WILL NOT BE CONNECTED WITH STUDENT RESPONSES IN ANY WAY. Completed questionnaires will be stored in a locked file cabinet for three years in one of my faculty advisors' offices located at the University of Nevada, Las Vegas.

- What is the purpose of the research?
- Why am I interested in this topic?
- Who will see the questionnaire results?
- How did I come up with the questionnaire items?
- Who approved my study?
- What population am I using?
- What do I do with the student comments?



Our cat Duster. He has already lost several of his lives to cars! Well, make that one tail and half a brain (ouch!).

I identified items by questioning Web-based mathematics instructors, students enrolled in four Web-based mathematics courses, and professors in the field of educational technology. Additional items were found through a review of the literature pertaining to Web page design, tools facilitating Web-based instruction, and online pedagogy.

- What is the purpose of the research?
- Why am I interested in this topic?
- Who will see the questionnaire results?
- How did I come up with the questionnaire items?
- Who approved my study?
- What population am I using?
- What do I do with the student comments?

Our son David. He is a computer slave!

The University of Nevada, Las Vegas Office of Sponsored Programs (Institutional Review Board) approved my study. If you have any questions about the rights of research subjects please contact the University of Nevada, Las Vegas Office of Sponsored Programs at (702) 895-1357. If you have any other questions you may also contact my dissertation co-chairs Dr. Eunsook Hong at **ehong@nevada.edu** or Dr. Neal Strudler at **strudler@nevada.edu**.

- What is the purpose of the research?
- Why am I interested in this topic?
- Who will see the questionnaire results?
- How did I come up with the questionnaire items?
- Who approved my study?
- What population am I using?
- What do I do with the student comments?

I considered the 15 member states of the Western Interstate Commission for Higher Education (WICHE) for the study. Of particular interest to me were Web-based undergraduate courses at two- and four-year public universities.

I only selected those courses that are semester-based, required ONE or NO face-to-face lecture or orientation meeting, and primarily used instructor-designed materials and WebCT. Course assessment activities could take place online or face-to-face.

This is my husband Ben. He loves his Denver Broncos!

- What is the purpose of the research?
- Why am I interested in this topic?
- Who will see the questionnaire results?
- How did I come up with the questionnaire items?
- Who approved my study?
- What population am I using?
- What do I do with the student comments?

I only need student comments for construct validation purposes. That is, I am doing a factor analysis which requires that the questionnaire be taken by individuals for which it was designed.

I AM NOT AT ALL INTERESTED IN ANALYZING THE STUDENTS' REACTIONS TO A PARTICULAR COURSE!

Our cat Lucy. If she keeps on eating she might just lose all of her lives real soon!

- What is the purpose of the research?
- Why am I interested in this topic?
- Who will see the questionnaire results?
- How did I come up with the questionnaire items?
- Who approved my study?
- What population am I using?
- What do I do with the student comments?

APPENDIX I

LETTER TO INSTRUCTORS TO CONVEY WEB ADDRESS OF QUESTIONNAIRE

Dear Dr. [Name]:

Two weeks ago, I sent you a message introducing my dissertation research project, the purpose of which is instrument development. Today I would be really, really grateful for your assistance in announcing to all of your online students the availability of my questionnaire.

***** At the end of this message you will find a letter to your students prepared by me for your convenience. Simply copy and paste it to the WebCT Bulletin Board in every Web-based course that you teach!*****

Anything else you can think of to convince your students to participate in the study would also be greatly appreciated! I need to receive at least 300 response patterns for my statistical analyses and getting that number has me just a little worried! Thus, every student in your course(s) counts! Every student who completes the questionnaire gets a thank-you note from me as proof for having participated.

If you want to see the questionnaire, please send me a message, and I will forward a copy to you. Please, do not try to fill out the questionnaire because it might capture your attempt, thereby, possibly skewing my results. If you would like to see your students' opinions, I will be happy to send them to you in June.

I hate to be a "pest." Thus, if you do not want me to contact you again, please reply to this message and type "Remove" into the subject line.

Sincerely,
Ingrid Stewart

Below is the letter to the students that I fervently hope you will copy and paste to the WebCT Bulletin Board in every Web-based course that you teach:

****

Hello Everyone!

*** Right now, you have the unique opportunity to voice your opinion concerning Internet courses. Your input will actually be used in the development of guidelines for the purpose of maintaining and improving the quality of Internet courses. ***

I'd really appreciate it if you would give me your opinion as soon as possible.

Better yet, why don't you just do it RIGHT NOW??? :-)

Just click on

http://www.scsv.nevada.edu/~stewarti/quest/

If that did not work, just copy and paste the entire Web address to a blank "Location" or "Address" line in your Web browser.

I can assure you that it will only take 10 minutes of your valuable time, and you don't even have to give your name!!! Remember . . . it is for an extremely worthy cause!!!

If you received information about this study in more than one of your courses, please feel free to complete an opinion form in each course!

Thank you so much for your willingness to help!

****

APPENDIX J

REMINDER MESSAGE TO INSTRUCTORS

Dear Dr. [Name]:

Thank you very much for having been so supportive of my dissertation research project. I really appreciate it!

May I take advantage of your goodwill one last time and ask you to post a message to your WebCT Bulletin Board reminding your students of my study.

I promise that today is the last time I will ask you to help me! If you are interested in reading my completed study or parts of it or if you would like to use the final questionnaire for your classes, please check my Web site at http://www.scsv.nevada.edu/~stewarti/mathweb.

I estimate that my study will be available in the fall of 2001. Thereafter, I will gladly help you with any questions, even technical ones.

Thanks so much for putting up with me :-)
Ingrid Stewart

Below is a reminder letter to your students for your convenience. Would you please consider pasting it to the WebCT Bulletin Board in every Web-based course that you teach?

****

Hello Everyone!

*** You still have the unique opportunity to voice your opinion concerning Internet courses. Your input will actually be used in the development of guidelines for the purpose of maintaining and improving the quality of Internet courses. ***

I'd really appreciate it if you would fill out the questionnaire as soon as you read this message.

Just click on

http://www.scsv.nevada.edu/~stewarti/quest/

If that did not work, just copy and paste the entire Web address to a blank "Location" or "Address" line in your Web browser.

I can assure you that it will only take 10 minutes of your valuable time, and you don't even have to give your name!!! Remember . . . it is for an extremely worthy cause!!!

If you received information about this study in more than one of your courses, please feel free to complete a separate questionnaire in each course!

Thank you so much for your willingness to help!

****

APPENDIX K

QUESTIONNAIRE ITEMS AND THEIR UNDERLYING CHARACTERISTICS

Questionnaire Items and their Underlying Characteristics of Web-Based Instruction

1. Course Web pages are dominated by overly bold graphics or text.

   Static images should be pleasing to the eye and not overwhelm the viewer.

   A primarily three-dimensional Web site should be avoided.

2. Important information is easy to find on course Web pages.

   If feasible, information should be presented in order of importance.

   If possible, avoid frame pages that might cause printing or search problems. If frames are used, provide a "no frames" option for users employing screen readers.

   All Web pages should state the date on which they were last updated.

   Let the user know what is new on the Web site.

3. It is easy to locate a particular course Web page from any other page (e.g., instructor notes, bulletin board, e-mail, quizzes, tests, etc.).

