ABSTRACT: Web-based instruction is becoming an increasingly popular method of teaching college-based classes. Bodin and Robert (2000) projected that by 2002, 15% of all students in higher education would be involved in at least some type of Web-based learning. Speech-language pathology, like other health-related fields, has joined the movement toward offering both courses and degrees by Web-based instruction. Such offerings, however, are not yet as common in speech-language pathology as they are in fields that require less instructor interaction or less clinical observation of client interactions. Chial, Sobolevsky, and Flahive (2000) found that 78 university speech-language programs out of approximately 145 surveyed offered some type of distance learning (which included an array of delivery systems such as video conferencing, e-mail, CD-ROM, Web-based, etc.). They also found that department chairs indicated a strong interest in developing and expanding such programs.

If national trends continue, a larger number of university speech-language programs are likely to offer Web-based instruction in the near future. Advocates of Web instruction indicate that it provides faster access to information and allows a student more responsibility for the learning process. Critics warn that it lacks the richness created by instructor–student or student–student interaction. It is important to study the impact of Web-based instruction systematically and objectively on both the student and the learning process.

There are various configurations of Web-based learning. For purposes of this article, Web-based instruction refers to asynchronous, text-based information that is delivered to...
the student via the Internet. Various links to supplemental sources and feedback mechanisms are also provided.

There is currently little information that reports on Web-based experiences in speech-language pathology (Chial et al., 2000), but educators in other fields such as economics, psychology, physics, education, and nursing have published materials relative to their experiences (Arbaugh, 2001; Bodain & Robert, 2000; Cravener, 1999; Fredericksen, Pickett, Shea, Pelz, & Swan, 2000; Hurt, 1996; Kerka, 1996; Leong, Baldwin, Usatine, Adelman, & Gjerde, 2000; Milstead & Nelson, 1998; Stelzer & Gladding, 2001; Thiele, Allen, & Stucky, 1999; VandeVusse & Hanson, 2000; Wang & Newlin, 2000). Most of these studies relate to course design or projected merits and cautions that may be associated with Web instruction. Others focus on learners’ attitudes and opinions toward Web-based instruction (Arbaugh, 2001; Fredericksen et al., 2000; Hurt, 1996; Wang & Newlin, 2000).

Wang and Newlin (2000) compared traditional classroom instruction with Web-based learning and attempted to identify attributes of students who did well in the latter form of instruction. They compared the perceptions of 51 students who participated in an undergraduate psychology class online and 66 students who participated in the same course in a traditional classroom. Web students’ perception of the quality of instruction was described as “highly comparable” to those of students in the traditional classroom, but there were differences between the two groups. On the whole, students who chose the traditional classroom achieved significantly higher scores on the final examination and significantly higher course grades than the students who participated online. Conversely, in a survey of more than 1,000 students taking Introduction to Psychology and Freshman Seminar at State University of New York (SUNY)-Herkimer Community College, 94% of students who completed the Internet-based course were of the opinion that they learned as much or more than they would have in a classroom-based course (Fredericksen et al., 2000). Retention was higher in the Web-based classes, with 82% of the original students completing their courses as compared to 78% of students in traditional classes.

Several variables have been proposed to relate to the successful completion of Web-based instruction. Bodain and Robert (2000) indicated that success may vary by academic discipline and by learner characteristics. VandeVusse and Hanson (2000) suggested that the degree to which Web students are willing and able to assume responsibility for their own learning was crucial to their success. Wang and Newlin (2000) found that Web students’ success (i.e., their course grade) was significantly related to their tendency to enjoy cognitive challenges and to be inquisitive. Fredericksen et al. (2000) reported that higher levels of self-perceived learning were consistent with levels of teacher and classmate interaction, access to technical support, and perceived levels of participation. More mature students (36–45 years of age) reported greater learning satisfaction than younger students (16–25 years), and women reported greater satisfaction than men.

