Electronic vs. Traditional Textbook Use: Dental Students' Perceptions and Study Habits

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Abstract: This descriptive study assessed dental students' attitudes about computer use as it relates to study habits and use of e-textbook technology. Academic deans and student leaders at all accredited dental education programs in the United States, Puerto Rico, and Canada were asked to forward an e-mail to students explaining the purpose of the study and asking them to participate. The e-mail included an embedded URL link to the survey. A total of 703 complete responses from twenty-four dental schools were received and used in the final analysis. Because the number of students contacted could not be determined, the overall response rate cannot be calculated. Over 65 percent of the respondents reported spending >11 hours per week studying although over 75 percent said they spent little time studying from their textbooks. Over 55 percent were from schools that use e-textbooks exclusively, with 25 percent from schools that exclusively use print textbooks. One-fourth indicated they purchased a traditional printed textbook even when an e-textbook was provided; more than one-third printed information from the e-textbooks rather than reading on the computer. A majority (59 percent) preferred traditional textbook resources over e-textbooks, with over 50 percent reporting not using the required e-textbooks at all. E-textbooks were used by students in this study less frequently than materials/notes provided by dental school faculty. The majority preferred to use traditional resources as references and for augmenting lecture material.

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Keywords: technology, dental education, dental students, computers in dentistry, textbooks, e-textbooks

Submitted for publication 4/28/11; accepted 10/25/11

This is a turbulent time for publishing companies and traditional bookstores, with the transition from traditional books to electronic books (e-books) causing large, upscale bookstores to lose millions of dollars and even being forced to shut their doors and file for bankruptcy.[1,2] Even though e-books have been around since the 1970s, they have only recently become fashionable with the development of handheld reading devices such as the Kindle, iPad, Tablets, etc.[1-4] This revolution has led to major changes in the publishing industry. The crossroads between traditional print books and e-book technology coincides with an immersion in media in the United States, with K-12 students reportedly spending almost seven hours per day on average looking at media screens (televisions, computers, PDAs, etc.).[5] U.S. school children, K-12, devote more time to media than to any other waking activity. If publishers are to continue to reach this population, they need to accommodate new technology, but while there are those who embraced this technology early on, others are now scrambling to meet the digital challenge.[6] Among the early adopters of e-textbooks are for-profit universities such as the University of Phoenix, in which most class content is delivered electronically in a distance education environment, allowing for a more on-demand delivery system.

Some feel that the use of computers and e-textbooks in the classroom opens up new potential for both teachers and secondary school students.[6,7] Others

believe that use of computers should be banned as illustrated in a study in which faculty members reported that their doctoral students were using their laptops for things other than school-related work, such as sending e-mail messages to one another, playing online video games, and placing orders with Internet vendors.[8] The addition of e-textbooks has met with some objections from both students and faculty.[8] Other students and instructors complain that reading from a computer text feels disjointed and can be inconvenient for students accustomed to using textbooks.[9]

There are few studies that compare perceptions of e-textbooks to traditional hardcopy textbooks. Researchers have reported insignificant differences in the effect on course grades.[10-12] Only a few undergraduate students have reported reading the material when it is presented in electronic rather than print-format and, in general, rated the use of e-textbooks less favorably.[7] When evaluating medical residents' and interns' responses, some researchers found that junior doctors preferred traditional resources to electronic options.[13,14]

This technology has now penetrated the classroom to an extent previously almost unimaginable.[10] The production of electronic access technology for the written word, such as netbooks, Kindles, iPads, and tablets, has accelerated the use of computers in the classroom with ancillary e-textbook technology. Because information technology has affected many aspects of human behavior, there is no reason to suspect its effect on educational practices would be any different. This shift to increased use of electronic paradigms is correlated with the emergence of a new generation of learners. Generations Y/Z (Millennials, Net Generation, Echo Boomers, etc.), defined as those born from 1982 to 2002, have adopted e-technology with ease. This generation is characterized by increased use of, comfort in, and familiarity with media communications and digital technologies.[15] Those who have tried banning laptops from classroom settings have met with objections from this generation of students, who contend that their ability to multitask enables them to easily and successfully participate with laptops in the classroom.[15] The disparity between the e-technology skills of this generation of students and current educators has been found to create distance and disaffection among students.[16,17] Thus, the debates continue: 1) do the students of today form a distinct generation regarding active learning, and 2) do learning strategies need to be fundamentally changed to bridge the gap between students and educators?