   Linking images and labels should be consistent. The same image or label should always connect to the same Web page.

   A title should appear on all Web pages in the heading and with the "title" HTM tag.

   All internal pages of a Web site should contain a link to the home page on top and bottom on the right side.

4. I often get feelings of disorientation within the course Web site.

   All Web pages internal to a Web site should have common headers, footers, and navigational controls.

   All Web pages making up a Web site should have a common look and feel.

   Users should be warned of links that launch applications (e.g., video, audio, etc.), open a new browser window, or link to another Web site.

   Intrapage links should be avoided.

5. Menus and buttons in the WebCT course management system readily indicate what function they perform (e.g., compose a letter, send a message, etc.).

   Menus and buttons should indicate what function they perform.

6. Due to a slow system there are times when I cannot access course components.

   Note: Course components include all aspects of the course, such as instructor notes, assignments, chat rooms, bulletin board, video presentations, etc.

   Novice Web users need to be instructed on how to use a Web browser and a search engine.

   Novice Web users need to be shown how to recognize and deal with Internet connection problems. Be aware of firewalls.

7. Some information visible on the screen is missing on printed copies.

   Text colors should be selected so that pages are readable when copied to black and white displays (e.g., default in Microsoft Word) or black and white printers.

   Specify tables as percentage of available space because fixed width tables may cause info to be chopped off when printed.

   If possible, avoid frame pages that might cause printing or search problems. If frames are used, provide a "no frames" option for users employing screen readers.

8. Helper applications (plug-ins) are difficult to install.

   Students must receive explicit directions on where to find and how to install plug-ins.

9. There are too few examples to show me how to properly apply or use what I have learned.

   Examples must be provided to illustrate the concept.

10. The instructional methods used in this course allow me to learn. Note: Instructional methods may include lectures, case studies, brainstorming, question-and-answer sessions, group work, etc.

    The instructional methods should be helpful in explaining and expanding the subject matter.

    The students should be told the purpose of the lesson.

    The students should be told what they have to know by the end of the instruction.

    The students should link new information with related information already stored in long-term memory.

    The information must be sufficiently current to meet the student's need.

    There should be no obvious gaps or omissions in the coverage of the subject matter.

    Link the lessons to real-life work.

    Group discussions should be relevant to the acquisition of knowledge.

11. The materials used to present the subject matter reflect the personal touch of the instructor.

    In addition to the textbook, distance instructors must develop their own instructional materials to simulate the presence of a human guide and teacher.

12. We are given little opportunity to apply or use new topics.

    The students must get the chance to apply the new information (e.g., tests quizzes, projects, etc.).

13. We are given sufficient resources to provide extra practice or to expand our knowledge (online tutorials or libraries, content-related Web sites, etc.).

    Opportunities must be provided for enrichment and remediation.

14. Messages from my instructor precisely address the issues.

    Messages should be kept brief and to the point.

Use space to break up paragraphs to improve readability of messages.

15. The instructor uses a lively writing style.

    The instructor should use colloquial language and a lively writing style both in notes pertaining to the subject matter and in communication.

    The instructor shows humor.

16. I am unsure how to properly express my questions in writing.

    Describe how special symbols (e.g., mathematics, foreign language, science, etc.) must be typed in an environment that does not allow their real representation.

17. Our instructor makes every effort to promote effective student interaction.

    Online communication with instructor and peers should be warm, responsive, empathetic, and considerate. Avoid sarcasm and insults. Negative comments sound worse in written messages than in face-to-face conversation.

    The instructor must set guidelines that govern the behavior of teams.

18. Our chat room discussions are confusing.

    Provide a protocol, such as "..." and "over" to indicate that a chat room participant has finished (over) a comment or has more to say (...). Without such a protocol chats can be confusing and chaotic.

19. Technology problems make our interactive computer video conferences frustrating (for example, CUseeMe).

    Attention must be paid to the technical issues with respect to interactive computer video conferencing.

20. The instructor is concerned with our progress.

    Explicit advice and suggestions to the student as to what to do and what to avoid, what to pay particular attention to and what to consider.

    Make recommendations pertaining to good study techniques.

21. Our instructor makes a continued effort to stay "visible".

Instructors should remain highly "visible". Send daily messages such as: (a) content-related messages (lectures, handouts, clarification of points in the text, discussion questions, synthesis of discussion); (b) process-related messages (order of assignments, directions for sending assignments, description of the flow of the class, guidance when students become confused); (c) technical tips (software tips, information about how to send attachments, discussion of how to format notes, URLs); or (d) protocol guidelines (code of conduct, plagiarism statement, netiquette, online tone).

APPENDIX L

QUESTIONNAIRE BLUEPRINT

Questionnaire Blueprint

Response format: 1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, 5 = Strongly Agree, 9 = Not Applicable

Appearance and Structure of Web Pages

The following questions pertain to the appearance and structure of Web pages. A Web page is any information with its own Web address that appears on your computer screen. *Please use the mouse to click on the circle next to the response that best describes how you feel about each statement. If you make a mistake, click on the correct choice and the previous answer will disappear.*

1. Text on course Web pages is clearly readable.
2. Course Web pages are uninspiring.
3. Course Web pages are dominated by overly bold graphics or text.
4. The color scheme of course Web pages interferes with the readability of the text.
5. Course Web pages are cluttered.
6. Important information is easy to find on course Web pages.
7. The course Web pages contain unnecessary animated or blinking graphics.
8. Pictures or animations that were supposed to be on the Web pages are missing.

Hyperlinks and Navigation

The following questions pertain to hyperlinks and navigation. Hyperlinks are the buttons, graphs, or phrases that connect one course Web page with another. Navigation is defined as the movement between course Web pages. *Please use the mouse to click on the circle next to the response that best describes how you feel about each statement. If you make a mistake, click on the correct choice and the previous answer will disappear.*

9. The hyperlinks are clearly identifiable on course Web pages.
10. The hyperlinks connect to nonexistent Web pages.
11. The hyperlinks provide a clear hint of the content they connect to.
12. The course Web pages contain unnecessary hyperlinks.
13. It is easy to locate a particular course Web page from any other page.
14. I often get feelings of disorientation with the course Web site.

15. Menus and buttons in the WebCT course management system readily indicate what function they perform (compose a letter, send a message, etc.).

