Factors for Increasing Adoption of E-Courses Among Dental and Dental Hygiene Faculty Members


Abstract: The incorporation of web-based learning into the dental curriculum has been consistently recommended in the literature on reform in dental education. There has been growing support for web-based learning in dental and dental hygiene education as demonstrated by deans’ identifying this as a planned curricular innovation. The purpose of our study was to explore characteristics of e-courses that may serve to increase adoption among dental and dental hygiene faculty members. Eight ninety-minute focus groups (three dental; five dental hygiene) were conducted with dental (n=27) and dental hygiene (n=23) faculty members from six academic institutions. The resulting data were analyzed to identify two overarching themes and associated subthemes with regard to benefits and barriers influencing adoption of e-courses. A working conceptual framework, based on the Diffusion of Innovations, was developed from these themes to understand the characteristics that may influence the rate of adoption of e-courses among dental and dental hygiene faculty members. Analysis of the data revealed four main adoption barriers: 1) low perceived relative advantage to faculty members; 2) low compatibility with current curriculum; 3) high perceived time commitment; and 4) complexity of e-course development. This exploratory assessment identifies leverage points for facilitating the adoption and sustainability of e-courses in dental and dental hygiene education.

Numerous calls for change have been made regarding the future direction of the dental curriculum and methods of instructional delivery. One of the priorities for future modification, identified in a 2009 study of fifty U.S. and five Canadian dental schools, was the online provision of some components of the core curriculum. Other consistently advocated changes include increased overall utilization of computer-based and web-based information technology and the development of distance learning programs that allow dental and dental hygiene students to receive much of their education within the communities where they live. Moreover, in anticipation of an increase in vacant faculty positions and resultant workforce shortages in instructional staff, the American Dental Education Association (ADEA) President’s Task Force on the Future of Dental School Faculty recommended...
that new opportunities be made for e-learning to ease faculty time for preparation of lectures and problem-solving activities.\textsuperscript{12}

Electronic curriculum (e-curriculum) refers to educational technologies that support the development and delivery of web-, computer-, or network-based learning.\textsuperscript{13,14} The advantages of e-curriculum include flexibility and quality, learner-centered education, delivery of educational opportunities to remote areas, increased student enrollment capacity, anytime anywhere learning, self-directed learning, learning at one's own pace, and reduced costs of course delivery.\textsuperscript{13,15-17} However, student concerns regarding e-learning have also been reported. For example, not all dental and dental hygiene students have access to e-materials at external locations. In addition, many prefer printed text over digital and want e-materials to supplement rather than replace lectures or interactions with the faculty.\textsuperscript{18}

Overall, e-learning can supplement and reinforce more traditional learning and has the potential to develop skills as well as knowledge among dental and dental hygiene students.\textsuperscript{19} The ADEA report \textit{Best Practices in Dental Education in 2001} identified the following strategies used by dental schools to incorporate web-based learning into their curricula: 1) using the web to deliver parts of or entire courses online and 2) development of e-learning that would supplement coursework.\textsuperscript{20} Additionally, use of e-learning has been suggested as a way to solve overcrowding of dental hygiene curricula and as a way to increase active learning.\textsuperscript{21}

There has been growing support for and adoption of e-learning in dental and dental hygiene education.\textsuperscript{13,16,22,23} The incorporation of web-based learning into the dental curriculum has been strongly encouraged by ADEA, which recommends the use of e-learning “to create new opportunities for distance learning in dental education” and “to use information technology to enrich student learning.”\textsuperscript{16,7,13}

Administrators of dental and dental hygiene programs have consistently reported intentions to increase the use of e-learning over the last decade.\textsuperscript{7,9,13,22} According to a 2001 study assessing the adoption of e-learning in the dental curriculum, 52 percent of responding deans of predoctoral dental programs and 33 percent of directors of graduate dental education programs encouraged the use of e-learning in their programs.\textsuperscript{13} Additionally, 53 percent of responding deans rated the integration of e-learning as a medium to high priority within their program. Furthermore, in a study of recent and planned innovations in dental curricula, 86 percent of responding deans indicated recently adopting e-learning in their programs, and 85 percent reported an increase of e-learning as an identified curricular innovation planned for the next three years.\textsuperscript{7} Among dental hygiene programs, a study published in 2002 reported 22 percent of responding programs had implemented online distance education, while 13 percent indicated plans to do so.\textsuperscript{22}