Graduate education not only requires a student to know an area of study in more depth, but it also presents the student with role models for professional behavior and practice. Thiele et al. (1999) and Milstead and Nelson (1998) completed studies related to the success of Web-based courses at the graduate level. Only Thiele et al. attempted an objective study of results. Fifty-eight undergraduate students were surveyed after their first nursing theory course and 13 graduates after their first nursing informatics course. Although graduates and undergraduates responded similarly in some respects, there was a difference in that graduates were more likely to use the Web to problem solve, that is, to search for answers to their own questions. Undergraduates were less likely to search for answers on their own and were more concerned that “they had missed important information because the technology was not working” (p. 202).

Speech-language pathology, because of the acoustic and dynamic nature of course content, presents special challenges to teachers on the Web. Chial et al. (2000) described the progress toward computer integration into distance learning and identified information that was needed to judge the effectiveness of any distance learning program for speech-language pathology. Three of the needs were to identify the impact of individual differences on success, the relationship between various student learning styles and technology, and the aspects of Web-based instruction that were likely to affect entire programs rather than isolated courses. The present study is an intrasubject design that attempts to address these questions. Students with experience both in Web and in traditional classes responded to a survey reflecting their experience in Web-based graduate speech-language pathology courses.

The specific aims of this study were to determine (a) whether graduate students in speech-language pathology expressed greater overall satisfaction with Web-based as compared to classroom-based instruction, (b) whether students’ satisfaction with Web-based instruction correlated with their reported experience with computers or the number of previous Web courses they had taken, and (c) the aspects of Web-based versus traditional classroom instruction that correlated with perceived satisfaction.

Method

Participants

Sixty-eight graduate students majoring in speech-language pathology and taking a Web-based graduate class chose to participate in this study. There was an equal number of students (n = 32) in their first and second year of graduate study, 3 students were nondegree, and 1 did not respond to the query. All of the students except 2 accessed the courses via home computer. The remaining 2 used a university computer. Students varied in their amount of computer and Web experience (Table 1).

Students also varied in their degree program and work experience. Thirty-seven of the students were enrolled in a Web-based degree program that led to a master of science
in speech-language pathology and were working as speech-language pathology assistants (SLPAs) in the public schools during the time they were taking the course. These SLPAs had obtained a bachelor’s degree in speech-language pathology. Thirty-one students were enrolled in a traditional degree program that was largely classroom based. These students were not employed in the public schools. All except 2 had completed a bachelor’s degree in speech-language pathology. Those 2 had bachelor’s degrees in related fields, but had completed preliminary courses such as phonetics, normal speech and language development, linguistics, and a survey of speech and language disorders.

To explore the biographical differences between the students enrolled in the Web-based degree program and the traditional program, groups were compared on the basis of age, Graduate Record Exam (GRE) scores, experience with computers, and experience with Web-based courses. The results are listed in Table 2.

In summary, students in the Web-based degree program tended to be older than students in the traditional degree program. They had more experience with Web-based classes, but had somewhat lower GRE scores. They did not differ in estimates of their own experience with computers. Because of the differences between the students in the Web-based degree program and the traditional program, the responses from each group were analyzed separately.

**Web-Based Courses**

Courses were created on Collegis, an Eduprise platform that used a Lotus Domino database. (Subsequently, the platform was changed to BlackBoard, with server management support maintained by Eduprise. BlackBoard seemed easier for instructors to learn.) Courses were delivered in text-based lectures that were posted on the classroom site once a week for each of the 15 weeks of the semester.

Although the lecture system was considered asynchronous, students were encouraged to complete each week’s work in a timely fashion. Lectures often contained video, audio, or customized links to supplement class material. References to related sites on the World Wide Web were also included in lectures. Students consistently had access to the forum, where discussions occurred and general announcements could be made. They were invited to communicate with the instructors and each other via the forum and e-mail. A virtual library was available to support class assignments. Some teleconferencing was used on an infrequent basis, and usually a class would meet face-to-face once a semester to review materials together or to make oral presentations. Grades were based on presentations or projects, class participation, and tests. All students were supported by technical staff who were ready to assist with computer-related problems.

