E-Teaching and Learning Preferences of Dental and Dental Hygiene Students

Ann L. McCann, R.D.H., Ph.D.; Emet D. Schneiderman, Ph.D.; Robert J. Hinton, Ph.D.

Abstract: This project was conducted to identify student preferences for e-teaching and learning. An online Student Preferences for Learning with E-Technology Survey was developed to assess computer experiences, the use and effectiveness of e-resources, preferences for various environments, need for standardization, and preferred modes of communication. The survey was administered in May 2008 to all dental and dental hygiene students at Baylor College of Dentistry. There was an 85 percent response rate (n=366/432). About two-thirds of the students found college e-resources effective for learning. They preferred printed text over digital (64 percent) and wanted e-materials to supplement but not replace lectures (74 percent). They reported e-materials would “extensively” enhance learning, such as e-lectures (59 percent), clinical videos (54 percent), and podcasts (45 percent). They reported the need for a central location for e-resources (98 percent) and an e-syllabus for every course (86 percent) in a standard format (77 percent). One difficulty reported was accessing e-materials from external locations (33 percent). Students commented on the need for faculty training and standardization of grade posting. A qualitative theme was that e-resources should not replace interactions with faculty. Some infrastructure problems have been corrected. Planning has begun for standardization and expansion of e-resources. These improvements should enhance learning and increase the options for individualizing instruction, study strategies, and course remediation.

Dr. McCann is Associate Professor and Director of Planning and Assessment; Dr. Schneiderman is Associate Professor; and Dr. Hinton is Professor—all at Texas A&M Health Science Center Baylor College of Dentistry. Direct correspondence and requests for reprints to Dr. Ann McCann, Texas A&M Health Science Center Baylor College of Dentistry, 3302 Gaston Ave., Dallas, TX 75246; 214-821-3153 phone; 214-874-4575 fax; amccann@bcd.tamhsc.edu.

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Many decisions are being made in dental education about how to use technology for learning, yet there is little in the literature about the preferences of dental and dental hygiene students. This assessment project was conducted to identify student preferences for teaching and learning with electronic technologies at a dental school. The identified preferences would be used to meet an initiative in the Baylor College of Dentistry strategic plan for developing an e-technology plan, as well as allocating current and future resources. The information would also help faculty members decide how to teach their courses and disseminate course materials. Project results could potentially impact many aspects of the college, including creation of e-resources, structure of e-resources on the website, faculty e-training, and the digital infrastructure of the institution. Project results could also guide dental education and other colleges in their e-technology decisions.

Literature Review

According to Ruiz et al., e-learning is using “Internet technologies to deliver a broad array of solutions that enhance knowledge and performance” (p. 207). Other terms used are web-based learning (WBL) or online learning. E-learning can be synchronous (everyone at the same time) or asynchronous (not at the same time). Asynchronous learning is very appropriate for health professions students who have demanding clinical rotations or for busy practitioners who can make use of e-conferences or online continuing education. A related term is “blended learning,” a combination of e-learning and instructor-led learning. A learning management system is Internet-based software that manages the delivery and tracking of e-learning across an institution, such as Blackboard and WebCT.

Advantages

Chumley-Jones et al. reported three advantages of WBL: universal accessibility, ease in updating content, and hyperlinks for cross-referencing to other resources. Potomkova et al. reviewed twenty-four articles from 1996 to 2005 that studied the implementation and evaluation of web-based tutorials in medical education. They reported that WBL was necessary for learning problem-solving as well as implementing evidence-based medicine. A disadvantage of WBL
was the student tendency to print out all e-materials. They concluded that students preferred web-based over traditional lecture-based classes for accessibility, ease of use, freedom in navigation, high image quality (medical radiographs), and the advantage of repeated practice.

Ruiz et al.\textsuperscript{1} cite many advantages of e-learning, particularly the possibility for increased learning. They claim that “learning is a deeply personal experience: we learn what we want to learn” (p. 208) and that e-learning aligns well with this principle. E-learning is active, and the interactivity maintains a learner’s interest in the materials. It also provides a means for practice and reinforcement that increases learning. Additionally, there is increased accessibility to course materials (anytime and anywhere), the opportunity for personalizing instruction, and a gain in control over course content and pacing. For faculty, there is an increased ease in updating course content and distributing course materials. It also allows them to standardize course content and provide a sequence for learning. Educators become “facilitators of learning and assessors of competency” (p. 212) rather than distributors of content.

