Technology supplements to college textbooks, such as self-guided quizzes and exercises available over the Internet, have become commonplace. The current study examined student perceptions regarding the utility of technology supplements that accompanied a public speaking fundamentals textbook. At semester’s end, students reported the supplements to be less useful than they had expected. The supplements were perceived to be more useful by females than by males. The supplements were reported to be more useful when they were required than when they were not. Students perceived technology supplements to be most helpful as study aids and speech preparation tools, but only when they worked properly, were required, and were related directly to course objectives. Instructors are ultimately responsible for ensuring that technology supplements function properly for their students.

Keywords: Technology-Enhanced Learning; Public Speaking; Higher Education; Instructional Supplements; Textbook Marketing

Technology pervades the United States higher education system. In fact, the use of “technology has become a daily part of the educational process for most faculty members” (Clery & Lee, 2002, p. 1). Consequently, research to determine which technology tools, if any, actually enhance student learning is warranted (Kuehn, 1994; Lane & Shelton, 2001; Sprague, 1993; Waldeck, Kearney, & Plax, 2001).

The growing number of articles published on this subject in recent years suggests that communication scholars are committed to studying “the efficacy, benefits, or
pitfalls of a computer-mediated approach to education” (Palloff & Pratt, 1999, p. xvi) and the utility of different technologies as they aid instruction (Daly, 2002). Technology-based articles have been published, for example, on issues related to computer-mediated communication (e.g., Brandon & Hollingshead, 1999; Hacker & Wignall, 1997; Lane & Shelton, 2001), distance learning (e.g., Carrell & Menzel, 2001; Easton, 2003), the paradoxes of online work (Shedletsky & Aitken, 2001), methods for teaching presentation software (Downing & Garmon, 2001), dealing effectively with students’ preinstructional beliefs (Jackson & Wolski, 2001), identity and power issues (Wood & Fassett, 2003), student peer critiques (Sims, 2003), and speech construction (Cronin, 1994).

One particularly interesting line of research focuses on a gendered relationship between technology use and anxiety. More specifically, several studies report that women experience more computer anxiety than men (e.g., Chua, Chen, & Wong, 1999; McIlroy, Bunting, Tierney, & Gordon, 2001; Schottenbauer, Rodriguez, Glass, & Arnkoff, 2004; Williams, Ogletree, Woodburn, & Raffeld, 1993). Others indicate no significant differences with regard to gender (e.g., Honeyman & White, 1987; Howard & Smith, 1986; Scott & Rockwell, 1997). Still others claim such differences appear to be a function of different levels of experience (e.g., Chen, 1986; Colley, Gale, & Harris, 1994; DeLoughry, 1993). Although the relationship between gender and technology is unclear, the conflicting results suggest a need for further investigation.

One recent technology-related development is the introduction of instructional supplements like CD-ROMs and book companion web sites augmenting introductory textbooks. Textbooks have long been acknowledged as an important learning tool to accompany the college classroom experience (although the notion of textbook utility is certainly debatable). As textbook costs continue to skyrocket, however, a feisty debate has emerged regarding the purpose of textbook technology supplements (Roediger, 2005). That is, do such ancillary materials really serve to enhance learning, or are they merely a marketing tool, a reason to increase textbook costs even more?

Little, if any, research has been published to date evaluating the utility of textbook technology supplements. Do students even use them, and why or why not? Do students find them helpful? Do they serve a useful pedagogical purpose when integrated into the curriculum? Essentially, are they worth the time and money invested in their development? Hence, this study sought to answer the following research questions:

RQ1: After using them, do students perceive textbook technology supplements to be more or less useful than they had expected?

RQ2: Do female students differ from male students with respect to their perceptions of the degree to which textbook technology supplements are useful to their learning?

RQ3: To what degree does making technology supplements a course requirement influence student perceptions of their utility?