The 68 students represented two graduate classes. One was devoted to voice disorders and therapy and the other to cognitive disorders and therapy. A limitation of the Web-based program used to structure the courses was that videos could be no longer than a few minutes. It was believed that longer video examples were needed for the voice course; therefore, each student also received a videotape that supplemented Web instruction.

### Table 1. Student experience with technology.

<table>
<thead>
<tr>
<th></th>
<th>None</th>
<th>Minimum</th>
<th>Moderate</th>
<th>Extensive</th>
<th>No reply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computers</td>
<td>0%</td>
<td>24%</td>
<td>67%</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>Web courses</td>
<td>48%</td>
<td>16%</td>
<td>4%</td>
<td>26%</td>
<td>5%</td>
</tr>
</tbody>
</table>

* Limited to word processing; ^1 1 class; ^2 2-3 classes; ^3 4 classes.

### Table 2. Biographical characteristics of students in relation to the degree program in which they were enrolled and according to their progress in their program.

<table>
<thead>
<tr>
<th>Class</th>
<th>Age</th>
<th>GRE score</th>
<th>Web course experience</th>
<th>Computer experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web degree</td>
<td>30.92</td>
<td>767.81</td>
<td>2.65</td>
<td>2.19</td>
</tr>
<tr>
<td>Traditional degree</td>
<td>24.28*</td>
<td>953.44*</td>
<td>1.40*</td>
<td>1.94</td>
</tr>
<tr>
<td>First-year students</td>
<td>27.80</td>
<td>880.64</td>
<td>2.19</td>
<td>2.91</td>
</tr>
<tr>
<td>Second-year students</td>
<td>27.50</td>
<td>830.66</td>
<td>1.94</td>
<td>2.72</td>
</tr>
</tbody>
</table>

Note. GRE = Graduate Record Exam; NA = not applicable.

* Verbal plus quantitative score. * 1 = no previous Web course; 2 = 1 previous Web course; 3 = 2–3 previous Web courses; 4 = 4 previous Web courses * 1 = no experience with computers; 2 = word processing experience only; 3 = moderate experience; 4 = extensive experience.

*p < .05*
Procedures

Students were given anonymous satisfaction surveys composed of 66 statements about classes taught in a Web-based and in a traditional face-to-face format. They were asked to respond on a 5-point Likert-type scale, where 1 = strongly disagree, 2 = moderately disagree, 3 = neutral, 4 = moderately agree, and 5 = strongly agree. An NA, not applicable, choice was also available, but was assigned no numerical rating.

Statements for the scale were customized from the literature about Web-based instruction after consultation with faculty who had been involved with teaching Web-based courses. Statements that were considered ambiguous were revised or eliminated. After the statements were constructed, three faculty members were asked to independently decide the category that best described each statement. If there was disagreement on the category for an item, a fourth faculty member was queried. Some statements were designed to elicit a student's impressions of Web-based learning in general. For example, “I am equally as likely to ask questions in Web-based classes as in classes taught in a traditional classroom.” Additionally, four separate categories were identified:

- **Technological ease:** Related to ease of access to hardware and the ability to use Web links, and so forth. For example, “I frequently have technology-related problems when connecting to the Internet.”

- **Instructor interaction/communication:** Concerned the ability to have interaction or communication with the course instructor. For example, “Instructors in Web-based classes are interested in what I have to say.”

- **Student and class interaction/communication:** Indicated the ability to have interaction or communication between and among students. For example, “I frequently use the forum to discuss lecture questions with other students.”

- **Student learning style:** Concerned aspects of learning in which students were asked to reflect on themselves as learners. Statements also required them to react to situations that might facilitate their individual access to knowledge as it was available in Web-based instruction. For example, “I prefer printing my notes from Web-based classes as opposed to taking notes in a traditional classroom.”

Of the 66 statements on the student satisfaction survey, eight were fashioned to elicit overall satisfaction with Web-based instruction directly, either by agreement with direct statements such as, “I prefer taking Web-based classes,” or by agreement with statements of more general attitude such as, “I am able to maintain the motivation required to succeed in my Web-based classes.” The remaining statements were constructed to measure reactions to specific topics, such as learning style and technological ease.