While use of technology in the classroom is gaining momentum, more needs to be done to remove barriers to learning with technological tools. This is especially true in dental schools where inclusion of technology can assist dental students and faculty members with the necessary tools designed to stimulate further learning (e.g., distance learning, simulations, and computer-based assessment). Such approaches can provide balance to the more traditional approaches to delivery of learning materials.[18] Researchers have found that while, in general, dental students approve of e-learning as a means to supplement traditional learning, faculty members appear to be more reluctant to accept it.[19,20]

Although there seems to be general satisfaction with electronic resources, few studies examining use of e-textbooks in dental schools have appeared in the literature. Discovery and examination of evidence-based dentistry in dental schools may be enhanced with current and future technologies. Along with the initiation of web-based learning in dental education, there is an expectation that faculty members should include rich multimedia with attractive educational content.[19] Companies such as VitalSource Technologies, Inc. (Raleigh, NC, USA) have specifically marketed e-textbooks to dental schools. Currently, a high percentage of dental schools use e-books, and many publishers have joined the e-textbook production bandwagon, with vendor data suggesting that about one-third of all textbooks in U.S. dental schools are now completely digital.[21] The purpose of this study was to identify how the use of electronic technology is evolving in dental education. More specifically, this descriptive study sought to identify and assess dental students' attitudes about computer use as it relates to their study habits and use of e-textbook technology.

Methods

A comprehensive review of the literature regarding student study habits, technology as a learning tool, and the use of e-textbooks in higher education was conducted to determine valid items for inclusion in this survey research study. The survey was designed with thirty-seven items that included a combination of selected-response questions (Likert-type scale) and closed-ended questions (yes/no or select one or all that apply options). The items were formatted and divided into four categories: 1) students' computer use (experience and comfort) (six items); 2) students' study habits (sixteen items); 3) use of

e-textbooks versus traditional print textbooks (seven items); and 4) general demographic information (eight items). The content validity of the survey was established in a review by a panel of dental educators and students.[22] The internal reliability, based on the average inter-item correlation, was established using Cronbach's alpha.[22] Test-retest was completed to establish stability-reliability of the instrument.[22] The reliability coefficients are reported in Table 1. The study was approved by the Institutional Review Board for protection of human subjects at the University of Nevada, Las Vegas prior to its start.

Web-based surveys have become more popular in the past decade and because this study pertained to computer and web technology, it was fitting to use this medium as a means to gather data. However, web-based surveys, while an attractive alternative to traditional postal and telephone surveys, raise issues regarding external validity—specifically how to obtain a representative sample and adequate response rate. Web-based surveys have been found to have lower response rates than face-to-face surveys.[23] However, responses to web-based surveys have been reported to be more sensitive because respondents are less likely to give socially acceptable responses, thus providing more honest responses.[23] Additionally, researchers have found that web-based participant responses contained fewer random and systematic errors than telephone survey responses.[24] Therefore, this survey was created and distributed in electronic format using Zoomerang (MarketTool, Inc., 1999). To prevent responses from being linked back to specific individuals, the link to the survey was embedded in an e-mail that included an explanation of the purpose of the study.

This cross-sectional study elicited responses from students attending U.S., Puerto Rican, and Canadian dental schools. There is a growing recognition of the importance of completing a power analysis for sample size calculations *a priori* (prior to the start of any study) to increase the confidence in the study results. In general, the larger the sample size *N*, the smaller the sampling error; however, in some cases the effect size is too small and difficult to determine whether significant differences exist. It is important to determine the effect size as the smallest that would be important to detect. Any smaller and it would no longer have clinical or substantive significance. While one can never be 100 percent certain, the power analysis helps determine the appropriate sample size number by which the researcher can reasonably ensure the sampling error is small without wasting valuable resources.[22,25]

Table 1. Reliability coefficients of survey instrument

Category	Coefficient
Overall survey	0.91*
Students' computer use (experience and comfort)	0.91*
Students' study habits	0.89*
Use of e-textbooks vs. traditional textbooks	0.94*
Test-retest stability-reliability	0.88*

*p<0.001

Therefore, a power analysis was performed prior to the start of this study to ascertain the appropriate minimum response rate. Ideally, power should be at least 0.80 to detect a reasonable departure from the null hypothesis. To achieve a power of 0.80 (p=0.05; d=0.20), a minimum of 656 responses were needed. A total of 703 complete responses from twenty-four dental schools were used in the final analysis. The geographic distribution was fairly evenly spread across the U.S. regions, with one school from Puerto Rico and one from Canada.