Divaris et al.\textsuperscript{4} published a 2008 European consensus paper about the dental student perspective on the ideal academic environment. They identified learning principles and aspects of a positive learning environment that strongly support WBL. They stated that the curriculum must be delivered with different methods to meet the needs of students with different learning styles and suggested a blended learning environment with both in-classroom information and on-demand with WBL. They claimed that most learning takes place outside of class through rehearsal and students need to feel in control of their own education with self-assessment on demand. WBL offers greater information retrieval and interactions with peers, colleagues, and faculty. It is also more appealing to students due to the graphic interfaces, multimedia content, and continuing upgrades of software. They cautioned that web information needs to be dynamic and not a passive repository of dated PowerPoint presentations.

Evidence-Based Dentistry

A major advantage of e-learning is the facilitation of evidence-based dentistry (EBD). Haden et al.\textsuperscript{5} defined evidence-based dentistry as an approach to oral health care that integrates systematic assessments of clinically relevant scientific evidence about a patient’s condition and history, with the dentist’s expertise and patient’s treatment needs and preferences. EBD treatment decisions require the best scientific evidence available, and online searches are crucial for identifying this information. A critically appraised topic summary (CATS) is a method for assessing a student’s ability to use EBD.\textsuperscript{6} Students review a case scenario, identify unknowns to explore, write a reasonable, researchable question in a standardized format (PICO: Patient Intervention Comparison Outcome), explore the literature to find and analyze the evidence, and then answer the question, as well as provide recommendations based on the analysis. Again, e-learning is central to the steps of identifying and analyzing the literature.

Schilling et al.\textsuperscript{7} described the testing of an e-module on evidence-based medicine (EBM). They compared a control group that attended a six-week family medicine clerkship only and an experimental group that both attended the clerkship and received training via the online EBM module. The experimental group outperformed the control group on the number of MEDLINE searches conducted during the clerkship (thirteen versus three) and on the quality of the literature search strategies for a case study (2.9 vs. 2.1 with 1=poor to 4=excellent). The experimental group was also more likely to report confidence in practicing EBM and learning from their fellow students (p<.05).

Collaborative Learning

As reported in the above study, another advantage of e-learning is the facilitation of collaboration. Ruiz et al.\textsuperscript{1} reported that e-learning has great potential for breaking “the isolation of learners” (p. 211). Advances in synchronous online education as well as weblogs, message boards, chats, e-mail, and teleconferencing create opportunities for collaborative learning.

Wiecha and Barrie\textsuperscript{8} reported on collaborative learning among general practitioners (GPs) in an asynchronous, online, continuing medical education course (CME). Twenty GPs in England, Bosnia, and New Zealand participated in a CME about treating type II diabetes. Twice a week for seven weeks they logged onto interactive evidence-based modules. They also applied the modules to a newly diagnosed, simulated patient that mimicked eighteen months of care. Treatment decisions were made collaboratively. After the course, the GPs reported changing their practices for diabetic patients based on this experience.
Wiecha et al.\(^9\) reported another collaborative e-learning experience with an online course for teaching patient interviewing to medical students. Ten students from two medical schools reviewed online modules about interviewing concepts and viewed videos that illustrated the concepts. They then participated in asynchronous discussion groups. Although this learning method was not compared to traditional methods, the students evaluated the course as well as participated in post-course interviews. In the evaluation, they rated the course highly and agreed that they had learned from each other. In the interviews, students stressed the benefits of e-learning, such as convenience and being able to learn when they were ready to learn.

**Comparable Learning**

Chumley-Jones et al.\(^2\) reviewed seventy-six research studies from 1996 to 2002 that evaluated WBL: forty-five descriptive (no data) and thirty-one evaluative (used control groups or pre-test/post-test, compared media, and/or qualitative methods). Regarding knowledge gains, the authors determined that WBL was comparable but not superior to other educational methods. Regarding learner attitudes, two studies showed a preference for WBL over slide/text and text materials. The most significant predictor of student satisfaction was download speed. The only significant design feature contributing to satisfaction was sound instructional technique. The authors concluded that WBL was a valuable addition to the educational armory but did not replace traditional methods such as lectures or text.