Technical Issues

The following questions pertain to technical issues. Specifically, they try to detect any problems you might have with the access and viewing of course content. *Please use the mouse to click on the circle next to the response that best describes how you feel about each statement. If you make a mistake, click on the correct choice and the previous answer will disappear.*

16. The following online course media requires an unreasonably long time to load to my home computer:
    a. Video Presentations
    b. Audio Presentations
    c. Pictures or Animations
    d. Web Pages
17. The technical quality of the following online course media is good:
    a. Video Presentations
    b. Audio Presentations
    c. Pictures or Animations
    d. Interactive Computer Video Conferencing
18. Due to a slow system there are times when I cannot access course components. **Note: Course components include all aspects of the course, such as instructor notes, assignments, chat rooms, bulletin board, video presentations, etc.**
19. Some information visible on the screen is missing on printed copies.
20. Helper applications (plug-ins) are difficult to install.
21. The following software is easy to use:
    a. Online Video or Audio Players
    b. Interactive Computer Video Conferencing
    c. Applications Requiring User Input (tutorials, simulations, etc.)
    d. WebCT Course Management System

Class Procedures and Expectations

The following questions pertain to class procedures and expectations. Specifically, the procedures in place that govern the course, as well as the instructor's expectations of you will be investigated. *Please use the mouse to click on the circle next to the response that best describes how you feel about each statement. If you make a mistake, click on the correct choice and the previous answer will disappear.*

22. I know whom to turn to in case of technology-related problems.
23. We were given an insufficient amount of time to become familiar with the technology.
24. The process in place for submitting assignments is unacceptable to me.
25. Our instructor makes every effort to provide alternatives to scheduled "fixed time" activities (chats, tests, field trips, etc.).
26. I have a clear understanding of how to use the course components to learn effectively.
27. The instructions for completing assigned tasks are confusing.
28. The testing arrangements fit my busy schedule (time, place, etc.).
29. Due dates and deadlines are clear to me.
30. From the beginning, I have known exactly what is expected of me as a student in an Internet course.

Instruction

The following questions pertain to the instruction. *Please use the mouse to click on the circle next to the response that best describes how you feel about each statement. If you make a mistake, click on the correct choice and the previous answer will disappear.*

31. The course content was delivered effectively using proper media. **Note: Media includes printed materials, audio, video, pictures, animations, etc.**
32. There are too few examples to show me how to properly apply or use what I learned.
33. The assigned tasks increase my comprehension of the subject matter.
34. The sheer number of assigned tasks overwhelms me.
35. We are given sufficient resources to provide extra practice or to expand our knowledge (online tutorials or libraries, content-related Web sites, etc.).

36. The instructional methods used in this course allow me to learn. **Note: Instructional methods may include lectures, case studies, brainstorming, question-and-answer sessions, group work, etc.**
37. We are given little opportunity to apply or use new topics.
38. Assessment activities contribute to my learning of the subject matter (tests, quizzes, essays, presentations, etc.).
39. The materials used to present the subject matter reflect the personal touch of the instructor.
40. Assigned tasks are relevant and appropriate to the course.

Quality of Interaction

The following questions pertain to the quality of the interaction. Specifically, the manner in which you and your instructor and peers communicate with each other will be investigated. *Please use the mouse to click on the circle next to the response that best describes how you feel about each statement. If you make a mistake, click on the correct choice and the previous answer will disappear.*

41. Interaction with our instructor reflects kindness and consideration.
42. Messages from my instructor precisely address the issues.
43. The instructor uses a lively writing style.
44. I am unsure how to properly express my questions in writing.
45. Our instructor makes every effort to promote effective student interaction.
46. Our chat room discussions are confusing.
47. Technology problems make our interactive computer video conferences frustrating (for example, CUseeMe).

Presence of Instructor and Peers

The following questions pertain to the course participation of the instructor and peers. *Please use the mouse to click on the circle next to the response that best describes how you feel about each statement. If you make a mistake, click on the correct choice and the previous answer will disappear.*

48. I can count on my instructor to quickly clear up confusion with new topics.
49. I get useful feedback from the instructor on my performance.

50. The instructor is concerned with our progress.
51. We are strongly urged to get in touch with our instructor in case of questions or concerns.
52. We receive timely instructor feedback with respect to our concerns and questions.
53. Our instructor makes a continued effort to stay "visible".
54. Our instructor is difficult to reach outside of the WebCT course management system.
55. The instructor's participation in mandatory communication activities is very poor.
56. We are encouraged to communicate with our peers.

Student Background

Please use your mouse to first click on the next four (4) fields, then type the required/optional information:

Gender
Age
Exact Title of your Course
Exact Name of your Institution

For the next three (3) questions, please use your mouse to click on the circle next to the response that best describes you. *If you make a mistake, click on the correct choice and the previous answer will disappear:*

Have you taken the prerequisite course?

Yes No No required prerequisite I don't know

How many Internet courses utilizing WebCT have you taken prior to this course?

0 1 2 or more

Are you predominantly using a home computer for this course?

Yes No

Please use your mouse to click on the text area first, then type any comments you might have! (optional)

APPENDIX M

BLUEPRINT DEVELOPED AFTER ITEM REVIEW

Blueprint Developed after Item Review

Response format: 1 = Strongly Disagree; 2 = Disagree; 3 = Undecided; 4 = Agree; 5 = Strongly Agree; 9 = Not Applicable. **Note: *** means that the option "not applicable" is a viable choice.**

Appearance and Structure of Web Pages

The following questions pertain to the appearance and structure of Web pages used in the course. A Web page is any information with its own Web address that appears on your computer screen. *Please use the mouse to click on the circle next to the response that best describes how you feel about each statement. If you make a mistake, click on the correct choice and the previous answer will disappear.*

1. I can clearly read the text on the Web pages.
2. The Web pages appear dull.
3. Overly bold graphics or text dominates the Web pages.
4. The color scheme of the Web pages interferes with text comprehension.
5. The Web pages are cluttered (information overload!).
6. Important information is easy to find on the Web pages.
7. *** The Web pages contain unnecessary animated or blinking graphics.
8. *** Pictures or animations that were supposed to be on the Web pages are missing.

Hyperlinks and Navigation

The following questions pertain to hyperlinks and navigation used in the course. Hyperlinks are the buttons, graphs, or phrases that connect one course Web page with another. Navigation is defined as the movement between course Web pages. *Please use the mouse to click on the circle next to the response that best describes how you feel about each statement. If you make a mistake, click on the correct choice and the previous answer will disappear.*

9. *** The hyperlinks are clearly identifiable on the Web pages.
10. *** The hyperlinks connect to nonexistent Web pages.
11. *** The hyperlinks tell me clearly what information I am connecting to.
12. *** The Web pages contain unnecessary hyperlinks.

13. It is easy to locate a particular Web page from any other Web page.
14. I seem to get lost in the course Web site.
15. *** The function of menus and buttons in the WebCT course management system are clearly explained (compose a letter, send a message, etc.).

Technical Issues

The following questions pertain to technical issues. Specifically, they try to detect any problems you might have with the access and viewing of course content. *Please use the mouse to click on the circle next to the response that best describes how you feel about each statement. If you make a mistake, click on the correct choice and the previous answer will disappear.*

16. The following online course media requires a very long time to load to my home computer:
    a. *** Video Presentations
    b. *** Audio Presentations
    c. *** Pictures or Animations
    d. Web Pages
17. The technical quality of the following online course media is good:
    a. *** Video Presentations
    b. *** Audio Presentations
    c. *** Pictures or Animations
    d. *** Interactive Computer Video Conferencing
18. Due to a slow system there are times when I cannot access course components. **Note: Course components include all aspects of the course, such as instructor notes, assignments, chat rooms, bulletin board, video presentations, etc.**
19. Some information visible on the screen is missing on printed copies.
20. *** The helper applications (plug-ins) are difficult to install.
21. The following software is easy to use:
    a. *** Online Video or Audio Players
    b. *** Interactive Computer Video Conferencing
    c. *** Applications Requiring User Input (tutorials, simulations, etc.)
    d. *** WebCT Course Management System

Class Procedures and Expectations

The following questions pertain to class procedures and expectations. These items refer specifically to the procedures used in the course and the instructor's expectations of you. *Please use the mouse to click on the circle next to the response that best describes how you feel about each statement. If you make a mistake, click on the correct choice and the previous answer will disappear.*

22. I know whom to turn to when technology-related problems arise.
23. In the beginning of the semester, we were given enough time to become familiar with the technology.
24. The process used for submitting assignments is inconvenient.
25. *** The instructor makes an effort to provide alternatives to scheduled "fixed time" activities (chats, tests, field trips, etc.).
26. I have a clear understanding of how to use the course components. **Note: Course components include all aspects of the course, such as instructor notes, assignments, chat rooms, bulletin board, video presentations, etc.**
27. The instructions for completing assigned tasks are confusing.
28. The testing arrangements fit my schedule (time, place, etc.).
29. The due dates and deadlines are clear to me.
30. In the beginning of the semester, I was told exactly what is expected of me as a student in an Internet course (learning style, academic and technical requirements, etc.).