Academic deans and student leaders from each of the fifty-six accredited dental schools in the United States and Puerto Rico and the ten in Canada were e-mailed and asked to promote the survey by forwarding to their students an introductory e-mail that explained the purpose and scope of the study. The e-mail included an embedded URL that linked students directly to the survey. Recorded responses were imported into an Excel file and subsequently uploaded into SPSS, 19.0 (SPSS, Inc., Chicago, IL) for analyses. Four e-mail reminders (approximately fifteen to twenty days apart) were sent to the academic deans' listserv and to the student leaders in an effort to increase the response rate. Because there was no way to determine which and how many students were contacted and asked to participate in the survey, there is no way to ascertain the overall possible response rate.

Descriptive statistics were used to compare numbers and percentages of responses by select variables of interest. Eight demographic variables were used to help track the diversity of respondents, but due to uneven responses within the various levels of some variables, only three were used in the final analysis: gender, class level, and computer experience. Class level and computer experience were collapsed into dichotomous variables. Class level was divided into first- and second-year students (DS1/DS2) and third- and fourth-year students (DS3/DS4). Computer

experience was divided by those who reported having little to moderate experience and those who reported having more than moderate experience.

Chi-square analyses were computed to determine if there were significant differences in study habits, perceptions of computer technology, and use of e-books among the three dependent variables (gender, class level, and computer experience). In an effort to assess potential generational differences, a two-factor Kruskal-Wallis analysis was used to assess associations between age (dependent variable) and reported student perceptions and preferences regarding reading and studying from e-textbooks. Assumptions of Analysis of Variance (ANOVA) were not met, indicating use of the non-parametric equivalent, the Kruskal-Wallis test. The sample in this study was not from a normally distributed population, and the variances were different. We initially thought that age might be a confounding factor in the analyses. To equalize the numbers in each group used for comparison reasons, the age marker (those equal to or below twenty-five years versus those above twenty-five) was used to divide the two groups. However, Gen Y/Z straddles these two age groups, so when completing the ANOVA with respect to class level and computer experience, age was controlled for in the Kruskal-Wallis analyses.[22]

Results

The majority (86.1 percent) of the survey respondents were under thirty years of age, with an adequate distribution across all U.S. regions, Puerto Rico, and Canada (Table 2). The sample consisted of 139 (19.8 percent) first-year students, 126 (17.9 percent) second-year students, 237 (33.7 percent) third-year students, and 201 (28.6 percent) fourth-year students. A majority (N=625; 88.9 percent) reported being in the top two-thirds of their class.

A majority (N=618; 87.9 percent) of these students reported being allowed to use laptops in the classroom and said they were required to purchase their own laptop for classroom use (N=473; 67.3 percent) (Table 3). Most (N=429; 61 percent) of the responding students reported that they had little to moderate experience using computers prior to entering dental school; however, most reported using this medium to study, with 54.5 percent (N=383) spending more than sixteen hours per week on the computer for schoolwork. The more time these dental students spent on the computer, the more they said their comfort level improved, with 96 percent (N=675) reporting they currently feel comfortable or very comfortable using computers.

Study Habits

Regarding study habits, over 66 percent (N=468) of the respondents reported spending more than eleven hours per week studying (Table 4). Conversely, the respondents said they spend little time using their textbooks to study, with over 78 percent (N=550) indicating they spend five or fewer hours studying from their textbooks (electronic or traditional). A majority of these students said they were expected to attend all lectures (N=496; 70.7 percent) and spend more than sixteen hours on average per week in lectures (N=399; 56.9 percent). Most of

Table 2. Demographic characteristics of students in study (N=703)

Variable	Number (Percentage)
Gender	
Males	393 (55.9%)
Females	310 (44.1%)
Race/Ethnicity	
White, non-Hispanic	533 (75.8%)
Black, non-Hispanic	17 (2.4%)
Hispanic	35 (5.0%)
Asian/Pacific Islander	110 (15.6%)
Native American/Alaska Native	8 (1.1%)
Age Group	
≤25 years	295 (42.0%)
26–30 years	310 (44.1%)
31–35 years	63 (9.0%)
Over 35 years	35 (5.0%)
Year	
DS1	139 (19.8%)
DS2	126 (17.9%)
DS3	237 (33.7%)
DS4	201 (28.6%)
Class Ranking	
Top 1/3	320 (45.5%)
Middle 1/3	305 (43.4%)
Bottom 1/3	78 (11.1%)
Dental Schools (N=24) by Region	
West	5
Midwest	7
Northeast	5
South	5
Puerto Rico and Canada	2

Note: Percentages may not total 100% because of rounding.