Despite their widespread support for e-curriculum, dental school administrators have identified faculty reluctance to change and lack of faculty training as barriers to increasing use of e-learning.\textsuperscript{14} Dental faculties have historically been slow to adopt technological innovations. Evidence that dental faculties are late adopters of e-curricula comes from a 2004 study of students in North American dental schools with mandatory laptop programs.\textsuperscript{24} Although the laptop programs at all but one of these schools had been in place for three or more years, students reported that instructors had made minimal effort to utilize e-learning beyond sharing PowerPoint files.

Clearly, the adoption and widespread use of e-curricula are highly dependent on dental and dental hygiene faculty members. However, faculty members’ opinions and experiences with e-learning have not been reported. Thus, the purpose of our study was to explore characteristics of e-courses that may serve to increase adoption among dental and dental hygiene faculty members.

\section*{Methods}

An exploratory assessment of factors regarding adoption of e-learning among dental and dental hygiene faculty members was conducted by using focus groups. A qualitative approach was chosen for this assessment to enable exploration of faculty opinions, beliefs, attitudes, and experiences, as there is a paucity of information in this area.

This study is part of a larger study of dental and dental hygiene faculty members pertaining to the adaptation and evaluation of a web-based training program for use in dental and dental hygiene curricula. Eight focus groups were conducted: three with dental faculty members and five with dental hygiene faculty members. The focus groups were held with a convenience sample of faculty members at collaborating dental schools and dental hygiene programs in the Eastern, Southeastern, Midwestern, and Pacific regions of the United States. Participants were recruited by the contact person at each col-
laborating dental school and dental hygiene program participating in the larger study. The contact person at each location sent an e-mail invitation describing the purpose and procedures of the focus group to his or her dental or dental hygiene faculty. The e-mail invitation instructed interested faculty members to sign up for the focus group with the contact person. Two weeks prior to the focus group, the contact person sent out e-mail reminders.

**Conceptual Framework**

Diffusion of Innovations served as the conceptual framework for the study. The main concept of Diffusion of Innovations deals with the process by which an innovation (e.g., behavior, technology) is communicated or diffused into a population and ultimately adopted.25,26 This framework posits a set of innovation attributes that influence and thus determine the speed of diffusion and adoption among the population.26

The process of innovation-decision consists of five steps: 1) knowledge (awareness, procedures, and principles); 2) persuasion; 3) decision to adopt or reject the innovation; 4) implementation of the innovation; and 5) sustainability (continuing to adopt innovation or discontinuing innovation).25,26 This innovation-decision process is made via a cost-benefit analysis by weighing the characteristics of the innovation presented in Table 1.26 Individual instructors will adopt an innovation if they believe it will enhance teaching or student learning.25 Subsequently, if an instructor believes that the innovation does not have relative advantage over what it would replace, is too complex, and/or is not compatible with his or her daily routine, the innovation is less likely to be adopted. Table 1 depicts innovation attributes that served as the conceptual framework for this study.

**Process and Analysis**

A semistructured moderator’s guide was developed for the focus groups by the principal investigator with input and feedback from the research team and expert panel representing the following areas: psychology, dental education, dental hygiene education, oral health curriculum development, and e-curriculum development. Questions were developed and organized following guidelines described by Hawe et al.27 allowing for a funneling effect of general to more specific.28 Examples of general key questions are the following: Generally speaking, what are your perceptions of online courses? How are online courses/teaching used within your curriculum? What have you heard from students regarding online courses?