RQ4: What reasons do students identify for their perceptions of technology supplements?
Method

Participants

Pretest. Participants for the study consisted of 792 undergraduate students enrolled during the spring semester of 2003 in 48 sections of the public speaking fundamentals course at a medium sized Midwestern U.S. university. Of all students enrolled, 299 students (37.8%) were enrolled in 19 sections that required the use of electronic textbook supplements, and 493 (62.2%) were enrolled in 29 sections in which the use of electronic textbook supplements was voluntary. Four hundred and seven participants (51.4%) were male, 315 participants (39.8%) were female, and 70 participants (8.8%) did not indicate their biological sex. First-year students made up the largest portion of the sample at 516 students (65.7%), followed by 164 sophomores (20.9%), 65 juniors (8.3%), and 40 seniors (5.1%). The 17–22-year-old age group made up the largest portion of the sample at 703 participants (88.8%).

Posttest. Of the 792 undergraduate students who completed the pretest, 674 (87.6%) completed the posttest questionnaire at the end of the semester. Of these, 270 students (40%) came from the sections that required the use of textbook technology supplements, and 404 students (60%) came from the sections where use of textbook technology supplements was voluntary. In the posttest sample, 336 respondents (55.4%) were male, 271 respondents (44.6%) were female, and 67 respondents (9.9%) did not indicate their biological sex. As was the case in the pretest sample, first-year students made up the largest portion at 452 participants (67.3%) followed by sophomores at 140 participants (20.8%), juniors at 46 participants (6.8%), and seniors at 34 participants (5.1%).

Procedures

This study employed a quasi-experimental pretest and posttest survey design and triangulates qualitative and quantitative data. The research team examined Sellnow’s (2003) public speaking textbook, accompanying CD-ROM, and companion website in order to create 22 technology-assisted assignments that in toto utilized each of the electronic supplement tools offered with the text. Students enrolled in each of the sections that required the use of electronic textbook supplements completed about two of these assignments per week. Each assignment was due the same week in all sections. The same 22 assignments were distributed to students in the volunteer-use sections as well, but presented merely as helpful exercises they could complete if they wanted to do so.

More specifically, the assignments focused on five electronic supplement types:

1. Internet activities directed students to a particular website where they might complete a personal inventory or find a resource to help prepare for an upcoming speech.
2. Online Infotrac exercises asked students to read an article that supplemented their assigned chapter reading for the day and to complete a short paper about what they learned.

3. Hypercontent weblinks directed students to websites to help brainstorm for quotations, rhetorical appeals, and other speech construction strategies they could use in upcoming speeches.

4. Internet tutorial quizzes asked students to answer ten multiple-choice questions per chapter to assess their understanding of chapter material.

5. CD-ROM speech clips enabled students to watch a student or a professional speaker and to critique the sample speech based on supplied criteria.

Regularly scheduled instructors (mostly graduate teaching assistants) were asked to choose whether they wanted to teach sections in which the technology-supplemented assignments were required or voluntary. Instructor preferences were honored to reduce the potential for subtle selection bias based on instructor technophobia. Students enrolling in the classes did not know in which treatment they were participating. In fact, the nature of this teaching experiment was not revealed to students until the end of the semester. Past experience indicates that students generally choose a section of this course in which to enroll primarily based on scheduling convenience.

Students in the sections that required use of electronic textbook supplements earned two points for completing each technology assignment. Students in the sections that did not require electronic supplement assignments completed alternative assignments designed to meet similar course objectives. All instructors met weekly to agree on how they would address the course objectives in their lessons. In addition, all instructors who taught in the required-use sections met weekly to agree on how they would uniformly integrate the technology assignments into the lessons.

Measures

On the first day of class, a pretest survey was administered to all 46 sections. Before administering the pretest, each textbook technology supplement was generally described to students. The pretest survey was designed to identify students’ preexisting perceptions about the utility of textbook technology supplements. Students were also asked to respond to one open-ended question inquiring which technological supplements they thought would be most useful and why, as well as to a second question inquiring which supplements they thought would be least useful and why. Posttest surveys were administered to all 46 sections during the last week of the semester. The posttest survey was identical to the pretest except that the items were phrased in the past tense.

In addition to the two open-ended items about supplement utility, participants responded to five items inquiring about the perceived utility of electronic supplement (one question for each different supplement type). Participants answered questions
like “How helpful do/did you believe a CD-ROM supplement will be/was?” Responses were reported on a four-point scale ranging from “useless” to “very helpful.” The five items were averaged and used as composite scores for perceived utility of electronic supplements. These composite scores exhibited good reliability at pretest ($\alpha = .80, M = 2.93, SD = .49$), as well as at posttest ($\alpha = .88, M = 2.57, SD = .74$).