Table 3. Students' reported computer use, by number and percentage of total respondents (N=703)

Variable	Number (Percentage)
Computer use	
School provides students with laptop for use in school.	158 (22.5%)
Student purchases own laptop for use in school.	473 (67.3%)
Student uses computers other than laptops at school or home.	72 (10.2%)
Students allowed to use laptops in classroom	
Yes	618 (87.9%)
No	85 (12.1%)
Hours spent per week on computer for schoolwork	
1–5 hours	106 (15.1%)
6–10 hours	100 (14.2%)
11–15 hours	110 (15.6%)
16 hours or more	383 (54.5%)
Experience level using computers	
Little to moderate experience	429 (61.0%)
Extensive experience	274 (39.0%)
Comfort level with computers before dental school	
Very comfortable	417 (59.3%)
Comfortable	244 (34.7%)
Uncomfortable and very uncomfortable	42 (6.0%)
Current comfort level with computers	
Very comfortable	438 (62.3%)
Comfortable	237 (33.7%)
Uncomfortable and very uncomfortable	28 (4.0%)

Note: Number of respondents in categories may not total 703 and percentages may not total 100% due to missing data.

the responding students noted that class lectures are helpful or very helpful (N=610; 87 percent) and that this medium provides new information not provided in textbooks (N=523; 74.7 percent).

Chi-square analyses (Table 5) were used to assess whether there were differences between class level, gender, and computer experience with regards to attending the lectures and methods of notetaking for study purposes. The results revealed significant differences across all three groups with respect to reviewing the assigned textbooks: women (N=78) more than men (N=65), DS1/DS2 (N=100) more than DS3/DS4 (N=43), and those with less computer experience (N=89) more than those with more computer experience (N=54) reported reviewing material from their assigned textbooks. Significant differences were also found in the use of laptops for taking notes, with the DS1/DS2 using laptops more often than the DS3/DS4 students (N=175 and N=90, respectively) and using audio recorders more often (N=30 and N=6, respectively). There was also a difference regarding reported computer experience and the use of audio recorders in the classroom, with those reporting that they used audio recorders having less computer experience (N=25) than those with more experience (N=11) (Table 5).

Data were also collected on students' self-reported percentages of delivery and use of study materials (Table 6). A majority (N=631; 89.8 percent) of the responding students reported spending 25 percent or less time studying from assigned textbooks, with 63 percent (N=441) actually reading what was required of them. A majority (N=456; 65 percent) of these students reported studying from their notes, either those they took or those obtained from another source, more than 75 percent of the time. These students also reported that while their instructors had assigned readings and referenced textbooks, a majority of them provided students with study materials more than 75 percent of the time (N=551; 78.4 percent) and that PowerPoint or podcasting or similar media were typically available electronically (N=585; 83.2 percent), although the students may choose to access these during lectures or at other times.

Table 4. Students' reported study habits, by number and percentage of total respondents (N=703)