To examine intrarater reliability, five statements on the survey were paired, for a total of 10 statements. Statement pairs were phrased from opposite perspectives. For example, a statement concerning class interaction was “I put more thought into my comments in traditional classes than Web-based classes,” but the reverse statement was “I put more thought into my comments in Web-based classes than traditional classes.” Opposite statements were separately embedded at different points within the survey so as not to be detected too easily. The responses from one of each pair of opposite statements were transposed and a correlation coefficient was calculated. Interrater reliability as determined by Spearman’s rank correlation was significant ($r_s = .81; n = 64; p < .01$).

Analysis

Survey responses, including demographic information, were entered into a computer program. Responses to statements were initially analyzed by descriptive statistics (medians). Mann-Whitney tests were used to identify differences between Web-based and traditional students. Satisfaction with Web-based instruction was correlated with the student’s expressed technological ease, instructor interaction, student/class interaction, and student learning style by application of Spearman's rank correlation.

RESULTS

Responses to the eight statements directly concerning attitudes toward and satisfaction with Web-based instruction were different for the two groups. Students in the Web-based program showed strong satisfaction with the Web-based format ($Md = 4.5$), but traditional students did not ($Md = 2$). Greatest disagreement between the groups was in response to the statement, “I prefer taking Web-based classes.” Most agreement was reached in response to statements such as, “My test grades in Web-based classes are consistent with my grades in traditional classes,” or “The quality of instruction in classes taught on the Web is adequate.” There was not a significant correlation between the students’ satisfaction with Web-based instruction and how far they had progressed in their studies (i.e., first or second year) or between their satisfaction and the number of Web-based courses they had previously taken.

Technological Ease

Responses from both groups, those seeking Web-based degrees and those seeking traditional degrees, indicated a significant correlation (Web-based: $r = .408; n = 34; p < .05$) (traditional: $r = .413; n = 30; p < .05$) between their satisfaction with Web-based instruction and their ease of manipulating the computer, navigating the Web, and using other technological aspects of Web-based instruction. The greatest difference between groups was that traditional degree students were less positive ($Md = 3$) than the Web-based students ($Md = 5$) concerning their ability to receive assistance with technical problems. Both groups agreed that once professors were notified of difficulties, they were helpful in solving technological problems.
Instructor Interaction

The responses from students seeking Web-based degrees indicated a significant correlation ($r_s = .787; n = 36; p < .01$) between their satisfaction with Web-based instruction and their overall interaction with Web instructors. There was “moderate agreement” ($Md = 4$) with statements indicating ample opportunities to ask questions and perceptions that the instructors were interested in students’ opinions and progress. There was somewhat less agreement with statements indicating ample opportunities to interact with ($Md = 3.5$) and get to know ($Md = 3.5$) the instructor. Traditional students taking Web-based courses indicated that both interaction and opportunity to get to know the instructor in Web-based classes was unsatisfactory ($Md = 2$ for both). Both student groups indicated some difficulty with maintaining motivation in a Web-based course ($Web-based Md = 3.5$; traditional $Md = 2$).

Student Interaction

For students pursuing a Web-based degree, there was a significant correlation ($r_s = .609; n = 36; p < .01$) between their expressed satisfaction with Web courses and their ability/willingness to interact with other cyber students on the forum. They strongly agreed with statements indicating frequent use of the electronic forum to communicate with classmates, request clarification, and discuss academic issues. They strongly agreed that they were active participants in Web-based classes ($Md = 5$). Students from the traditional program did not indicate frequent use of the forum ($Md = 1$) for discussion or communication and tended not to view themselves as active participants in Web classes ($Md = 2$).

Learning Style

For both groups of students, there was a significant positive correlation between their responses concerning learning style consistent with Web-based instruction ($Web-based r_s = .754; n = 35; p < .01$; traditional $r_s = .420; n = 29; p < .05$) and expressed satisfaction with their Web-based courses. Both groups agreed that techniques that expanded their usual Web experience (i.e., audio–video links and links to related Web sites) were helpful supplements to class information. Both groups enjoyed reading lectures at their convenience. Students in the Web-based program strongly agreed that it was helpful to have the delays that frequently and naturally occurred in Web communication, thereby allowing them to organize their thoughts before responding to questions posed on the forum. Students from the traditional program were neutral. Students from the Web-based degree program strongly agreed that they enjoyed printing class notes rather than writing them. Students from the traditional program expressed moderate disagreement.