Solomon et al.\(^10\) found no differences in performance between e-learning and traditional learning at Michigan State University. They compared a group of medical students attending a series of six lectures (n=12) and a group watching CD-ROM modules from digital recordings of lectures (n=17). All students completed an examination at the end, and there were no differences in performance. Despite technical problems, the experimental group using the digital lectures strongly agreed or agreed that the modules could serve as an adequate replacement for live lectures for students on community rotations.

Howerton et al.\(^11\) found similar results at the School of Dentistry, University of North Carolina. Seventy-five first-year dental students in an introductory radiology course were placed in three groups: interactive CD only, interactive CD and lecture, and lecture only. Pre- and post-tests were administered to measure gains in knowledge, and an evaluation instrument was used to measure preferences. Although there was significant gain in knowledge for all three groups, there were no differences between the groups. The group that used both the interactive CD and lecture indicated a preference for the interactive CD.

**Student Preferences**

Today’s college students, born between the years 1982 and 1994, have been categorized as the Millennials or Gen Nexters. Their connections to each other and their learning are often through technology. Many of their relationships exist primarily online, and the “lines between the online and the live are blurred or nonexistent” (p. 49).\(^{12}\) Many on-campus students take online courses, reflecting their preference for life online. Some other characteristics that affect their technology preferences for education are the following: 1) consumer orientation—seek the best deal for their education; 2) instant gratification—may become impatient when e-course materials are not at their fingertips; 3) entitlement—deserve the best e-products; and 4) entertainment orientation—want learning to be entertaining.\(^{12}\)

Sweeny, who has conducted more than thirty-five focus groups with college groups, describes the characteristics of Millennials that impact their e-preferences as the following: 1) expect more choices, 2) prefer learning by doing, 3) prefer to keep their options open as long as possible, 4) expect customization of features and services, 5) expect services instantly, 6) have no tolerance for services that do not reliably work, 7) are good at multitasking, 8) love gaming online, and 9) are prolific e-communicators via text messaging, instant messaging, Facebook, MySpace, etc. Millennials assume they will be able to download their grades, course schedules, and other information automatically and get assistance whenever they need it.\(^{13}\)

Embi et al.\(^{14}\) developed a survey to assess the preferences of first- and second-year medical students at the University of Cincinnati for e-lectures delivered online or via personal digital audio/video devices. The majority of respondents were interested in being able to review recorded lectures, regardless of how or when it was presented. Ninety-seven percent were at least “minimally interested” in being able to listen to the lecture and view the slides after the lecture. Ninety-eight percent were at least “minimally interested” in doing this via the Internet. Eighty percent were at least “minimally interested”
in using a personal digital audio/video device (iPod), while 94 percent were at least “minimally interested” in viewing/saving it on their computer. Most students wanted the recordings either within the same day (48 percent) or the next day (22 percent).

ECAR,\(^{16}\) the EDUCAUSE Center for Applied Research, has conducted a number of national studies to assess the use of and preferences for information technology by undergraduate students. For the 2005 study, they surveyed 18,039 students at sixty-three higher education institutions in twenty-four states. They also interviewed eighty-two students and twenty instructional staff at seven institutions. They found that virtually all had access to the Internet and the majority had broadband access. Students preferred a “moderate” amount of IT in their courses and expected faculty to use technology well. They viewed technology as supplemental to their course experiences and preferred face-to-face interaction with their instructors. Sixty-four percent of the students reported that IT in courses improved their learning, and the most important factor contributing to learning was the skill of the instructor. Students reported positive experiences (75 percent) with course management systems (CMS), and those most positive experiences (75 percent) with course management systems (CMS), and those most positive agreed that IT allowed them to take greater control of their courses. They also wanted instructors to use CMS more extensively and consistently. The authors recommended the following: 1) comprehensive training for students and faculty, 2) standardization of learning environments and instructional approaches, and 3) fast, easy-to-use, and reliable IT services.

In the 2007 study, ECAR\(^{16}\) again conducted a large national survey (27,846 respondents at 103 institutions) and focus groups (fifty students at four institutions). They found that most students created PowerPoint presentations (92 percent), created spreadsheets or charts (88 percent), used course management systems (83 percent), and created graphics (Photoshop, 72 percent). More than 85 percent preferred e-mail for institution-related communications over paper mail and other modes. They continued to prefer “moderate” use of technology in their courses. They liked to learn by running Internet searches (72 percent). The features of CMS that they found most useful were keeping track of grades and getting access to sample exams and quizzes. Continued themes were that technology should not be a substitute for face-to-face interaction with faculty, and faculty were responsible for making sure that IT improved learning. The authors continued to recommend faculty training and improvement in the speed, reliability, and support of the CMS network.

