Use of Distance Education in Dental Hygiene Programs


Abstract: The prevalence of distance education is steadily increasing in institutions of higher education in the United States and abroad. Colleges and universities are seeking new avenues to deliver curricula to students in remote areas and/or to nontraditional students. Distance education is a relatively new venture for dental hygiene education. The purpose of this study was to determine the prevalence and use of distance education in dental hygiene educational programs nationally. Dental hygiene directors of all associate degree and baccalaureate degree dental hygiene programs in the United States (N = 255) were mailed a fifteen-item survey regarding their use of distance education. Results of the study indicated that 22 percent of dental hygiene programs have implemented distance education. In addition, a large variety of courses are being offered by several distance education delivery methods. Thirty of the thirty-eight dental hygiene programs that responded to the survey reported that they were satisfied with their distance education initiatives. The length of time that distance education was offered by the dental hygiene program was not related to satisfaction level (p = .0795), and there was no relationship between the type of distance education used and satisfaction level (p > .05). Considering all factors involved in this study, we can conclude that distance education is being used in a substantial number of dental hygiene programs and that the majority of these programs are satisfied that distance education is an adequate alternative to traditional “brick and mortar” approaches.

Dr. Grimes is Clinical Associate Professor, Department of Dental Hygiene, University of Vermont. Direct correspondence to her at the Department of Dental Hygiene, University of Vermont, 002 Rowell Building, Burlington, VT 05405; 802-656-5044 phone; 802-656-8440 fax; egrimes@zoo.uvm.edu. Reprints will not be available. This research was supported in part by a research grant from the University of Vermont School of Allied Health Sciences and funding from the Department of Dental Hygiene.

Submitted for publication 3/5/02; accepted 8/9/02

The prevalence of distance education is steadily increasing in institutions of higher education in the United States and abroad.1,2 Colleges and universities are seeking new avenues to deliver educational courses to students in remote areas and/or to nontraditional students with family and employment commitments.1,3 Distance education has been successful in facilitating these learning experiences.4,5 Moreover, the advent of new technologies has presented multiple distance education alternatives.4,5 Distance education is education delivered to learners at an alternative site from the presenting institution.3,6 High-quality distance education emphasizes the design of instruction, interaction between student and faculty, and evaluation of learning outcomes.6 When successful, the delivery of course content to the learner at his or her location results in a seamless system of instruction.6

Print, audio, computer, or video technology are various forms of distance education used to create the virtual classroom.8 The most well-known and oldest form of distance education originating in 1873 is print-based or correspondence studies.3,8 These self-paced courses are sent to the student by mail or fax and, upon completion, are sent back to the instructor for grading and granting of credit.7 Radio became a popular distance education modality in the 1920s; then, in the 1950s, telephone or audio conferencing was the method of choice.9 Two-way communication between instructor and student via telephone line link-up was made possible with the advent of audio conferencing.9 Audio conferencing helped to reduce the feeling of isolation that students often express as a criticism of distance education.10

Television technology made its way into distance education from the 1960s to the 1980s, providing video-based distance education.9 Videoconferencing is an electronic meeting where students and faculty interact via a visual and oftentimes an audio link for simultaneous communication.5 There are various types of videoconferencing: 1) broadcast television, as a one-way video broadcast via satellite, microwave, or cable system where students cannot talk with the instructor; 2) one-way video/two-way audio, which adds a telephone to the broadcast system to allow response by the instructor; 3) instructional television fixed service, which uses microwave towers for transmission of one-way video and two-way audio within a radius of twenty-five miles; 4) cable television delivery, which transmits programs via cable to television sets in homes, often supple-
Distance education is becoming widespread in institutions of higher education. A study by Gibson estimated that, of the 14.3 million students enrolled in college, 750,000 were enrolled in distance education courses. Moreover, 25 percent of the 1,200 institutions surveyed offered distance degrees. The National Center for Educational Statistics determined that in 1995 one third of higher education institutions in the United States offered distance education courses, and another 25 percent planned to offer distance education courses in the next three years.