The principal investigator, who is experienced with focus group procedures, moderated all focus groups. The Institutional Review Boards at the participating institutions granted approval for the study. To collect data reported here, eight 1.5-hour focus groups were conducted at three accredited U.S. dental schools and four accredited U.S. dental hygiene programs. Each focus group consisted of five to twelve faculty members, who were provided a $50 gift card for participating. Inclusion criteria

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**Table 1. Intervention attributes influencing rate of diffusion and intervention adoption**

<table>
<thead>
<tr>
<th>Intervention Attribute</th>
<th>Description Pertaining to This Study</th>
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<tbody>
<tr>
<td>Relative advantage</td>
<td>The unique benefits of e-courses that are better than what they will replace</td>
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<tr>
<td>Compatibility</td>
<td>The fit of e-courses with regard to the sociocultural, economic, and ideological value system of the oral health program</td>
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<tr>
<td>Complexity</td>
<td>The degree of difficulty in developing and/or using e-courses</td>
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<tr>
<td>Trialability</td>
<td>The degree to which e-courses can be tried on a small scale before formally adopted</td>
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<tr>
<td>Observability</td>
<td>The degree of difficulty pertaining to evaluation of e-courses</td>
</tr>
<tr>
<td>Communicability</td>
<td>The degree to which e-course development and implementation are understood</td>
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<tr>
<td>Time</td>
<td>The amount of time that must be invested to develop and maintain e-courses</td>
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<tr>
<td>Risk and uncertainty</td>
<td>The degree of risk and uncertainty pertaining to e-courses</td>
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<tr>
<td>Commitment</td>
<td>The degree of commitment needed for e-course development, facilitation, and maintenance</td>
</tr>
<tr>
<td>Modifiability</td>
<td>The degree to which e-courses can be modified and updated over time</td>
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for the focus groups consisted of the following: over the age of eighteen and current faculty member in an accredited dental or dental hygiene program.

Prior to the focus groups, each participant was asked to read and sign a consent form and description of the procedures. The moderator explained the purpose of the group, and participants were given an opportunity to ask questions about the goals of the group or the format. All focus groups were audiotaped and later transcribed verbatim (with the exception of identifying information) by an experienced transcriptionist. All focus group transcriptions were reviewed by the principal investigator to verify that the transcripts were as accurate and reflective as possible of the groups.

Two independent coders initially hand-coded transcriptions from all focus groups utilizing modified coding methods developed by Spradley. This initial coding explored patterns for words, perceptions, and ideas that were classified into intervention adoption categories. Coding was then compared, and an agreement of initial codes was reached. Focus group transcripts were then imported into the qualitative analysis software NVivo, where further exploration of data and detailed coding were conducted and, as a result, overarching themes and subthemes emerged. Lastly, a working conceptual framework built from emerged codes was developed to define the characteristics that may influence the rate of adoption of e-courses among dental and dental hygiene faculty.

Results

A total of fifty participants were involved in the focus groups: twenty-seven dental faculty members and twenty-three dental hygiene faculty members. The majority of participants self-reported as female (84 percent), non-Hispanic (92 percent), and white (78 percent). Mean age of participant subgroups ranged from 33.3 years to 51.5 years. Nearly half of the participants indicated they have taught courses with at least some online content (e.g., posting course materials, quizzes, and incorporation of online lectures). Of those who had not taught online courses, a number indicated they had previously taken an online course or continuing education course.

Analysis of focus group data revealed two general themes consisting of benefits and barriers to the adoption of e-courses among dental and dental hygiene faculty participants. The relative advantage of e-learning was identified as a subtheme within benefits. Complexity, communicability, time, and compatibility were identified as subthemes within the general barriers theme. Table 2 presents a summary of these general themes and subthemes. The description in this section presents the findings that support the general themes of benefits and barriers in addition to associated subthemes.

Theme One: Benefits of e-Course Adoption

The first overall theme that emerged from the data involves the benefits of e-course adoption within dental and dental hygiene curricula. Upon further analysis of the data, relative advantage emerged as a benefit subtheme. The participants discussed how e-courses provide relative educational advantage over traditional courses in that e-courses increase accessibility and convenience for students. In addition, the participants indicated that e-courses provide relative advantage over traditional courses in that they allow faculty members to add depth (additional materials, websites, readings, and activities) to traditional face-to-face didactic courses and provide an easy way to assess how students are doing via online quizzes. Representative comments (identified by type of faculty member) reflecting the relative advantage subtheme are as follows.