In the 2008 ECAR study\(^{17}\) (survey of 24,000 respondents at ninety institutions and focus groups with seventy-five students at four institutions), a new focus was social networking. Students reported spending an average of 19.6 hours per week in online activities for work, school, or recreation. Just about one-half of the respondents (49.7 percent) reported that they used social networks for communicating with classmates about course-related topics. Regarding IT services, at 82 percent of the institutions, only 40 to 59 percent of the students reported that IT services were always available for coursework. Regarding attendance, just over 62 percent reported that they do not skip classes when online course materials were available. Only 44 percent of the students reported that “most” or “almost all” of their instructors used IT effectively. The authors summarized that students valued the convenience of IT and expected IT services to be available when needed. However, they were not looking for extensive use of IT in their courses, did not take a lot of online courses, and still attended classes. They preferred blended experiences in which IT was balanced with face-to-face interactions with faculty.

**Preference for Printed Text**

At least three studies have found that college students prefer reading printed text over reading online. In 2004, the National Association of College Stores released the results of a survey of over 4,000 students at twenty-one campuses. In this study, 71 percent preferred buying traditional textbooks, and only 11 percent preferred electronic versions. Some of the limitations of electronic texts reported were the following: cannot be given to friends, cannot be sold to used-textbook dealers or kept for permanent libraries, and limitations on where and the number of times they can be viewed. Although online texts could cost one-half the cost of printed versions, students had to give up a lot of freedom. One publisher commented that online texts best served as a supplement to paper texts rather than a replacement. “The real value of digitization is the interactivity, not the readability. . . . It’s silly to think that the book, as a printed item, is going to go away” (p. 4).\(^{18}\)

Spencer\(^{19}\) surveyed 245 business undergraduates and graduates about their online course-related reading habits and conducted follow-up interviews

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The results were that most respondents (67 percent) read less than 30 percent of their course materials online when provided with a printed alternative. They printed an item if they needed to work concurrently on other documents (92 percent), if it was long or complicated (82 percent), if they needed to study it for an exam or assignment (80 percent), and if they needed to take notes (75 percent). In the interviews, all participants expressed the preference of having course materials available both in text and online. Their reasons for preferring paper were the convenience of portability, reliability, annotation, highlighting, and ergonomics.

Another study found that reading paper is faster than reading online. Kurniawan and Zaphiris\(^\text{20}\) studied forty-two participants with a mean age of fifty that were divided into two reading groups: online and on paper. They found that reading paper was 10 to 30 percent faster than reading online. They speculated that the difference was associated with disorientation when reading long lines of e-text, which resulted in losing track and having to reread passages.

**Impact on Attendance**

One study specifically addressed the faculty concern that creating access to e-course materials would decrease attendance at lectures. Billings-Gagliardi and Mazor\(^\text{21}\) surveyed three classes of first-year medical students (n=298, 2004–2006) at the University of Massachusetts Medical School about their decisions to attend lectures. During this time period, lecture attendance was not required, at least 95 percent of lectures were recorded, and slides were provided online for viewing or downloading. Most respondents (83 percent) reported they made their decisions about whether to attend lectures on a case-by-case basis; the other 17 percent said they routinely attended. Of the sixty-two students who described the impact of e-materials on their decision making, 90 percent said they had no effect. Factors that did affect their decisions to attend included previous experiences with a lecturer (82 percent, 134/163), a cost-benefit analysis (50 percent, 82/163), predicted outcome of learning (40 percent, 65/163), and effect on personal lives (13 percent, 21/163). The authors concluded that students are generally predisposed to go to lectures and they will attend, regardless of the availability of e-materials, if they feel it will help them learn. They also believed that students viewed e-materials as supplements to lecture but would use them instead of attending if they thought a class would not be beneficial.