Variable	Number (Percentage)
How many hours per week do you spend studying?	
1–5 hours	82 (11.7%)
6–10 hours	151 (21.5%)
11–15 hours	183 (26.1%)
16 hours or more	285 (40.7%)
How many hours per week do you use textbooks (either type)?	
1–5 hours	550 (78.5%)
6–10 hours	92 (13.1%)
11–15 hours	32 (4.6%)
16 hours or more	27 (3.9%)
Are you required to attend all lectures?	
Yes	496 (70.7%)
No	206 (29.3%)
How many hours per week do you spend in lectures?	
1–5 hours	95 (13.6%)
6–10 hours	135 (19.3%)
11–15 hours	72 (10.3%)
16 hours or more	399 (56.9%)
Regarding course material, do you feel lectures are:	
Very helpful	205 (29.2%)
Helpful	405 (57.8%)
Not helpful	93 (13.0%)
Do you feel lectures provide NEW information not in textbooks?	
Yes	523 (74.7%)
No	177 (25.3%)
If you do not attend the lectures, how do you obtain the material? (check all that apply)†	
Classmates provide me their notes	252 (35.8%)
Review assigned textbooks	143 (20.3%)
Electronic notes from instructor	314 (44.7%)
Note from previous years' courses obtained from upper classmates	154 (21.9%)
Do not miss lectures	377 (53.6%)
How do you take notes? (check all that apply)†	
Pencil and paper	0
Laptop/notebook/PDA	265 (37.7%)
Receive from classmates or instructor	438 (62.3%)
Do not take notes	100 (14.2%)
Use an audio recorder	36 (5.1%)
Where do you spend the majority of your time studying?	
School labs or study rooms	103 (14.7%)
Local or school library	109 (15.5%)
Home	489 (69.8%)
Whom do you study with the majority of the time?	
No one; I study on my own	524 (74.5%)
With a classmate	142 (20.2%)
With a family member or friend	7 (1.0%)
Group of classmates at school or off-site location	30 (4.3%)
How do you feel about electronic resources (podcasting, etc.)?	
I would feel comfortable skipping classroom lectures.	150 (21.3%)
I would still attend all classroom lectures.	377 (53.6%)
I would attend class only on review days and exam days.	126 (18.0%)
I would only attend class on exam days.	50 (7.1%)

†On these questions, students were asked to check all that apply, so percentages total greater than 100%.

Note: Number of respondents in categories may not total 703 and percentages may not total 100% due to missing data.

Table 5. Chi-square analyses between select variables (N=703)

Survey Item	Number	Gender	Class Level	Computer Experience
If you do not attend the lectures, how do you obtain the material?				
Classmates provide me with their notes	252	.82	35.21*	1.33
Review assigned textbooks	143	7.25*	63.70*	21.37*
Electronic notes from instructor	314	1.90	3.15	2.95
Notes from upper classmates	154	3.29	26.14*	2.37
Do not miss lectures	377	2.84	4.13	2.28
How do you take notes?				
Pencil and paper	0	—	—	—
Laptop/notebook/PDA	265	2.55	21.84*	1.68
Receive from classmates or instructor	438	1.83	.28	2.09
Do not take notes	100	2.86	.10	.36
Use an audio recorder	36	1.68	28.05*	8.54*

*p<0.001

Table 6. Students' reported use of study materials, by number and percentage of total respondents (N=703)

Variable	0–25%	26–50%	51–75%	76–100%
What percent of time that you study is from the assigned textbooks?	631 (89.8%)	52 (7.4%)	11 (1.6%)	9 (1.3%)
What percent of assigned readings do you actually read?	441 (63.0%)	138 (19.7%)	85 (12.1%)	11 (7.9%)
What percent of study time is from notes?	65 (9.3%)	68 (9.7%)	112 (16.0%)	456 (65.0%)
What percent of required study material is provided by the instructor?	8 (1.1%)	15 (2.1%)	128 (18.2%)	551 (78.4%)
What percent of lectures are delivered electronically (PowerPoint, Pod Casting, etc.)?	36 (5.1%)	22 (3.1%)	60 (8.6%)	585 (83.2%)

Note: Numbers on some variables may not total 703 and percentages may not total 100% due to missing data.

E-Textbook Use and Generational Differences

Over 57 percent (N=403) of the respondents were from schools that currently use e-textbooks exclusively, while 24.6 percent (N=173) were from schools that exclusively use traditional textbooks (Table 7). A quarter (N=139, 26.2 percent) of the respondents indicated they purchased a print textbook even when an e-textbook was provided, with more than a third of these respondents (N=197, 37.2 percent) printing information from the e-textbooks rather than reading on the computer. The majority (N=354, 59.8 percent) said they still preferred traditional textbook resources over e-textbooks, with over 54 percent (N=287) reporting they did not use the required e-textbooks at all.

Analysis was conducted to assess whether there were generational differences between those who preferred e-textbooks and those who preferred traditional textbooks with respect to their reading and studying preferences. Regardless of age groups defined in this study, there were no significant reading preferences (H=2.332; p=0.25) or study preferences (H=4.271; p=0.180).