**Data Analysis**

To answer the first three research questions, a $2 \times 2 \times 2$ mixed factorial ANOVA was conducted. The first factor was the time of testing (either pretest or posttest), the second factor was treatment condition (either assigned or voluntary use of electronic supplements), and the final factor was biological sex (either male or female). Time of testing was a repeated measure. Cell means and standard deviations were examined to determine the direction of significant differences.

To answer the fourth research question, a qualitative content analysis was conducted on the open-ended responses to discover emergent themes using a grounded theory approach. This approach was appropriate because researchers could then discover themes “directly from the data rather than from a priori assumptions, other research, or existing theoretical frameworks” (Taylor & Bogdan, 1998, p. 137). All qualitative coding occurred through the collaboration of two raters.

**Results**

The first research question examined the overall perceived utility of textbook technology supplements by students. Cell means are reported in Table 1. Results of the mixed factorial ANOVA revealed a significant main effect for time of testing, $F(1,1295) = 512.61, p < .001$, partial $\eta^2 = .28$. Inspection of the cell means indicates that across all groups, supplements were regarded at posttest as less useful than students had initially expected them to be. It is important to note, however, that the values of all mean scores exceeded 2.0, the scale’s theoretic midpoint.

**Table 1** Time of Testing, Treatment Condition, and Biological Sex Means and Standard Deviations for Perceived Utility of Electronic Supplements

<table>
<thead>
<tr>
<th>Variable</th>
<th>Time of testing</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pre-test</td>
<td>Post-test</td>
<td>n</td>
<td>Pre-test</td>
<td>Post-test</td>
</tr>
<tr>
<td>Overall perceived utility</td>
<td>2.939 (.495)</td>
<td>709</td>
<td>2.132 (.747)</td>
<td>594</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological sex</td>
<td>2.876 (.501)</td>
<td>401</td>
<td>2.067 (.738)</td>
<td>332</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>3.021 (.474)</td>
<td>308</td>
<td>2.215 (.753)</td>
<td>262</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronic supplement use condition</td>
<td>Required</td>
<td>3.014 (.449)</td>
<td>271</td>
<td>2.502 (.619)</td>
<td>238</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not-required</td>
<td>2.893 (.515)</td>
<td>438</td>
<td>1.885 (.724)</td>
<td>356</td>
<td></td>
</tr>
</tbody>
</table>
The second research question examined whether women and men differed in their assessments of the helpfulness of technology supplements with respect to learning. Results of the mixed factorial ANOVA revealed a small but statistically significant main effect for biological sex, $F(1,1295) = 22.63$, $p < .001$, partial $\eta^2 = .017$. Inspection of cell means indicated that women overall perceived the supplements to be more useful than did men.

The third research question inquired whether there were differential changes in perceived utility of textbook technology supplements over time between students who were required to use the technology supplements and those who were not required to do so. Results of the mixed factorial ANOVA revealed a significant interaction effect between supplemental use condition and the time of testing, $F(1,1295) = 56.66$, $p < .001$, partial $\eta^2 = .042$. Bonferroni $t$-tests indicated that at pretest, the two treatment conditions did not differ ($M_{pre/vol} = 2.89$, $SD_{pre/vol} = .515$; $M_{pre/req} = 3.01$, $SD_{pre/req} = .449$). At posttest, the rated utility of the textbook supplements was lower for the voluntary use condition ($M_{post/vol} = 1.89$, $SD_{post/vol} = .724$) than for the required use condition ($M_{post/req} = 2.50$, $SD_{post/req} = .619$). However these post hoc contrasts also revealed that posttest mean utility scores were significantly lower than pretest expected utility for both treatment groups. A further contrast comparing the amount of decrement from pre- to posttest for both groups did indicate that the drop in utility ratings was more dramatic for students in the voluntary supplement use classes than for students in the required supplement use classes.

Qualitative Results

The fourth research question inquired about reasons students offered for their perceptions of perceived utility of technology supplements. On pretest students were asked what supplements they expected to find most and least useful (and why), and then on posttest what they had in fact found to be most and least useful (and why).