Instruction

The following questions pertain to the instruction. *Please use the mouse to click on the circle next to the response that best describes how you feel about each statement. If you make a mistake, click on the correct choice and the previous answer will disappear.*

31. The course content is delivered with appropriate media. **Note: Media includes printed materials, audio, video, pictures, animations, etc.**
32. *** The instructor provides examples so I can better understand the subject matter.
33. *** The assigned tasks increase my comprehension of the subject matter.
34. *** The number of assigned tasks overwhelms me.

35. *** We are given useful resources for extra practice or for expanding our knowledge (online tutorials or libraries, content-related Web sites, etc.).
36. The instructional methods used in this course help me learn the subject matter. **Note: Instructional methods may include lectures, case studies, brainstorming, question-and-answer sessions, group work, etc.**
37. We are given opportunity to practice what we learn.
38. The assessment activities contribute to my learning of the subject matter (tests, quizzes, essays, presentations, etc.).
39. The materials used to present the subject matter reflect the personal touch of the instructor.

Quality of Interaction

The following questions pertain to the quality of the interaction. Specifically, the manner in which you and your instructor and peers communicate with each other will be investigated. *Please use the mouse to click on the circle next to the response that best describes how you feel about each statement. If you make a mistake, click on the correct choice and the previous answer will disappear.*

40. The interaction with the instructor reflects kindness and consideration.
41. The messages from the instructor are clear to me.
42. The instructor uses an informal conversational style (uses humor, is folksy, etc.).
43. I have a hard time expressing my questions in writing.
44. The instructor makes an effort to promote effective student interaction (teaches Internet etiquette or conduct during discussions, etc.).
45. *** The dialogue in chat room discussions is difficult to follow.
46. *** Technology problems make our interactive computer video conferences frustrating (for example, CUseeME).

Presence of Instructor and Peers

The following questions pertain to the course participation of the instructor and peers. *Please use the mouse to click on the circle next to the response that best describes how you feel about each statement. If you make a mistake, click on the correct choice and the previous answer will disappear.*

47. I can count on the instructor to clear up quickly any confusion that I may have with a topic.
48. I get useful feedback from the instructor on my performance.
49. The instructor is concerned with our progress (for example, asks how we are doing).
50. We are encouraged to get in touch with the instructor when questions or concerns arise.
51. The instructor provides feedback in a timely manner.
52. *** The instructor is difficult to reach outside of the WebCT course management system.
53. *** The instructor's participation in mandatory communication activities is poor.
54. We are encouraged to communicate with our peers.

Student Background

Please use your mouse to first click on the next four (4) fields, then type the information.

Gender
Age
Exact Title of Course
Exact Name of Institution

For the next three (3) questions, please use your mouse to click on the circle next to the response that best describes you. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

Have you taken the prerequisite(s) for this course?

Yes No I don't know Prerequisite(s) not required

How many Internet courses utilizing WebCT have you taken prior to this course?

0 1 2 or more

Are you predominantly using a home computer for this course?

Yes No

Please use your mouse to click on the text area first, then type any comments you might have! (optional)

APPENDIX N

BLUEPRINT DEVELOPED AFTER CONTENT VALIDATION

Blueprint Developed after Content Validation

Response format: 1 = Strongly Disagree; 2 = Disagree; 3 = Undecided; 4 = Agree; 5 = Strongly Agree; 9 = Not Applicable. **Note: *** means that the option "not applicable" is a viable choice.**

Appearance and Structure of Web Pages

Please use the mouse to click on the "circle" next to the response that best describes how you feel about the appearance and structure of Web Pages used in the course. A Web page is any information with its own Web address that appears on your computer screen. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

1. I can clearly read the text on the Web pages.
2. The Web pages appear lifeless and dull.
3. The Web pages are dominated by overly bold graphics or text.
4. The color scheme of the Web pages interferes with text comprehension.
5. The Web pages are well organized.
6. Important information is easy to find on the Web pages.
7. *** The Web pages contain unnecessary animated or blinking graphics.
8. *** Pictures or animations that were supposed to be on the Web pages are missing.

Hyperlinks and Navigation

Please use the mouse to click on the "circle" next to the response that best describes how you feel about the hyperlinks and navigation used in the course. Hyperlinks are the buttons, graphs, or phrases that connect one course Web page with another. Navigation is defined as the movement between course Web pages. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

9. *** The hyperlinks are clearly identifiable on the Web pages.
10. *** There are hyperlinks that connect to nonexistent Web pages.
11. *** The hyperlinks tell me clearly what information I am connecting to.
12. *** The web pages contain unnecessary hyperlinks.

13. It is easy to locate a particular Web page from any other Web page.
14. The layout of the course Web site is clear to me.
15. *** The buttons in the WebCT course management system tell me clearly what function they perform (compose a letter, connect to chat rooms, etc.).

Technical Issues

Please use the mouse to click on the "circle" next to the response that best describes how you feel about your access to course components and viewing of the course material. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

16. The following online course media requires a very long time to load to my home computer:
    a. *** Video Presentations
    b. *** Audio Presentations
    c. *** Pictures or Animations
    d. Web Pages
17. The technical quality of the following online course media is good:
    a. *** Video Presentations
    b. *** Audio Presentations
    c. *** Pictures or Animations
    d. *** Interactive Computer Video Conferencing
18. The school's computer system consistently allows me access to the course components. **Note: Course components include all aspects of the course, such as instructor notes, assignments, chat rooms, bulletin board, video presentations, etc.**
19. Some information visible on the screen is missing on printed copies.
20. *** The helper applications (plug-ins) are difficult to install.
21. The following software is easy to use:
    a. *** Online Video or Audio Players
    b. *** Interactive Computer Video Conferencing
    c. *** Applications Requiring User Input (e.g., tutorials, simulations, etc.)
    d. *** WebCT Course Management System

Class Procedures and Expectations

Please use the mouse to click on the "circle" next to the response that best describes how you feel about the procedures guiding the course and the instructor's expectations of you. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

22. I know exactly what actions to take in the event of technology-related problems.
23. In the beginning of the semester, we were given enough time to become familiar with the technology.
24. The process used for submitting assignments is inconvenient.
25. *** We are given reasonable alternatives to scheduled "fixed time" activities (chats, tests, field trips, etc.).
26. The grading procedures are clearly stated.
27. The directions for completing assigned tasks are confusing.
28. The due dates and deadlines are clear to me.
29. In the beginning of the semester, I was told exactly what is expected of me as a student in an Internet course (learning style, academic and technical requirements, etc.).