**Faculty Development**

Looney and Ramsey\(^\text{22}\) reported that students born in or after 1982 were “digital natives,” and expected “seamless integration of multimedia content into their learning experiences” (p. 88). This type of instruction generally required faculty development. They described a workshop developed for medical faculty at the University of Virginia Health System in 2004 entitled “Multimedia Bootcamp.” The workshop consisted of six, two-hour sessions spread over four weeks in the summer. Participants were required to capture still images, scan an image, shoot digital video footage, and import the footage. They also had a multimedia vendor day. Participant reviews were very favorable, and the workshop was continued, with the topics evolving as needed. Informal conversations revealed that many participants had put what they learned into practice.

**Literature Summary**

In summary, today’s college students expect access to e-course materials. E-learning has many advantages that support improved performance, particularly evidence-based practice strategies. However, e-learning does not necessarily result in greater learning than the traditional lecture and written text materials. The best use of e-learning is as a supplement to traditional methods in a blended learning environment. E-learning also works well for students working off campus at community clinics or for busy practitioners who want to attend e-conferences or take continuing education courses. Students want access to e-lecture materials within twenty-four to forty-eight hours. Fast download speed and good pedagogy are the characteristics of e-learning that matter most to students. Students expect faculty to have good technology skills, so faculty will need training in creating e-learning materials. Finally, contrary to faculty belief, access to e-learning materials probably does not of itself decrease motivation to attend lectures.

In order to identify dental and dental hygiene student preferences for e-teaching, e-learning, and communication, a survey project was conducted at the Baylor College of Dentistry. It also investigated students’ use of e-course resources and the effectiveness of those experiences.
Methods

Six faculty members of the Planning and Assessment Committee conducted a focus group with four e-technology representatives from the first- and second-year dental classes. The students were asked to identify the critical issues with using electronic technologies at the college. With the information they provided and other areas identified by the committee, the electronic Student Preferences for Learning with E-Technology Survey was created with Inquisite software and was pilot-tested. IRB approval was received, and the survey was administered online in May 2008 to all dental and dental hygiene students (n=432).

The survey instrument requested information about level of experience with computers, digital equipment used, frequency of using college resources and their effectiveness, preferences for learning in various environments, need for standardization of e-course materials, and preferred modes of communication. Each section of the survey had an open-ended question at the end: “Are there any other comments you wish to make about facilities, e-teaching and learning, or communication?” There was also an open-ended question at the end of the survey: “Is there anything else you would like to tell us?”

Descriptive statistics were used to analyze the survey data using SPSS software. Survey comments were coded into categories. Following this analysis, qualitative themes emerged that primarily reflected those found in the literature.

Results

There was an 85 percent response rate (n=366/432) to the survey. The students rated themselves as average (61 percent) or experienced users (34 percent). The overwhelming majority of students owned newer (<4 years old) computers (95 percent), and 24 percent owned both desktop and laptop models. They had high-speed Internet access (96 percent) and owned some type of MP3 player (90 percent). The majority used a Windows platform (89 percent) and had experience with Blackboard or WebCT (82 percent) course management systems.

Comments reported in this area primarily related to 1) areas in the college where students had trouble accessing the wireless network, 2) the need for longer library hours, 3) the need for a bigger and more available computer lab and/or modifications to it, and 4) difficulty accessing the school network from outside the college.

Use and Effectiveness of E-Resources

Regarding current e-resources (see Figure 1), there was a range in using them from 38 to 57 percent (“very much” and “somewhat” combined); the scale was “very much used,” “somewhat used,” and “not at all used.” About one-half to two-thirds of the students found them effective for learning (“very” and “somewhat” combined); the scale was “very effective,” “somewhat effective,” and “not at all effective.” Virtual microscopy (69 percent), digital skull atlas (68 percent), and digital tooth atlas (64 percent) were reported as the most effective, followed by discipline-specific National Board reviews (anatomy 59 percent; physiology 58 percent) and clickers (52 percent). Regarding clickers, 68 percent of the first-year students, who had most frequently used them, rated them effective for learning. Again, the students reported some difficulty in accessing e-course materials from external locations (33 percent “sometimes difficult/very difficult”).

Student responses regarding potential future resources are shown in Figure 2. They reported the following e-course materials would “extensively” enhance their learning: e-lectures (59 percent), videos of clinical procedures (54 percent), and podcasts (45 percent).

A number of student comments supported the need for recording lectures:

• “Electronic recording of all lectures so that they could be a reference in the future would be tremendously helpful.”