Regarding student relative advantage:
• “What I meant is it’s convenient for the student. It’s convenient because you can access it at anytime and anywhere. Usually they set it up so that you can do it [the course] in different segments whenever you’re available and you can go back to the portion where you started.” (Dental faculty member)
• “The students can access it at their convenience. . . I deal a lot with the seniors, and they go out in rotations, external rotations, and so they cannot be physically present at the class. They have to depend on classmates or on a recorder to get the class materials. And with the course being online, everybody gets the same thing.” (Dental hygiene faculty member)
• “One good thing for the students: it allows them to repeat things, and so they get more than one opportunity to listen to things that they might’ve not gotten on the first time.” (Dental faculty member)

Regarding faculty member relative advantage:
• “I do think it’s a good thing because you can access it at anytime and anywhere. Usually they set it up so that you can do it [the course] in different segments whenever you’re available and you can go back to the portion where you started.” (Dental faculty member)

• “The students can access it at their convenience. . . I deal a lot with the seniors, and they go out in rotations, external rotations, and so they cannot be physically present at the class. They have to depend on classmates or on a recorder to get the class materials. And with the course being online, everybody gets the same thing.” (Dental hygiene faculty member)

• “One good thing for the students: it allows them to repeat things, and so they get more than one opportunity to listen to things that they might’ve not gotten on the first time.” (Dental faculty member)

Regarding faculty member relative advantage:
• “I do think it’s a good thing because I think that, with the way technology is going and the way students continue to learn and because we do things so quickly now, we’re so instantaneous with our—
you know, we want the answers right away, and we move so fast. I think from that perspective it’s good, and I think we can give them access maybe to a lot more material quicker.” (Dental hygiene faculty member)

• “There’s also the factor when the authors developed a course, they put links in there, hyperlinks, that the students can click on and get more information. Very similar to what we would do if we were answering a question in class. And that gives them a little bit broader base of understanding of the content of the program, and I think that’s valuable as well.” (Dental hygiene faculty member)

• “I don’t know how that works from a faculty perspective when you get the results of the quizzes if it’s like coursework where you can kind of get a gauge for what people are grasping and what they’re not, so that’s kind of a nice feedback for faculty from a data perspective. I would imagine it’s quicker to tell you that up on a computer submission.” (Dental faculty member)

Theme Two: Barriers to e-Course Adoption

The second overall theme that emerged from the data represents barriers to e-course adoption among dental and dental hygiene faculty members. Further analysis of data within the general barrier theme revealed more specific subthemes of complexity, communicability, time, and compatibility (Table 2). For example, complexity barriers included lack of faculty capacity to develop e-courses (e.g., hard to create, faculty not trained, and technology issues beyond faculty skill level). In addition, participants described the complexity of e-courses in that this learning format may not be appropriate for all students. In other words, participants indicated that e-courses were good for independent, motivated student learners, but may not be ideal for other student learners who are teacher-dependent or lack capacity for effective independent study. Representative comments with regard to the complexity barriers subthemes are as follows.

Regarding lack of faculty capacity to develop e-courses:

• “It is a lot harder for me to step back and [say,] okay, how can I get this material across and not just post PowerPoints? How am I going to get [students] to interact? A lot of it is the technology I think. Using the technology . . . is also hard for faculty who aren’t real up on the newest, latest, and greatest.” (Dental hygiene faculty member)

• “I think knowing that there is a technology—you know, someone available to help you or show you things from the parts that you don’t know. I didn’t study to be expert on the Web or things like that. So if someone else is next to you doing that part, you know, it’s like a multidisciplinary team, and you need that.” (Dental faculty member)

Regarding not being appropriate for all learning styles:

• “[The students] have to be self-sufficient and self-motivated because we’re not there to babysit them, basically. They feel more comfortable with it, but some still don’t like it because they tend to

| Table 2. Themes and subthemes representing e-course adoption characteristics |
|-----------------------------------|-----------------------------------|
| **Benefits**                     | **Barriers**                      |
| Increased student accessibility  | Complexity                        |
| Student convenience              | • Low faculty capacity for e-course development |
| Ability to provide added depth to course | • Not trained |
|                                  | • Hard to create                  |
|                                  | • Technology issues               |
|                                  | • Not appropriate for all learner types |
| Student convenience              | Communicability                    |
| Ability to provide added depth to course | • Lack of understanding that e-course means more than an online repository |
|                                  | Time                              |
|                                  | • Increased time for faculty/student communication |
|                                  | • Course development              |
|                                  | • Updating e-course               |
|                                  | Compatibility                     |
|                                  | • Not appropriate for all courses  |
|                                  | • Lack of student and faculty inter-
|                                  | action                           |

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be those traditional learners. They tend to be more passive learners. They like sitting in the classroom and letting somebody else do all the work, where I think that the Web-based, Web-enhanced, even on the Internet they have to be active learners. It’s up to them to get it. We put it out there, but they’ve got to do it. That’s what they don’t like about it.” (Dental hygiene faculty member)

• “But they’ve got to be disciplined. . . . I think some of them sign up for online classes thinking they will be easier and sometimes they’re not.” (Dental hygiene faculty member)

• “So until you [reach] a critical point where the online courses become a majority and the students’ learning style leans more towards that, I think we’re going to see that kind of mixed reception not only by the students but by the faculty. . . . When you’re looking at my age group, our first thing is no. If you’re looking at the young ones, their first thing is yeah, this is the way I want to do it.” (Dental faculty member)

• “I feel if the student is very determined to learn, they’re going to go look, and they’re going to learn. So [they] have to be self-motivated for the online course to be successful.” (Dental faculty member)

Also materializing within the general barriers theme was communicability pertaining to current perceptions of e-courses. For example, the majority of participants indicated that although their respective universities were urging faculty members to develop e-courses, many indicated that adoption of e-learning merely consisted of using the electronic technology as a repository for the syllabus, PowerPoint slides, and readings. Thus, it appears that faculty members and e-curriculum advocates may have different perceptions of the purposes and capacities of e-learning. For example, representative comments included the following:

• “We have used Blackboard for a number of years, but in my opinion, it’s a repository for dumping documents and posting . . . your course syllabus and any associated course documents and it’s a place for students to go to retrieve things. But it’s not necessarily an interactive place for students to be. Yeah, some people use the discussion forum, and some people do quizzes and things like that through Blackboard, but it’s not a highly interactive place.” (Dental hygiene faculty member)

• “[A coworker and I are] working with people on the other campus with putting our classes online. And they have really pushed us I think maybe outside of our comfort zone because we know the material, we know we can get up and lecture about it. But to push us—not to just post PowerPoints and post readings and say okay, and post the online tests because it’s pretty easy to put the tests online, but really what are they gaining from that? That doesn’t make it an interactive course.” (Dental hygiene faculty member)

The third subtheme regarding barriers that emerged from the data was concern about time. Generally speaking, the participants indicated that e-courses took more time than traditional courses to develop and update. In addition, many participants suggested that e-courses required increased time to address student questions and correspondence. Representative comments from participants pertaining to time barriers included the following.

Regarding development and maintenance time:

• “A negative aspect might be the amount of work that’s required for me to prepare for the course and to prepare the assignments and so forth.” (Dental hygiene faculty member)

• “Of course, the trouble is web technology changes, and so what looked state of the art six years ago is actually looking pretty old now. I’m going to have to learn way more to update it. But just to emphasize—and I think I speak for all of us—we all do more than one FTE’s worth of work. So time is huge.” (Dental hygiene faculty member)

• “I would say, for the people that are responsible for the course, it probably takes more time than a lecture course just to make sure that you keep things current and that you make whatever corrections pop up during the course of the activity. So I think it takes more time and I think it takes more creativity, but it is more convenient for the students.” (Dental faculty member)