Pretest. When students were asked on the pretest which supplements they expected to be most useful and why, the most prevalent theme was Internet activities, followed by Internet tutorial quizzes. This finding is not unusual given the fact that students today “assume everything they need to know is on the Internet” (Roediger, 2005, p. 1). The most commonly cited reasons for these high expectations were that the supplements would be (1) effective study aids and (2) easy to access and use.

Students in large numbers commented about the wealth of information on the Internet and how easy it would be to access and use. One student wrote, for example, “The Internet is the place where I get most of my information for anything. You can look up almost any book, or anything rather than buying it.” Others claimed, “I believe that just overall the Internet is the most useful. I feel that you can do anything on the web and it’s a good place to get materials from,” and the “Internet is most helpful to me. This is because it is easy to use and has unlimited information,”
and “anything on the Internet will be helpful to me as a supplement because it is easy to access and not difficult to use.”

Likewise, students reported a belief that Internet tutorial quizzes would be helpful as an effective way to monitor their understanding of course material. One student wrote, for example, “Quizzes will be most helpful because they test a student’s knowledge and let them know what they need to work on or study more.” Another claimed, “Internet tutorial quizzes will help me going in the right direction on knowing what I need to learn.” Still another offered, “Internet tutorial quizzes will be the best because you get quizzed and then the wrong answers are explained to you.”

The most prevalent themes to emerge regarding what students expected to be least useful were the CD-ROM and Infotrac exercises. The major reason for their low expectations of these materials focused on unfamiliarity with them. One student wrote, for example, “I don’t think Infotrac is going to be a big help to me because I really don’t know how to use it and I like using online papers at home.” Another claimed, “Because I do not use Infotrac enough to use it on a regular basis (I wouldn’t know how to use it).” Still another student stated, “I really don’t know since I have never used them.” A slight variation on this theme some students mentioned had to do with other professors who never used the electronic supplements that came with textbooks. For example, “I have never used a CD-ROM supplement and I don’t know if I would try one,” and “Technology textbook supplements are useless in the fact that they aren’t utilized.” In sum, “I have yet to see one [a supplement] that effectively helps you learn materials that professors actually grade on.”

Posttest. Posttest responses reflected which technology supplements students actually perceived to be most and least helpful and why. The most prevalent themes to emerge regarding the most helpful supplements identified the Internet, the Internet tutorial quizzes, and the CD-ROM. Reasons for this perceived helpfulness centered on them as study aids and as speech preparation tools.

One student wrote, for example, “I liked the tutorial quizzes because they were good for studying for exams and helped add variety to how we learn the information. Technology helps a lot!!” Another commented, “The Internet tutorial quizzes were the most helpful because they gave me an idea of questions that would be asked on the tests.” Many students also claimed that the CD-ROM was useful because it provided a visual example of each speech assignment they would be preparing. One student wrote, for example, “Watching others’ speeches was the most helpful because I’m a visual learner and I got a feel for what the upcoming speech was supposed to be like.” And another claimed, “The example speeches by other people were most helpful because it gave me a chance to see an actual speech like the one that I needed to do.”

As for least helpful tools, the CD-ROM again emerged as a theme as did “everything.” Reasons that emerged for these negative opinions differed between students in the required-use and volunteer-use sections.

Students in the required-use sections who claimed the CD-ROM was least helpful said that the CD-ROM failed to work properly in their computers. For example,
“Watching the speeches was the least helpful because my CD-ROM never worked” and “the CD-ROM supplement was the least helpful because most of the time it never worked in our computers.” Students in the required-use sections also complained when they did not see the relevance of the assignment. That is, they failed to see how the assignment was directly related to test or speech preparation. For example, “The technology assignments were just busy work, very few are helpful so it is a waste of time to do them.” Another student from a required use section wrote that the supplements were “not helpful because they were tedious and didn’t seem to relate to what we were doing in class.” And another claimed, “All of the technology supplements were not helpful. They didn’t help at all and I learned nothing from them. They were just busy work to me.”

Conversely, the only theme to emerge as a major reason the supplements were not useful in the volunteer-use sections was that students did not use them. In fact, 78% of the responses offered by students in the volunteer-use sections fell into this theme. Students wrote, for example, “all of the technology was a waste because I didn’t use any of it” and “I didn’t like it because I didn’t use it.”