Content Delivery

Please use the mouse to click on the "circle" next to the response that best describes how you feel about the manner in which the course material was presented to you. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

30. The course content is delivered with appropriate media. **Note: Media includes printed materials, audio, video, pictures, animations, etc.**
31. *** The instructor provides enough examples to allow me to better understand the subject matter.
32. *** The assigned tasks increase my comprehension of the subject matter.
33. *** The number of assigned tasks overwhelms me.
34. *** We are given useful resources for extra practice or for expanding our knowledge (online tutorials or libraries, content-related Web sites, etc.).

35. The instructional methods used in this course help me learn the subject matter.
    Note: Instructional methods may include lectures, case studies, brainstorming, discussions, group work, etc.
36. The assessment activities contribute to my learning of the subject matter (tests, quizzes, essays, presentations, etc.).
37. The materials used to present the subject matter reflect the personal touch of the instructor.

Quality of Communication

Please use the mouse to click on the "circle" next to the response that best describes how you feel about the manner in which you and your instructor and peers communicate with each other. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

38. The communication with the instructor reflects kindness and consideration.
39. The messages from the instructor are clear to me.
40. The instructor uses an informal conversational style (uses humor, is folksy, etc.).
41. The instructor makes an effort to promote effective student interaction (teaches Internet etiquette or conduct during discussions, etc.).
42. *** The dialogue in chat room discussions is difficult to follow.
43. *** I have a hard time following the conversation during interactive computer video conferences (for example, CUseeME).

Presence of Instructor and Peers

Please use the mouse to click on the "circle" next to the response that best describes how you feel about the course participation of the instructor and peers. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

44. I can count on the instructor to clear up quickly any confusion that I may have with a topic.
45. The instructor makes an effort to ask us how we are doing.
46. We are encouraged to get in touch with the instructor when questions or concerns arise.

47. The instructor responds to my messages in a timely manner.
48. *** The instructor is difficult to reach when WebCT is unavailable.
49. *** The instructor's participation in mandatory discussions is poor (in chat rooms, on the bulletin board, etc.).
50. We are encouraged to communicate with our peers.

Student Background

Please use your mouse to first click on the next four (4) fields, then type the information.

Gender
Age
Exact Title of Your Course
Exact Name of Your Institution

For the next three (3) questions, please use your mouse to click on the "circle" next to the response that best describes you. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

Have you taken the prerequisite(s) for this course?

Yes No Prerequisite(s) not required I don't know

How many Internet courses utilizing WebCT have you taken prior to this course?

0 1 2 or more

Are you predominantly using a home computer for this course?

Yes No

Please use your mouse to click on the text area first, then type any comments you might have! (optional)

APPENDIX O

INITIAL QUESTIONNAIRE

Following are 60 Questions That Pertain To The Internet Course That You Are Presently Taking! Don't worry, responding to the questions will only take 10 minutes of your time!

★ Appearance and Structure of Web Pages

Please use the mouse to click on the "circle" next to the response that best describes what you think of the appearance and structure of Web pages used in the course. A Web page is any information with its own Web address that appears on your computer screen. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

SA = Strongly Agree **A = Agree** **U = Undecided**
SD = Strongly Disagree **D = Disagree** ***NA = Not Applicable**

*** Use the "Not Applicable" response if a statement does not pertain to your course!**

1. I can clearly read the text on the Web pages.	○ SA	○ A	○ U	○ D	○ SD	
2. The Web pages appear lifeless and dull.	○ SA	○ A	○ U	○ D	○ SD	
3. The Web pages are dominated by overly bold graphics or text.	○ SA	○ A	○ U	○ D	○ SD	
4. The color scheme of the Web pages interferes with text comprehension.	○ SA	○ A	○ U	○ D	○ SD	
5. The Web pages are well organized.	○ SA	○ A	○ U	○ D	○ SD	
6. Important information is easy to find on the Web pages.	○ SA	○ A	○ U	○ D	○ SD	
7. The Web pages contain unnecessary animated or blinking graphics.	○ SA	○ A	○ U	○ D	○ SD	○ NA
8. A considerable number of pictures or animations that are supposed to be on the Web pages are missing.	○ SA	○ A	○ U	○ D	○ SD	○ NA

★ Hyperlinks and Navigation

Please use the mouse to click on the "circle" next to the response that best describes what you think of the hyperlinks and navigation used in this course. Hyperlinks are the buttons, graphs, or phrases that connect one Web page with another. Navigation is defined as the movement between Web pages. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

SA = Strongly Agree A = Agree U = Undecided
SD = Strongly Disagree D = Disagree *NA = Not Applicable

*** Use the "Not Applicable" response if a statement does not pertain to your course!**

9. The hyperlinks are clearly identifiable on the Web pages. Note: Hyperlinks are the buttons, graphs, or phrases that connect one Web page with another	○ SA	○ A	○ U	○ D	○ SD	○ NA
10. A considerable number of hyperlinks connect to nonexistent Web pages.	○ SA	○ A	○ U	○ D	○ SD	○ NA
11. The hyperlinks clearly tell me what information I am connecting to.	○ SA	○ A	○ U	○ D	○ SD	○ NA
12. The Web pages contain unnecessary hyperlinks.	○ SA	○ A	○ U	○ D	○ SD	○ NA
13. It is easy to locate a particular Web page from any other Web page.	○ SA	○ A	○ U	○ D	○ SD	
14. The layout of the course Web site is clear to me.	○ SA	○ A	○ U	○ D	○ SD	
15. The buttons in the WebCT course management system clearly tell me what function they perform (compose a letter, connect to chat rooms, etc.).	○ SA	○ A	○ U	○ D	○ SD	○ NA

Please hang in there! You are already one third done!

Click Here to Go to Page 2 of 4

Please be patient, the connection to the Web server is a little slow at times!

Please Be Honest! Remember that you do not have to give your name! Hang in there because your efforts advance a worthy cause!