• “I’m already starting for my course in the fall. It’s a lot of work. It’s a lot of thinking how exactly you want to deliver the course. How you want to evaluate the students because it’s going to be somewhat different.” (Dental hygiene faculty member)

Regarding communication time:

• “I also think that once it is out there, it’s going to still be a lot of work because if I am going to be interactive with them, I have to be online just as much as they are.” (Dental hygiene faculty member)

• “I think when you’re teaching an online course, there’s the expectation from students that you are always available. If they’re having technical difficulties and they e-mail you, they expect a response right away, whereas if you’re a lecturer usually you get questions right after a lecture or
right before. That’s, I think, one of the difficulties too: that you’re not always online 24 hours in the day.” (Dental faculty member)

- “I’ve heard that from different faculty members—not here, but colleagues and friends of mine that teach, and they said that they spend so much more time just responding . . . and interacting than they do the actual teaching.” (Dental faculty member)

Compatibility emerged as the fourth subtheme within the general barriers theme. Specifically, focus group participants indicated that e-courses may not be compatible with current culture in dental schools and dental hygiene programs. For example, they suggested that e-courses may not be appropriate for all courses (e.g., skill-based courses) in dental and dental hygiene curricula. In addition, they indicated the perceived lack of student interaction in e-courses may be incompatible with current educational culture. Representative comments from participants pertaining to incompatibility included the following.

Regarding not being appropriate for all courses:

- “I think it depends on the subject matter. I think there are some things that definitely need to be instructed in a classroom, but . . . there is subject matter that you can do online and elicit discussion and get some really good feedback—there again depending on the subject matter.” (Dental hygiene faculty member)

- “I do feel that if you’re doing clinical teaching, it’s very difficult to be able to do that online. You know, how do you teach someone to talk to a patient, to care about [the patient]? Those are things that you can’t teach someone off a computer screen, I don’t think.” (Dental hygiene faculty member)

- “[With] the way the curriculum is traditionally structured here, I think online courses would be something that would be easier for some of us to put in for elective type material or some of the grad areas.” (Dental faculty member)

Regarding lack of student interaction:

- “I am going to agree with [another participant]. I think it’s very impersonal. Maybe I’m more traditional in the sense of having . . . that personal interaction.” (Dental hygiene faculty member)

- “From a student perspective it works better, in my opinion as a learner, as a supplement. I sort of needed that lecture-style format to have some interaction, whether it was [with] classmates or faculty.” (Dental faculty member)

- “I also hear that from the students, and I find that the students are almost exasperated that they can’t talk to someone. They can’t see a person. You can’t see the facial expressions. There’s so much of tangible sight, touch, feel, the senses that are lost in that communication. That’s my impression. Of course I’m the old dog, so I’m concerned. I’m very concerned about the future of education in that regard.” (Dental hygiene faculty member)

- “I think, when creating lecture materials for an online course, it’s very hard to [place] an emphasis on certain items or points that you want to make to the students if you’re not going to be lecturing to them or if you’re not going to be interacting with them in person in a small group. As a participant who’s taken part in an online course, it’s also hard to understand what is being emphasized to me.” (Dental faculty member)

Discussion

The results from this qualitative study indicate both perceived benefits and barriers to the adoption of e-courses by dental and dental hygiene faculty members (Table 2). One goal of qualitative analysis is to develop a framework for communication of observed themes and subthemes. A working conceptual framework built from emerged codes based on Diffusion of Innovations was developed to better define the characteristics influencing adoption of e-courses among these faculty members.

When viewed as a whole, subthemes observed in this study reflect the following concerns about e-courses among the participants: 1) incompatibility with current curriculum and culture; 2) great time commitment; 3) complexity with regard to e-course development and maintenance; and 4) low relative faculty advantage over traditional course delivery. However, the participants did perceive relative advantages of e-courses for students who are independent learners, and they identified many of the same student benefits to e-learning that have been previously reported by dental and dental hygiene students. Nonetheless, the perceptions of e-course characteristics among dental and dental hygiene faculty members in this study point towards greater perceived costs than benefits of e-courses over traditional course delivery. Accordingly, findings from this exploratory study suggest that to increase the likelihood or speed of e-course adoption among dental and dental hygiene faculty, it is critical to achieve a fit between the innovation (e-courses) and its end users (the faculty members) and to understand the dental and dental
hygiene program environment (culture) in which diffusion of e-courses will occur.