Discussion

E-book alternatives have a great many supporters who believe that the use of computers and e-textbooks by teachers and students in the classroom will enhance learning.[6] Moving away from traditional textbooks, however, has presented challenges and resistance among both teachers and students. This study found that, if given the choice, dental students would still rather have traditional textbooks. While e-textbooks are not new, they have had some difficulty being accepted in higher education.[26] One distressing finding in this study relative to dental students' study habits was that while students were spending many hours per week studying, they were spending very little time using or reading from their textbooks.

Table 7. Students' perspectives regarding e-textbooks, by number and percentage of total respondents (N=703)

Variable	Number (Percentage)
Which best describes your school regarding electronic textbooks?	
My school only uses electronic textbooks.	403 (57.3%)
My school only uses traditional textbooks.	173 (24.6%)
My school uses both traditional and electronic textbooks in combination.	85 (12.1%)
I am given the option to choose which media I prefer to use.	42 (6.0%)
If your school uses traditional textbooks, what percent are you required to purchase?	
0 to 25%	168 (56.0%)
26% to 50%	54 (18.0%)
51% to 75%	53 (17.7%)
76% to 100%	25 (8.3%)
Have you ever purchased a traditional textbook that you already had electronically?	
Yes	139 (26.2%)
No	391 (73.8%)
Which statement best describes your preference regarding reading from e-books?	
I prefer to print e-book material rather than read on the computer screen.	197 (37.2%)
I prefer to read on the computer screen.	236 (44.5%)
I read from the computer screen 50% of the time and print 50% of the time.	97 (18.3%)
Which best describes your preference regarding studying from e-books?	
I find I use the e-book mostly to study for exams.	112 (21.1%)
I find I use the e-books mostly to reinforce the lectures.	212 (40.0%)
I use the information from e-books mostly as a clinical resource.	206 (38.9%)
If you have ever had the opportunity to experience using e-books, which do you prefer?	
Electronic resources	238 (40.2%)
Traditional resources	354 (59.8%)
If your school uses e-books, which best describes what YOU do?	
I do not use the e-book if the instructor provides detailed material/handouts.	287 (54.2%)
I use e-books only if the instructor does not provide much detailed material/handouts.	210 (39.6%)
I use the e-book even if the instructor provides detailed material/handouts.	33 (6.2%)

Note: Responses to some questions may not total 703 because items were not applicable to some respondents.

In 1985, Schumacher and Waller noted that readers risk losing important information when they are unable to interact with the text.[27] That seems to be the case in our study, with students indicating a preference for use of traditional resources and a tendency to print e-textbook materials for reading and studying. This finding is similar to that of another study in which 57.3 percent of the respondents indicated they prefer hardcopy to electronic textbooks.[20]

While we feel that computer comfort is relevant for students' willingness to use e-textbooks, that did not appear to be the case in this study.[28] A majority of our responding students reported being allowed to use laptops in the classroom and to use their computers to take notes and to study. These results were consistent with expected increases over the past decade in Millennial students in the dental school applicant pool and their positive orientation to the use of computers.[28,29] Many in our cohort said they spent a significant proportion of time every day interfacing with technology. Additionally, students in the first and second years of dental school reported using the laptop more often than those in the third and fourth years. This discrepancy was likely influenced by the shift from a concentration of didactic courses in the first two years of dental school to clinical courses in the last two years in most dental schools. However, none of the respondents reported taking notes the old-fashioned way (paper and pencil) even if they did not report being uncomfortable using computers or reported little to no experience with computers when they entered dental school.

Because of the shift over the past decade to Millennial students, it was expected that most stu-

dents would be less likely to attend lectures and more likely to enjoy electronic delivery of course materials.[29] However, there were no significant differences between students who preferred reading or studying from e-textbooks and those who preferred traditional textbooks controlling for age. This could have been due to the disproportionate number of students who were members of the Millennial generation (thirty years of age or less).

In addition, a majority of the responding students reported they would still attend lecture if not required even if there were optional electronic delivery methods. Most of these students reported that they found class lectures helpful and that they received new information not provided in their required textbooks. Instructors may not have been selecting textbooks that augment their lectures but instead were trying to find divergent information for students. It could also be that instructors were not critically evaluating the textbooks they were using as they updated their courses. In either case, this could have been one reason a majority of the students reported studying from their notes rather than from the assigned textbooks.