★Technical Issues

Please use the mouse to click on the "circle" next to the response that best describes what you think of your access to course components and viewing of course materials. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

SA = Strongly Agree **A = Agree** **U = Undecided**
SD = Strongly Disagree **D = Disagree** ***NA = Not Applicable**

*** Use the "Not Applicable" response if a statement does not pertain to your course!**

16. The following online course media quickly loads to my home computer:						
a. Video Presentations	○ SA	○ A	○ U	○ D	○ SD	○ NA
b. Audio Presentations	○ SA	○ A	○ U	○ D	○ SD	○ NA
c. Pictures or Animations	○ SA	○ A	○ U	○ D	○ SD	○ NA
d. Web Pages	○ SA	○ A	○ U	○ D	○ SD	

17. The technical quality of the following online course media is good:						
a. Video Presentations	○ SA	○ A	○ U	○ D	○ SD	○ NA
b. Audio Presentations	○ SA	○ A	○ U	○ D	○ SD	○ NA
c. Pictures or Animations	○ SA	○ A	○ U	○ D	○ SD	○ NA
d. Interactive Computer Video Conferencing (CUseeME, etc.)	○ SA	○ A	○ U	○ D	○ SD	○ NA

18. The school's computer system consistently allows me access to the course components. Note: Course components include all aspects of the course, such as instructor notes, assignments, chat rooms, bulletin board, video presentations, etc.	○ SA	○ A	○ U	○ D	○ SD	
19. Information visible on the screen is clearly displayed on printed copies.	○ SA	○ A	○ U	○ D	○ SD	
20. The plug-ins (video or sound players, etc.) are difficult to install.	○ SA	○ A	○ U	○ D	○ SD	○ NA

21. Overall, the following software is easy to use:						
a. Online Video or Audio Players	○ SA	○ A	○ U	○ D	○ SD	○ NA
b. Interactive Computer Video Conferencing	○ SA	○ A	○ U	○ D	○ SD	○ NA
c. Applications Requiring User Input (tutorials, simulations, etc.)	○ SA	○ A	○ U	○ D	○ SD	○ NA
d. WebCT Course Management System	○ SA	○ A	○ U	○ D	○ SD	○ NA

★ Class Procedures and Expectations

Please use the mouse to click on the "circle" next to the response that best describes what you think of the procedures guiding the course and the instructor's expectations of you. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

SA = Strongly Agree **A = Agree** **U = Undecided**
SD = Strongly Disagree **D = Disagree** ***NA = Not Applicable**

*** Use the "Not Applicable" response if a statement does not pertain to your course!**

22. I know exactly what actions to take in the event of technology-related problems.	○ SA	○ A	○ U	○ D	○ SD	
23. In the beginning of the semester, I was given enough time to become familiar with the technology.	○ SA	○ A	○ U	○ D	○ SD	
24. Overall, the process used for submitting assigned tasks is cumbersome.	○ SA	○ A	○ U	○ D	○ SD	
25. I am given reasonable alternatives to scheduled "fixed time" activities (chats, tests, field trips, etc.).	○ SA	○ A	○ U	○ D	○ SD	○ NA
26. The grading procedures are clearly stated.	○ SA	○ A	○ U	○ D	○ SD	
27. The directions for completing assigned tasks are confusing.	○ SA	○ A	○ U	○ D	○ SD	
28. The due dates and deadlines are clear to me.	○ SA	○ A	○ U	○ D	○ SD	
29. In the beginning of the semester, I was told exactly what is expected of me as a student in an Internet course (learning style, academic and technical requirements, etc.).	○ SA	○ A	○ U	○ D	○ SD	

Please, please hang in there!
You are already half way done!

Click Here to Go to Page 3 of 4

Please be patient, the connection to the Web server is a little slow at times!

You are half way done! Don't forget . . . you are contributing to the success of future Internet courses!

★ Content Delivery

Please use the mouse to click on the "circle" next to the response that best describes what you think of the manner in which the course material was presented to you. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

SA = Strongly Agree **A = Agree** **U = Undecided**
SD = Strongly Disagree **D = Disagree** ***NA = Not Applicable**

*** Use the "Not Applicable" response if a statement does not pertain to your course!**

30. The course content is delivered with appropriate media. Note: Media includes printed materials, audio, video, pictures, animation, etc.	○ SA	○ A	○ U	○ D	○ SD	
31. The instructor provides enough examples to allow me to better understand the subject matter.	○ SA	○ A	○ U	○ D	○ SD	○ NA
32. The assigned tasks increase my comprehension of the subject matter.	○ SA	○ A	○ U	○ D	○ SD	○ NA
33. I am overwhelmed by the number of assigned tasks.	○ SA	○ A	○ U	○ D	○ SD	○ NA
34. I am given useful resources for extra practice or for expanding my knowledge (online tutorials or libraries, content-related Web sites, etc.).	○ SA	○ A	○ U	○ D	○ SD	○ NA
35. The instructional methods used in this course help me learn the subject matter. Note: Instructional methods may include lectures, case studies, discussions, group work, etc.	○ SA	○ A	○ U	○ D	○ SD	
36. The assessment activities (tests, quizzes, essays, presentations, etc.) contribute to my knowledge of the subject matter.	○ SA	○ A	○ U	○ D	○ SD	
37. The materials used to present the subject matter reflect the personal touch of the instructor.	○ SA	○ A	○ U	○ D	○ SD	

★Quality of Communication

Please use the mouse to click on the "circle" next to the response that best describes what you think of the manner in which you and your instructor and peers communicate with each other. ***If you make a mistake, click on the correct choice and the previous answer will disappear.***

SA = Strongly Agree **A = Agree** **U = Undecided**
SD = Strongly Disagree **D = Disagree** ***NA = Not Applicable**

*** Use the "Not Applicable" response if a statement does not pertain to your course!**

38. The instructor communicates with me in a thoughtful manner.	○ SA	○ A	○ U	○ D	○ SD	
39. The messages from the instructor are clear to me.	○ SA	○ A	○ U	○ D	○ SD	
40. The instructor uses an informal conversational style (uses humor, is folksy, etc.).	○ SA	○ A	○ U	○ D	○ SD	
41. The instructor encourages proper communication among students (teaches Internet etiquette or conduct during discussions, etc.).	○ SA	○ A	○ U	○ D	○ SD	
42. The dialogue in chat room discussions is difficult to follow.	○ SA	○ A	○ U	○ D	○ SD	○ NA
43. I have a hard time following the conversation during interactive computer video conferences (for example, CUseeME).	○ SA	○ A	○ U	○ D	○ SD	○ NA

You almost made! There are only 8 more questions left!

Click Here to Go to Page 4 of 4

Please be patient, the connection to the Web server is a little slow at times!

You've almost made it! Below are just a few more questions pertaining to your course and a few background questions. Thank you so much for hanging in there!

★Presence of Instructor and Peers

Please use the mouse to click on the "circle" next to the response that best describes what you think of the course participation of the instructor and peers. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

SA = Strongly Agree **A = Agree** **U = Undecided**
SD = Strongly Disagree **D = Disagree** ***NA = Not Applicable**

*** Use the "Not Applicable" response if a statement does not pertain to your course!**

44. The instructor confirms in a timely manner that assigned tasks have been received.	○ SA	○ A	○ U	○ D	○ SD	○ NA
45. I can count on the instructor to clear up quickly any confusion that I may have with a topic.	○ SA	○ A	○ U	○ D	○ SD	
46. The instructor makes an effort to ask me how I am doing.	○ SA	○ A	○ U	○ D	○ SD	
47. I am encouraged to get in touch with the instructor when questions or concerns arise.	○ SA	○ A	○ U	○ D	○ SD	
48. The instructor reponds to my messages in a timely manner.	○ SA	○ A	○ U	○ D	○ SD	
49. The instructor is difficult to reach when WebCT is unavailable.	○ SA	○ A	○ U	○ D	○ SD	○ NA
50. The instructor's participation in mandatory discussions (in chat rooms, on the bulletin board, etc.) is poor.	○ SA	○ A	○ U	○ D	○ SD	○ NA
51. I am encouraged to communicate with my peers.	○ SA	○ A	○ U	○ D	○ SD	

★Background Questions

Thank you for completing the survey. Your responses will be very helpful in my attempt to improve the quality of Web-based instruction. **The following background questions will help me to present a valid and reliable evaluation form.**

Please enter a USER ID using only a combination of letters and numbers!