The decision to adopt an innovation is influenced by awareness of the innovation, procedural knowledge (how to use the innovation), and knowledge of the principles (how the innovation works). With regard to procedural and principles knowledge, identified barriers to e-course adoption included low faculty capacity in developing, implementing, and maintaining e-courses. Many participants stated that they lacked training in e-course development and use of information technology for teaching. Accordingly, many of the participants reported utilizing the Web only as a repository for PowerPoint presentations and traditional course materials. This finding is consistent with students’ perceptions that faculty members have put forth limited effort to utilize e-learning beyond sharing PowerPoint files. 24

We postulate several strategies for innovation development that could serve as leverage points for facilitating e-course adoption in dental schools and dental hygiene programs. First, with regard to innovation development, end users (dental and dental hygiene faculty members) should play a major role in identifying an appropriate audience for e-courses and should be active in providing feedback on content and design of such courses. Thus, it is important that collaborative partnerships and participatory approaches be developed and facilitated between those recommending the innovation (deans, program directors, and other university administrators) and those adopting the innovation (faculty members). For example, participants in our study suggested that e-courses may not be appropriate for all courses. Subsequently, having faculty members provide input on which courses would best be suited for e-delivery may improve the likelihood of compatibility with the current curriculum.

Second, participants in our study indicated that e-courses were not appropriate for all learner types. These faculty concerns could perhaps be addressed if the e-course were developed using a blended learning approach (i.e., use of traditional as well as online teaching methods). A blended approach may help meet a variety of learner needs and is consistent with the opinion reported among dental and dental hygiene students that e-learning should enhance rather than replace traditional learning and interaction with instructors. 18 A study using a blended learning approach with dental and dental hygiene students found that it increased the perceived relative advantage over traditional course delivery for the majority of student learners. 29 Additionally, the use of a blended learning approach may decrease the complexity students often perceive in e-courses. Furthermore, blended courses would allow faculty members to try technology on a smaller scale, which may decrease their perceptions of risk and uncertainty about e-courses because it would not require them to give up the traditional format altogether.

Third, participants in our study indicated time as a major barrier to e-course development and implementation. Consequently, dental and dental hygiene administrators might offer course release time or teaching stipends for training faculty members in e-course strategies and for development of e-courses.

Research on innovation development indicates that adoption of e-courses can be increased by decreasing perceived complexity and time commitment and by increasing relative advantage over current course delivery. 26 This can be accomplished by providing training and technology support for faculty members interested in developing and implementing e-courses. The results of this study indicate that universities should create partnerships with information technology departments and instructional services to facilitate faculty training and technology support.

Conclusion

This qualitative study explored opinions, beliefs, attitudes, and experiences regarding adoption of e-courses among dental and dental hygiene faculty members. Although saturation was achieved with the eight focus groups, this study has the usual limitations to drawing conclusions that are typical of qualitative research. It was beyond the scope of this study to determine how important barriers are or which barriers most interfere with adoption of e-courses. However, it is likely that the data accurately reflect many of the perceived barriers to e-curriculum development that are typical of dental and dental hygiene faculty members.

The incorporation of web-based learning into the dental curriculum has been strongly encouraged in ADEA reports. 6,12 Over the past decade, there has been growing support for e-learning in dental and dental hygiene education as many deans have identified it as a planned curricular innovation. If the goal of increasing web-based learning in dental and dental hygiene curricula is to be achieved, the characteristics of e-courses identified in this study that would facilitate or hinder adoption among faculty members must
be addressed. Improving the fit between the innovation and end users is critical for widespread adoption and implementation of e-courses. This could be done by training faculty in e-course development and/or providing e-materials that could gradually be added to current courses and thereby allow implementation on a smaller scale.

REFERENCES