The students in our study reported that while instructors typically assigned textbook readings, they also tended to provide students with additional study materials. The majority of the students reported studying from eleven to more than sixteen hours per week and spending over sixteen hours per week in lectures, thus making time available for review of textbooks somewhat limited. Students may have found that reading from textbooks was not necessary for them to be successful in their classes, given the time pressures associated with dental curriculum requirements. The relationship between time management issues and use of technology among dental students should be explored in future studies.

A quarter of the respondents in our study who used e-textbooks indicated they purchased a traditional textbook even when an e-textbook was provided. Other researchers have reported that, in spite of the advantages touted about the use of e-textbooks and electronic media in the classroom, students still prefer to purchase traditional textbooks.[30-32]

An interesting study of how students use browser-based electronic books suggested that students found it easier to work with the print version due to its familiarity.[33] Those authors found students preferred using e-textbooks in a more nonlinear way and reading segments rather than cover to cover. This preference is significant when one considers that many textbooks in certain disciplines are designed to be read in a more linear fashion. Similarly, our study found that a good portion of the dental students still preferred to print information from the e-textbooks rather than read from the computer, with more than 50 percent reporting that they did not read the textbook at all. In support of these findings, dental students participating in a recent study reported using e-textbooks mainly to search for specific words or concepts, but few students relied on their e-textbooks to prepare for classes or study for quizzes/exams.[19] Providing students with study materials in electronic format is less costly and has eliminated the need for massive printing. Therefore, instructors have been more likely to provide students with additional material through this medium than when they had to pay for printing handouts.

There were no generational differences in this sample between those who preferred e-textbooks and those who preferred traditional textbooks with respect to their reading preferences and studying preferences. However, this finding could be due to there being far fewer respondents over the age of thirty (86 percent) than under the age of thirty. Most of these respondents were likely at or within the Gen Y/Z group, which did not allow for clarification of generational differences.

There were some limitations to this study. Because a majority of the respondents (55 percent) attended schools that currently use e-textbooks, they may have been more likely to respond to a survey regarding e-textbooks and have caused the data to be skewed by this condition. While survey research has proven to be a good low-cost method for collecting large amounts of disparate data, measurements must be reliable and valid to generate confidence in generalizability beyond the sample studied. Cross-sectional research studies have provided a snapshot of a specific point in time and given no indication of any sequence of events. In addition, the use of voluntary respondents increased the chances that the sample may not have been representative of the population from which it was taken. It is possible that students who did not respond were less likely to use their computers regularly. Even with the use of a valid and reliable instrument, there could have been problems due to missing data, incorrect interpretation of questions, or dishonest responses. Caution when generalizing these study results to other population and setting is therefore warranted.

Recommendations for Future Research

Because of the growing popularity of e-textbooks, they are likely to become even more popular and pervasive. The purpose of this study was not to ask why e-technology was used, but rather to obtain a baseline of what types of technology were being used relative to students' study habits and use of e-textbooks in dental schools. Follow-up studies should focus on why students who are using this technology find it more desirable and whether they differentiate between the various types of technology when explaining their preferences.

These technology trends will continue to increase with the development of distance education courses for dental students, which are designed to loosen the restrictions of students' daily schedules and provide greater opportunity for skill development. These trends should be documented and validated before dental schools delve into extensive curriculum reform that hinges on technology. Future studies should also look at faculty development with regard to integrating e-textbooks into teaching. Finally, financial issues regarding multimedia could affect the amount and type of distribution of electronic resources for students. A study using a quasi-experimental design without financial constraints, or controlling for financial confounders, could provide a better understanding of students' attitudes toward using new technology.

Conclusions

E-textbooks were found to be used by the students in this study less frequently than were materials and notes provided by dental school faculty members. The majority of the responding students said they preferred to use traditional resources as references and for augmenting lecture material.

Overall, there are advantages and disadvantages to using e-textbooks in dental schools. Since a majority of dental students have access to a computer, use of e-textbooks is a logical and efficient approach for access to dental science and practice material. However, the cost of e-textbooks used by students is usually included in dental school fees. The books currently used are not open-access textbooks and are thus costly. To achieve a better balance, faculty members could consider delivering more review material to students in the form of electronic notes and presentations. This way, the number of textbooks ordered might be reduced and the costs decreased.

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