• “I learn much better if I have access to all course materials and lectures. It is very hard for me to sit and concentrate in a classroom all day long. If I could do it on my own time, it would help tremendously.”

• “Attendance is mandatory, and we are expected to be at class. However, for those of us with families, which require more extensive obligations, having a recorded lecture helps if we are not able to go to class or just as an extra way to study.”

Student comments also supported the need for videos of clinical procedures:

• “One of the main problems we have is not knowing exactly how to do a procedure. Sure we can read about it, but actually getting to see how it is done would GREATLY help us out.”
Figure 1. Percent used (very much/somewhat) and effective (very/somewhat) for current e-resources

*First-year students rated clickers as 68 percent effective for learning.

Figure 2. E-course materials reported to have the potential to “extensively” enhance student learning
“Live demonstrations are pertinent to seeing things and being able to get all the angles and ask questions. Being able to observe a video beforehand (to prepare questions or get in positions for that correct angle) would be useful, but certainly to be able to view the procedure again after everyone has gone home would be invaluable in some situations.”

In fact, comments indicated that students believed that having access to e-lectures was their right:
- “All classes should be REQUIRED to record their lectures. It is a professional obligation in my opinion.”
- “It should be mandatory to have each PowerPoint lecture posted online unless it has already been printed for us. Also, each lecture should be recorded every time, and professors should NOT have the right to choose not to record.”
- “All classes should be REQUIRED to record their lectures. It is a professional obligation in my opinion.”
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Students also expressed their individual preferences for using recorded lectures:
- “Many students like to use Windows Media Player, because we can speed up or slow down lectures to get through certain sections at a desired pace.”
- “Further, many students like to have just the audio portion of their MP3 player, so that they can listen to it while working out, driving, or whatever else.”
- “I’m a slow note taker so I prefer to listen to lectures on my own time so that I can pause the recording to write my notes.”
- “It depends on how each student learns. I learn best if I have the PowerPoint the instructor is going to use during class, listen to the lecture, and write my own additional notes.”

Learning Environment

The students reported they preferred printed textbooks over digital (64 percent). They also reported wanting e-lecture materials to supplement but not replace attendance at lectures (74 percent). The following are comments that illustrate these themes:
- “Nothing will replace live teaching and real textbooks.”
- “It’s nice to have online access to materials, but they shouldn’t be substituted for class time.”
- “I know that many professors are disinclined to provide all materials online for fear that students will not come to class. . . . All handouts, all lectures, all demonstrations being online help me stay organized and make my study materials complete, even though I do not ‘skip’ class.”
- “Recorded lectures are very helpful to review outside of class. Recorded clinical procedures could be helpful too from time to time if you need to refresh your memory. I don’t think you can replace actual class time and note taking with digital recordings.”

Another clear theme in the various comments was that digital resources should not replace the human touch; interacting with faculty one-on-one was still very important to students. The following comments illustrate this theme:
- “Be careful how far you take this. There is no substitute for a great teacher.”
- “I do not want to lose physical contact with people.”

Standardization

Results about standardizing e-resources are illustrated in Figure 3. The students reported the need for a central location for digital course materials (98 percent important/very important) and having an e-syllabus for every course (86 percent) in a standard format (77 percent). The following are representative comments:
- “It would be nice to consolidate all the school info in one area, as opposed to looking at several different places.”
- “I don’t like that there are three different places professors can post lectures, slides, etc.”

They also commented on the need for standardizing the posting of course grades. For example, “I really hate chasing down grades that are posted in random places. The grades need to be easily accessible online through Blackboard or something.”

Communication and Training

As illustrated in Figure 4, the students overwhelmingly preferred email as the means of communication with the faculty (74 percent) over campus mail (8 percent) and phone (4 percent). The majority of “other” responses (15 percent) were about wanting to communicate in person with faculty members (20/33 comments). Some communication difficulties reported were 1) wireless network not working in some internal locations; 2) school email not being forwarded; and 3) school email system in competition with axiUm (clinic management software) email.

The need for faculty e-training was identified
Figure 3. E-resources that need to be standardized (rated as very important/important)

Figure 4. How students prefer to communicate with faculty members

Note: “Other” responses were primarily about wanting to communicate in person.
in several areas of the survey. The comments below are examples of this:
• “All of these technologies are great, but we should be sure the faculty is qualified and trained to use them, clickers being a great example.”
• “Most faculty need to get up-to-date on their technology skills.”