Discussion

Results of this study suggest several implications regarding textbook technology supplement use in college classrooms. First, although students expected textbook technology supplements to be very useful, they reported them to be less useful than anticipated by the end of the term. This drop was more dramatic in those sections where textbook technology assignments were not required. Moreover, posttest responses to the open-ended questions suggest that technology failure—especially with respect to the CD-ROMs played a role in the drop in the required-use group. Hence, electronic supplements must work properly for students to perceive them as useful. Problem-ridden technology is probably worse than no technology at all.

While this appears to be an obvious conclusion, the question it raises is, whose responsibility is it to make sure the technology functions properly? Is it the textbook company’s responsibility, the campus instructional technology unit’s, students’, or instructors’? We suggest that, as with other classroom technology, instructors are ultimately responsible for making sure the electronic supplements work. This position also implies, however, that textbook companies provide full-time assistance to instructors and their students if necessary.

Second, results of this study suggest that females find textbook technology supplements to be more useful overall than their male counterparts. This conclusion contributes to the conflicting research about inherent gender bias in computer use. Our research contradicts Scott and Rockwell’s (1997) conclusion that women are less likely to adopt new technologies, as well as Williams et al.’s (1993) conclusion that males tend to score higher “on measures of aptitude and attitudes” than females. It also confounds existing research suggesting that females experience higher levels of computer anxiety than males (e.g., Chua et al., 1999; McIlroy et al., 2001;
Schottenbauer et al., 2004). Perhaps, females perceive technology supplements to be more helpful than males, regardless of anxiety level, aptitude, or attitude. Or, perhaps, given ever-accelerating rates of change in technology diffusion, females today are just as experienced with computers and technology as males, and thus experience is no longer associated with gender difference (Scott & Rockwell, 1997).

Prospectively, students typically expected the supplements to be useful study aids and speech preparation tools. Retrospectively, students reported that the supplements were indeed helpful only when they served as study aids and speech preparation tools. Overall, it must be remembered, the supplements were viewed as significantly less helpful at posttest than they were anticipated to be at pretest. This points to an important implication for teachers. Textbook technology supplements can be confidently assigned if they serve students as study aids or speech preparation tools. Otherwise, these materials may put off students. Instructors must clearly articulate such relevance to students. Failing to do so will likely result in students perceiving the assignments as mere busy work.

Finally, carefully selected assignments using textbook technology supplements as study aids and speech preparation tools must become course requirements if students are to realize the utility of them. Just as any assignment ought to be carefully planned in order to “foster the intellectual growth of students,” so must electronic textbook supplement assignments be carefully planned and integrated (Sprague, 2002, p. 349). Students in the volunteer-use sections reported on the posttest that the supplements were dramatically less useful than they expected them to be, simply because they did not use them. Assignments supplementing textbooks must be integrated and required, or students are unlikely to undertake them. Assignments that students fail to undertake are indeed useless.

Based on the results of this study, instructors at the research site subsequently reduced the number of textbook technology assignments by half, modified each remaining assignment to function clearly as a study aid or speech preparation tool, and made each of them a requirement in all sections. Instructors were trained to articulate how each assignment served one of these outcomes and were asked to share the rationale with their students when making each assignment.

This preliminary study would be well complemented by additional research that assesses not only student perceptions of usefulness, but also resulting student learning outcomes. For example, are student speeches better, examination scores higher, or student critiques stronger when such textbook technology supplement assignments are required? A post hoc examination of overall class grades (on the standard A-B-C-D-F scale) of students participating in the present study revealed that students in the required-use sections ($M = 3.11, SD = .978$) earned significantly higher grades than did students in the voluntary-use sections ($M = 2.95, SD = 1.045$), $t(732) = 2.13, p = .035$. This observation suggests a need for further study. Did the required-use sections earn higher grades, for instance, as a result of better speeches, better examination scores, or better outline construction? Which, if any, of the supplements contributed to the improvement? This study gives rise to questions on a more general level as well. Are some technology supplements better equipped to foster intellectual
growth than others? Are some better suited for certain courses or programs than others? These questions ought to be addressed as we continue to embrace technology in college classrooms.

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