Please use your mouse to first click on the next four (4) text fields, then type the information.

Exact Title of Your Course

Exact Name of Your Institution

Gender (Male/Female)

Age

For the next three (3) questions, please use the mouse to click on the "circle" next to the response that best describes you. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

Have you taken the prerequisite(s) for this course?

- ○ Yes
- ○ No
- ○ Prerequisite(s) not required
- ○ I don't know

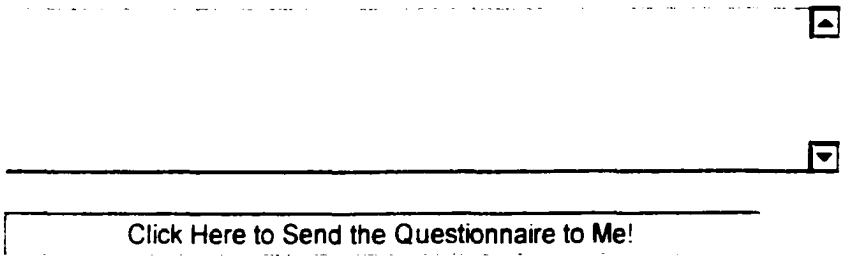
How many Internet courses utilizing WebCT have you taken prior to this course?

- ○ 0
- ○ 1
- ○ 2 or more

Are you predominantly using a home computer for this course?

- ○ Yes
- ○ No

Please use your mouse to click on the text area first, then type any comments you might have! (optional)



Please be patient, the connection to the Web server is a little slow at times!

Name of Course
Name of Institution

Thank You for Completing the Questionnaire 

Your completed questionnaire has been mailed to me. I really appreciate your efforts. If you would like to comment on the questionnaire please visit my **Home Page** which provides an opportunity for electronic mail communication with me. This is also the place where you and the Web-based instructors will eventually find the final version of the questionnaire.

Ingrid Stewart

APPENDIX P

FINAL QUESTIONNAIRE

Web-Based Course Evaluation

Following are 59 Questions That Pertain To The Internet Course That You Are Presently Taking! Don't worry, responding to the questions will only take 10 minutes of your time!

Please type the name of the course that you are evaluating! _____

★ Appearance of Web Pages

Please use the mouse to click on the "circle" next to the response that best describes what you think of the appearance and structure of Web pages used in the course. A Web page is any information with its own Web address that appears on your computer screen. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

SA = Strongly Agree **A = Agree** **U = Undecided**
SD = Strongly Disagree **D = Disagree** ***NA = Not Applicable**

*** Use the "Not Applicable" response if a statement does not pertain to your course!**

1. The font (type face, size, and style) used on the Web pages detracts from the content.	○ SA	○ A	○ U	○ D	○ SD	
2. The Web pages appear lifeless and dull.	○ SA	○ A	○ U	○ D	○ SD	
3. The Web pages are dominated by overly bold graphics or text.	○ SA	○ A	○ U	○ D	○ SD	
4. The color scheme of the Web pages interferes with text comprehension.	○ SA	○ A	○ U	○ D	○ SD	
5. The layout of the Web pages is uncluttered.	○ SA	○ A	○ U	○ D	○ SD	
6. The Web pages are overcrowded with hyperlinks.	○ SA	○ A	○ U	○ D	○ SD	
7. The Web pages contain unnecessary animated or blinking graphics.	○ SA	○ A	○ U	○ D	○ SD	○ NA
8. A considerable number of pictures or animations that are supposed to be on the Web pages are missing.	○ SA	○ A	○ U	○ D	○ SD	○ NA

★ Hyperlinks and Navigation

Please use the mouse to click on the "circle" next to the response that best describes what you think of the hyperlinks and navigation used in this course. Hyperlinks are the buttons, graphs, or phrases that connect one Web page with another. Navigation is defined as the movement between Web pages. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

SA = Strongly Agree **A = Agree** **U = Undecided**
SD = Strongly Disagree **D = Disagree** ***NA = Not Applicable**

*** Use the "Not Applicable" response if a statement does not pertain to your course!**

9. The hyperlinks are clearly identifiable on the Web pages. Note: Hyperlinks are the buttons, graphs, or phrases that connect one Web page with another.	○ SA	○ A	○ U	○ D	○ SD	○ NA
10. Important information is easy to find on the Web pages.	○ SA	○ A	○ U	○ D	○ SD	○ NA
11. The hyperlinks clearly tell me what information I am connecting to.	○ SA	○ A	○ U	○ D	○ SD	○ NA
12. It is easy to locate a particular Web page from any other Web page.	○ SA	○ A	○ U	○ D	○ SD	
13. The layout of the course Web site is clear to me.	○ SA	○ A	○ U	○ D	○ SD	
14. The buttons in the WebCT course management system clearly tell me what function they perform (compose a letter, connect to chat rooms, etc.).	○ SA	○ A	○ U	○ D	○ SD	○ NA

Please hang in there! You are already one third done!

Click Here to Go to Page 2 of 4

Please be patient, the connection to the Web server is a little slow at times!

Please Be Honest! Remember that you do not have to give your name! Hang in there because your efforts advance a worthy cause!

★Technical Issues

Please use the mouse to click on the "circle" next to the response that best describes what you think of your access to course components and viewing of course materials. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

SA = Strongly Agree **A = Agree** **U = Undecided**
SD = Strongly Disagree **D = Disagree** ***NA = Not Applicable**

*** Use the "Not Applicable" response if a statement does not pertain to your course!**

15. The following online course media quickly loads to my home computer:						
a. Video Presentations	○ SA	○ A	○ U	○ D	○ SD	○ NA
b. Audio Presentations	○ SA	○ A	○ U	○ D	○ SD	○ NA
c. Pictures or Animations	○ SA	○ A	○ U	○ D	○ SD	○ NA
d. Web Pages	○ SA	○ A	○ U	○ D	○ SD	

16. The technical quality of the following online course media is good:						
a. Video Presentations	○ SA	○ A	○ U	○ D	○ SD	○ NA
b. Audio Presentations	○ SA	○ A	○ U	○ D	○ SD	○ NA
c. Pictures or Animations	○ SA	○ A	○ U	○ D	○ SD	○ NA
d. Interactive Computer Video Conferencing (CUseeME, etc.)	○ SA	○ A	○ U	○ D	○ SD	○ NA

★Online Applications

Please use the mouse to click on the "circle" next to the response that best describes what you think of the ease of use of ONLINE applications. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

SA = Strongly Agree **A = Agree** **U = Undecided**
SD = Strongly Disagree **D = Disagree** ***NA = Not Applicable**