Discussion
Figure 5 illustrates the themes for e-teaching and learning that were identified in this project. The themes were preferences, perceived rights, policy, and infrastructure. The following are included in perceived rights:
• Access to e-recordings was viewed as a right rather than a privilege.
• Students wanted all lectures and clinical procedures to be recorded.

The following are included in preferences:
• E-resources were viewed as a supplement to lectures, not a replacement for attending lectures.
• E-textbooks were not viewed as a replacement for printed textbooks. In fact, students preferred printed textbooks.

• E-recordings allowed accommodation for different learning styles, learning when and where they wanted to learn, and at the pace that was appropriate to the individual.
• Students preferred email communication with faculty.
• Many expressed the continued need for face-to-face interactions with faculty.

The following are included in policy:
• Policy was needed to dictate what e-resources should be created and where they should reside.
• E-resources, such as digital course syllabi, needed to be in a standard format and in one location, such as in the college’s Blackboard site.
• Course grades needed to be posted online in one secure location.
• Students believed that faculty needed training in developing e-resources.

The following are included in infrastructure:
• Students wanted easy access to e-resources, both within and external to the college.
• Students wanted e-resources to be easy to find.

Policy
In this study, students indicated the need for standardization regarding the content and loca-

Figure 5. Themes for factors affecting e-learning
tion of e-resources and the posting of test grades. Implementing these would require the development of college policies that dictate these practices. The need for policy about e-resources has been discussed quite extensively in the distance education literature. Gellman-Danley and Fetzer\textsuperscript{3} claimed that policy and planning were the most neglected areas of distance education. They defined policy as a “framework for operation, an agreed upon set of rules that explain all participants’ roles and responsibilities” (p. 1).

King et al.\textsuperscript{24} defined policy as “a written course of action adopted to facilitate program development and delivery” (p. 2). In their study of twenty-five universities, the authors found that distance education practice was far ahead of policy development. Institutions were offering distance education but did not have policy or rules in place for how it should be conducted. They recommended the development of policy about e-education in the following domains:

- Academic: calendar, course content and evaluation
- Fiscal/governance/administration: tuition rate, technology fee, administration cost, staffing
- Faculty: compensation and workload, development incentives, training, faculty support, faculty evaluation
- Legal: intellectual property, faculty, student, and institutional liability
- Student support services: library access, materials delivery, training, test proctoring, videotaping, computer accounts
- Technical: systems reliability, connectivity/access, hardware/software, setup concerns, technical support, costs

The dental and dental hygiene students in this study reported that the faculty needed further training in e-teaching and learning. This result is similar to other studies discussed.\textsuperscript{15,16} The literature clearly shows that students expect faculty to perform well in this area and that good pedagogy significantly contributes to learning with WBL.\textsuperscript{2,15} Training might also dispel some of the fears that faculty members have about WBL, including being replaced by computers, not having enough technical assistance,\textsuperscript{25} and losing intellectual property rights. Again, policy would need to be created to mandate faculty training in e-resources and settle these issues.

Preferences

A subtheme within preferences was that e-materials were supplements to traditional methods and should not replace attendance at lectures or using printed texts. Dental school faculty members are concerned that the creation of e-resources will decrease student attendance at lectures. Although the students in this study were not specifically asked this question in the survey, their comments suggested they still felt the need to attend lectures. Several researchers indicated that e-materials served as a supplement to learning rather than a replacement for lectures or text.\textsuperscript{2,15,17} There was even support for the result that access to e-resources did not decrease motivation to attend lectures.\textsuperscript{21}

Although there is a substantial movement in dentistry towards using online textbooks, these students did not support it. There may be some bias in this result as the use of printed texts could have influenced their decision to attend this dental school. At least one other Texas dental school uses online texts exclusively. However, this result is similar to that of other higher education studies.\textsuperscript{16,19} Perhaps this will change in time as future students, who have grown up in wired classrooms and have always been plugged into electronic devices, become more skillful at reading online.\textsuperscript{26}

Another subtheme in preferences was that students still wanted one-on-one interactions with faculty members. They did not want to lose the human touch. Berge calls this the fear of “faceless teaching.”\textsuperscript{25} This result is also supported by the ECAR studies of student preferences.\textsuperscript{16,17}

Students in this study commented on how they could adapt the recorded materials to their learning styles, speeding up or slowing down the transmission, accessing the materials when they had the time to do it, etc. This WBL advantage of accommodating different learning styles is frequently mentioned in the literature.\textsuperscript{1,4} The flexibility of the media allows the customization of instruction, studying, and course remediation.