Miscellaneous

Some statements did not easily fit into a category and were considered separately. Students from the Web-based program strongly agreed that Web-based courses were convenient and moderately agreed that course content was clear. They also agreed that taking the course improved their Internet skills. They were secure that once they printed a lecture, they had all the needed information. Students from the traditional program were less enthusiastic and moderately disagreed that Web-based learning helped improve their Internet skills.

POST HOC ANALYSIS

Students in each degree program responded to the satisfaction survey statements in different ways. These differences might be attributable to self-selection, that is, students who enjoyed working with computers might likely choose that medium for instruction. However, there was no significant difference in how the students rated their skills with regard to computer use. There could be other differences that separated the students. A study of Web-based learning by Wang and Newlin (2000) found that certain cognitive and motivational characteristics correlated with success in Web-based courses. In the post hoc study, the surveys used by Wang and Newlin were given to a sample of students participating in the present study. A total of 33 students responded. Nineteen of the students were enrolled in the Web-based curriculum, and 14 had just taken a Web course but were enrolled in a traditional curriculum.

Motivational factors that Wang and Newlin (2000) found predictive of academic success for their Web students were a high degree of inquisitiveness, as measured by responses on the Need for Cognition Scale (NFCS; Cacioppo & Petty, 1982), and more self-sufficiency (i.e., an internal locus of control), as measured by responses to the Locus of Control Scale (LOCS; Rotter, 1966).

The NFCS is composed of 34 statements such as, “I really enjoy a task that involves coming up with new solutions to problems.” Students indicated disagreement or agreement by responding on a 9-point Likert scale. Statements were intended to measure an individual’s tendency “to engage in and enjoy thinking” (Cacioppo & Petty, 1982, p. 116).

The LOCS, a 29-item survey, attempts to measure an individual’s preference for internal or external locus of control. Students are asked to select the more nearly correct of two statements for each item. For example: (a) “Without the right breaks one cannot be an effective leader” (external locus), or (b) “Capable people who fail to become leaders have not taken advantage of their opportunities” (internal locus). An internal locus is interpreted as a generalized expectancy for reinforcement to be dependent on an individual’s own ability and effort rather than on forces outside of the individual. An external locus indicates expectancy for reinforcement to come from the environment.

The aim of post hoc analysis was to determine whether there were positive correlations between the students’ grades in the Web-based class they had just completed and (a) their expressed inquisitiveness as measured by the NFCS, and/or (b) their reliance on internal versus external
reinforcement as measured by the LOCS. Separate Spearman rank correlations were calculated between the students’ grades and their responses to the two scales, NFCS and LOCS. Neither correlation was significant. As Wang and Newlin (2000) found significant correlations between LOCS and student grades, it is not clear why significance was not found in the present study. The Wang and Newlin study involved undergraduate classes. Graduate students, as those in this study, have more academic experience and may have learned to manipulate motivational factors so that locus of control was less meaningful to their academic success.

There was a weak difference between the students (z = 1.25; n = 20; p < .08) in regard to the NFCS. Students in the traditional degree program expressed a higher need for cognition score than did those seeking a Web-based degree. This finding may relate to the higher GRE scores of the students involved in the traditional degree program.

**DISCUSSION**

This study examined Web-based instruction by analyzing responses from graduate students working toward a master of science degree in speech-language pathology. The 68 students who participated in the study presented two different perspectives—that of students who had enrolled in a Web-based degree program and that of students who had enrolled in a traditional degree program. Both groups were taking the same Web-based courses as part of the requirements toward degree completion. Both groups were successful in completing course requirements, and there was not a significant difference between the groups in the final grades achieved.