*** Use the "Not Applicable" response if a statement does not pertain to your course!**

17. The following ONLINE applications are easy to use:						
a. Video Player	○ SA	○ A	○ U	○ D	○ SD	○ NA
b. Audio Player	○ SA	○ A	○ U	○ D	○ SD	○ NA
c. Interactive Computer Video Conferencing System	○ SA	○ A	○ U	○ D	○ SD	○ NA
d. Chat Rooms	○ SA	○ A	○ U	○ D	○ SD	○ NA
e. Bulletin Board	○ SA	○ A	○ U	○ D	○ SD	○ NA
f. Private E-Mail System	○ SA	○ A	○ U	○ D	○ SD	○ NA
g. White Board	○ SA	○ A	○ U	○ D	○ SD	○ NA
h. Tutorials	○ SA	○ A	○ U	○ D	○ SD	○ NA
i. Simulations	○ SA	○ A	○ U	○ D	○ SD	○ NA
j. Plug-ins (other than video or audio players)	○ SA	○ A	○ U	○ D	○ SD	○ NA

★ Class Procedures and Expectations

Please use the mouse to click on the "circle" next to the response that best describes what you think of the procedures guiding the course and the instructor's expectations of you. ***If you make a mistake, click on the correct choice and the previous answer will disappear.***

SA = Strongly Agree **A = Agree** **U = Undecided**
SD = Strongly Disagree **D = Disagree** ***NA = Not Applicable**

*** Use the "Not Applicable" response if a statement does not pertain to your course!**

18. I know exactly what actions to take in the event of technology-related problems.	○ SA	○ A	○ U	○ D	○ SD	
19. In the beginning of the semester, I was given enough time to become familiar with the technology.	○ SA	○ A	○ U	○ D	○ SD	
20. I am told exactly how to turn in each assignment.	○ SA	○ A	○ U	○ D	○ SD	
21. I am given reasonable alternatives to scheduled "fixed time" activities (chats, tests, field trips, etc.).	○ SA	○ A	○ U	○ D	○ SD	○ NA
22. The grading procedures are clearly stated.	○ SA	○ A	○ U	○ D	○ SD	
23. The directions for completing assigned tasks are confusing.	○ SA	○ A	○ U	○ D	○ SD	
24. The due dates and deadlines are clear to me.	○ SA	○ A	○ U	○ D	○ SD	
25. In the beginning of the semester, I was told exactly what is expected of me as a student in an Internet course (learning style, academic and technical requirements, etc.).	○ SA	○ A	○ U	○ D	○ SD	

Please, please hang in there!
You are already over half way done!

Click Here to Go to Page 3 of 4

Please be patient, the connection to the Web server is a little slow at times!

You are almost done! Don't forget . . . you are contributing to the success of future Internet courses!

★ Content Delivery

Please use the mouse to click on the "circle" next to the response that best describes what you think of the manner in which the course material was presented to you. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

SA = Strongly Agree **A = Agree** **U = Undecided**
SD = Strongly Disagree **D = Disagree** ***NA = Not Applicable**

*** Use the "Not Applicable" response if a statement does not pertain to your course!**

26. The course content is delivered with appropriate media. Note: Media includes printed materials, audio, video, pictures, animation, etc.	○ SA	○ A	○ U	○ D	○ SD	
27. The instructor provides enough examples to allow me to better understand the subject matter.	○ SA	○ A	○ U	○ D	○ SD	○ NA
28. The assigned tasks increase my comprehension of the subject matter.	○ SA	○ A	○ U	○ D	○ SD	○ NA
29. I am given useful resources for extra practice or for expanding my knowledge (online tutorials or libraries, content-related Web sites, etc.).	○ SA	○ A	○ U	○ D	○ SD	○ NA
30. The instructional methods used in this course help me learn the subject matter. Note: Instructional methods may include lectures, case studies, discussions, group work, etc.	○ SA	○ A	○ U	○ D	○ SD	
31. The assessment activities (tests, quizzes, essays, presentations, etc.) contribute to my knowledge of the subject matter.	○ SA	○ A	○ U	○ D	○ SD	
32. The materials used to present the subject matter reflect the personal touch of the instructor.	○ SA	○ A	○ U	○ D	○ SD	

★ Instructor and Peer Interaction

Please use the mouse to click on the "circle" next to the response that best

describes what you think of the manner in which you and your instructor and peers interact with each other. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

SA = Strongly Agree **A = Agree** **U = Undecided**
SD = Strongly Disagree **D = Disagree** ***NA = Not Applicable**

*** Use the "Not Applicable" response if a statement does not pertain to your course!**

33. The instructor communicates with me in a thoughtful manner.	○ SA	○ A	○ U	○ D	○ SD	
34. The messages from the instructor are clear to me.	○ SA	○ A	○ U	○ D	○ SD	
35. The instructor uses an informal conversational style (uses humor, is folksy, etc.).	○ SA	○ A	○ U	○ D	○ SD	
36. The instructor encourages proper communication among students (teaches Internet etiquette or conduct during discussions, etc.).	○ SA	○ A	○ U	○ D	○ SD	
37. The instructor confirms in a timely manner that assigned tasks have been received.	○ SA	○ A	○ U	○ D	○ SD	○ NA
38. I can count on the instructor to clear up quickly any confusion that I may have with a topic.	○ SA	○ A	○ U	○ D	○ SD	
39. The instructor makes an effort to ask me how I am doing.	○ SA	○ A	○ U	○ D	○ SD	
40. I am encouraged to get in touch with the instructor when questions or concerns arise.	○ SA	○ A	○ U	○ D	○ SD	
41. The instructor reponds to my messages in a timely manner.	○ SA	○ A	○ U	○ D	○ SD	
42. The instructor is difficult to reach when WebCT is unavailable.	○ SA	○ A	○ U	○ D	○ SD	○ NA
43. The instructor's participation in mandatory discussions (in chat rooms, on the bulletin board, etc.) is poor.	○ SA	○ A	○ U	○ D	○ SD	○ NA
44. I am encouraged to communicate with my peers.	○ SA	○ A	○ U	○ D	○ SD	

You almost made! There are only a few background questions left!

Click Here to Go to Page 4 of 4

Please be patient: the connection to the Web server is a little slow at times!

You've almost made it! Below are just a few more background questions. Thank you so much for hanging in there!

★Background Questions

Thank you for completing the survey. Your responses will be very helpful in my attempt to improve the quality of Web-based instruction. The following background questions will help me to better evaluate the results.

Please use your mouse to first click on the next four (3) text fields, then type the information.

Please enter any combination of letters and numbers not to exceed 10!

Gender (Male/Female)

Age

For the next three (3) questions, please use the mouse to click on the "circle" next to the response that best describes you. *If you make a mistake, click on the correct choice and the previous answer will disappear.*

Have you taken the prerequisite(s) for this course?

- ○ Yes
- ○ No
- ○ Prerequisite(s) not required
- ○ I don't know

How many Internet courses utilizing WebCT have you taken prior to this course?

- ○ 0
- ○ 1
- ○ 2 or more

Are you predominantly using a home computer for this course?

- ○ Yes
- ○ No

Please use your mouse to click on the text area first, then type any comments you might have! (optional)

Click Here to Send the Questionnaire to Me!

Please be patient, the connection to the Web server is a little slow at times!

Name of Course:

Thank You for Completing the Questionnaire 

Your completed questionnaire has been mailed to me. I really appreciate your efforts. If you would like to comment on the questionnaire please visit my **Home Page** which provides an opportunity for electronic mail communication with me.

Ingrid Stewart

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Development and Validation of an Instrument for Student Evaluation of Web-Based Instruction

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