Rights

The students believed that all lectures should be recorded and that they should have e-access to all lecture slides and handouts. This belief was probably strengthened by the fact that they pay a technology fee every semester. More and more faculty in this dental school are recording their lectures and posting them online. Some faculty members are also producing videos of clinical procedures and posting them online. One wonders if there can ever be enough e-resources from the Millennial student
perspective. There is certainly a limit to how much e-material faculty can produce as well as a limit to college support for this activity.

**Infrastructure**

Students in this study wanted e-resources that were easy to find and easy to access. This is very similar to the 2005 ECAR result of students wanting fast, easy-to-use, and reliable IT services.\(^1\) Other studies indicated that students wanted lecture recordings either within the same day or the next\(^1\) and that download speed was the most significant predictor of student satisfaction.\(^2\) Currently, recorded lectures at the college are posted for student access within twenty-four hours, and download speed is only limited by the power of each student’s computer.

Certainly one of the biggest infrastructure issues is deciding what proportion of institutional resources will be allocated to this effort. Currently, the dental school uses Camtasia software for recording PowerPoint lectures, and the media department can process up to six lectures each evening. They are processed in four formats: MP3, iPod, Flash, and Windows Media. On the following day, the processed files are ready for viewing and are directed to course directors and/or staff for posting on various sites. About 1.5 staff FTEs are allocated to this effort. If the college were to move in the direction of recording all lectures, new software and hardware would need to be purchased as well as dedicating more staff effort. The technology exists for such an effort, but it would involve a significant cost.

**Reality Check**

Already mentioned here is the effort and cost involved in creating new e-resources for dental and dental hygiene students. Also asked was whether there can ever be enough e-resources to satisfy today’s students. One could argue that the effort should not be undertaken unless it could be proved that learning with e-course materials was superior to traditional methods. However, the literature does not support this, indicating that learning with these two approaches is comparable.\(^2,10,11\) For better or worse, our students live in an online world and have come to expect educational resources to be as accessible as those used in other domains of their lives. They want to customize their learning experiences with e-resources—anytime, anywhere, speed up, slow down, videos, etc.—and that intense involvement with their materials is when learning takes place. Also, dentistry needs to develop e-course materials to keep pace with the consistent direction that higher education is taking towards online education. Interestingly enough, the president of the Texas A&M Health Science Center recently distributed guidelines to faculty for dealing with a possible H1N1 epidemic and recommended that course materials be posted online to offset student and faculty absences! Keep in mind also that the availability of these blended learning experiences could affect the admission decisions of potential students as well as the satisfaction of our graduates with their education.

**Closing the Loop**

As illustrated in Figure 6, the institutional effectiveness process involves collecting assessment data to determine if goals are being met and to identify areas for improvement. With this project, the data collected about student preferences are being used to modify the e-technology plan and improve the e-teaching program at the college. The results indicated that some of the college’s strategic initiatives should move faster and some should be changed. The initiatives needing to move faster included development of e-course materials such as recorded lectures, use of Blackboard for centralizing e-resources and posting grades, and faculty training. Those needing to change direction included forwarding school email to personal email, adding wireless network hot spots, and simplifying external access to the network.

Planning has begun at the college to use these results for accelerating the development of e-course materials, centralizing and standardizing e-resources, and modifying the technology infrastructure. The following have already been implemented:

- School email can now be forwarded to personal email.
- Additional wireless access points have been added within the college.
- All e-resources can be easily accessed off campus, including Blackboard.

The following are planned for the near future:

- Continued faculty training in using the Blackboard 9 Course Management System.
- Posting standardized syllabi and grades (test, projects, etc.) for all courses in Blackboard 9.
- Expanding the capability of recording and storing e-lectures.
- Expanding clicker use with purchase of portable units.
These improvements in e-teaching and technology infrastructure should enhance student learning and performance. They address student preferences for e-learning and significantly increase the options for individualized instruction, study strategies and course remediation. The Student Preferences for Learning with E-Technology Survey will be read-ministered in two years to assess progress on this strategic initiative.

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REFERENCES