Student satisfaction surveys validated each groups’ choices of degree programs, in that Web-students indicated more consistent and generally greater satisfaction with Web instruction than did traditional students. Some of the differences in responses between the two student groups might relate to differences in their willingness to invest in the Web experience. Extracting meaning and satisfaction from Web classes was vital to students in the Web-based curriculum, and their success as students depended in part on their ability to do so. Active involvement of traditional students was somewhat less critical, as they would take only a few Web courses. The number of Web courses taken, however, did not seem to affect a student’s satisfaction with Web instruction. There was not a within-group correlation between the number of Web courses students had completed and their satisfaction with Web-based instruction. The responses of both groups indicated areas of concern and strengths on which educators might focus in order to assist with counseling students in regard to Web-based instruction.

The Chial et al. (2000) review of distance learning in speech-language pathology indicated that use of a teaching medium should depend on knowing aspects of the medium that are likely to affect students across an entire program. This study included students who were completing a graduate degree by Web-based instruction. Group concerns related to several variables. Diminished interaction with the instructor was somewhat of a concern. Students expressed low agreement that they had sufficient interaction and had established a personal relationship with their instructor. Maintaining motivation in a Web-based class was a concern for both classes. Neither of these deficiencies was sufficient to prevent the students from being successful in their studies; both classes were considered and planned for when developing a Web-based class.

Those students involved in the Web-based degree program responded more positively than students in the traditional course concerning their ability to communicate and build ties with classmates. They expressed moderate-to-strong agreement that these ties were successfully established. Being able to have open discussions on the forum and to interact by e-mail seemed sufficient to build and maintain helpful relationships. In contrast, this was the variable with the lowest positive responses from traditional students taking the Web-based course. Their disappointment with the Web as a medium for class interaction may relate to the fact that these students lived in the same city. They had both previous and concurrent classes together that were not Web-based.

Interaction habits established before the Web-based class appear to have interfered with the formation of new patterns. Clearly, these students did not feel that the interaction provided by the Internet supported their needs. Integrating preexisting groups into a Web class while honoring established friendships and support is a challenge for Web-based instructors. (A course designed to assist in evaluating Web-based courses is available at http://seamonkey.ed.asu.edu/~alex/teaching/WBI/outline.html.)

Chial et al. (2000) also indicated that studies of distance learning should investigate the relationship between learning styles and technology. In this study, students were asked to respond to statements relating to how they learned. Web-based students were positive about all variables associated with learning style and Web interaction, but traditional students were not. For example, traditional students indicated that they learned better if they wrote class notes by hand rather than printing them.

Although both groups of students gave a neutral response to statements such as “I am primarily a visual (auditory) learner,” the traditional degree students seemed to feel that they benefited more from both hearing lecture/classroom information and having to process that information by writing it down. Methods of increasing auditory as well as visual input in Web instruction, and suggestions for techniques that assist students in integrating and assimilating information, need to be devised.

Finally, Chial et al. (2000) suggested that studies of distance education attempt to identify individual differences that impact student success. Although Wang and Newlin (2000) found correlations between student grades and scores indicating a need for cognition and an internal locus of control, their results were not duplicated in this study. This lack of significant findings indicates that differences observed in the undergraduate population may not apply at the graduate level because of students’ greater specialization and motivation.
In summary, students enrolled in a Web-based degree program judged their Web-based course as successful, and major variables associated with the course were correlated with their satisfaction. Some reservations associated with not getting to know their instructors and maintaining motivation were identified. Students from a traditional degree program were also enrolled in the same Web-based class and indicated less satisfaction with their experience. They expressed concern about the lack of class and instructor interaction. The findings of this study would indicate that Web-based instruction may be an efficient and effective method of teaching some students, but is not the optimal method of instruction for all students. Certainly, strong orientation programs that address technology and methods of interacting on the Web are necessary. A student’s determination to integrate into the Web experience is helpful for building a cohesive and supportive class experience.

REFERENCES


Contact author: Patricia B. Blackwell, PhD, Division of Communicative Disorders, Myers Hall, University of Louisville, Louisville, KY 40202. E-mail: pbblac01@louisville.edu