Nursing has been at the forefront of distance education by offering a variety of formats. A 1997 study determined that 38 percent of nursing programs were offering distance education, and forty-one additional schools planned to provide distance education in the future. In 1998, the American Association of Colleges of Nursing performed an in-depth study of distance education in nursing programs to assess the growth of distance technology as a means to deliver nursing education. This study determined that 51 percent of nursing programs offered distance education courses and 63 percent of these courses were initiated within the previous five years.

Distance education is a relatively new venture for dental hygiene education, and little is known about the exact extent and type of offerings in dental hygiene programs. The American Dental Hygienists’ Association launched a volunteer survey in the fall 2000 issue of Education Update. The survey consisted of eight questions regarding the structures of dental hygiene distance learning programs, methodology used, program plans, and demographic information. Unfortunately, only eight surveys were returned, and therefore the results could not be generalized to all dental hygiene programs. The purpose of this study is to determine the prevalence of...
and use of distance education in dental hygiene educational programs nationally.

**Method**

Dental hygiene directors of all associate degree and baccalaureate degree dental hygiene programs in the United States (N = 255) were mailed a fifteen-item survey regarding their use of distance education. Items addressed their use of distance education, general and specific modality used, dental hygiene courses for which it was being used, length of time used in the dental hygiene curriculum, and satisfaction with the use of distance education. For purposes of this study, distance education was defined as any dental hygiene course where at least 90 percent of the course material was delivered to learners at a distance from the presenting institution. The 90 percent level was used in an attempt to differentiate between courses exclusively using distance education for course presentation versus using distance education modalities to enhance course presentation. Design of the survey included open- and closed-ended questions. Responses were anonymous, and confidentiality was assured. The self-reply format implies consent upon return of the completed survey. The survey was pre-tested by dissemination to five program administrators at five educational settings. Following two mailings, 172 surveys were returned for a response rate of 67 percent. Of those responding, 140 (81 percent) were associate degree programs, and thirty-two (19 percent) were baccalaureate degree programs.

**Results**

Distance education was offered by thirty-eight dental hygiene programs (22 percent) responding to the survey. In addition, 13 percent had plans to offer distance education courses in the future. Sixty-five percent of the programs did not offer distance education alternatives and had no imminent plans to do so.

Sixty-eight percent (N = 26) of the programs that offered distance education were located in institutions offering associate degrees. Of these associate degree programs, eighteen (69 percent) were located in community college or technical college settings, whereas eight (31 percent) were found in university or college settings. Twelve of the thirty-eight programs responding to the survey (32 percent) reported they were involved in distance education that led to a baccalaureate degree (Table 1). Five of these programs only offered distance education in the baccalaureate degree completion (D.C.) program and not in their dental hygiene professional curriculum. Since the professional curriculum of associate and baccalaureate dental hygiene degree programs are reasonably similar, the results of the study were reported in the aggregate. One exception to this concept was the baccalaureate degree completion (D.C.) programs using distance education. Since their curriculum is significantly different, the results from these programs will be reported separately from the professional dental hygiene programs (P.D.).

**Distance Education in the Parent Institution and the Dental Hygiene Program**

All dental hygiene programs except one had parent institutions that also offered distance education. The majority of the parent institutions had offered distance education programs from one to ten years (one to five years: 56 percent; six to ten years: 37 percent). One (3 percent) program’s parent institution had been offering distance education for longer than fifteen years. Results were similar for the degree completion programs, with the majority of the programs’ parent institutions providing distance education from one to ten years (one to five years: 40 percent; six to ten years: 40 percent), and one pro-

<table>
<thead>
<tr>
<th>Table 1. Number and percentages of responding programs offering distance education (N = 38 respondents)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of Program</strong></td>
</tr>
<tr>
<td>All Associate Degree Programs</td>
</tr>
<tr>
<td>Associate Degree at Community College</td>
</tr>
<tr>
<td>Associate Degree at University/College</td>
</tr>
<tr>
<td>Baccalaureate Degree</td>
</tr>
<tr>
<td>DH Professional Curriculum only</td>
</tr>
<tr>
<td>Degree Completion</td>
</tr>
</tbody>
</table>
gram providing distance education for more than fifteen years (20 percent).

The majority of the dental hygiene programs at these institutions had distance education courses available for up to five years (less than one year: 25 percent; one to five years: 59 percent). Four programs had distance education available for six to ten years (13 percent), and one program had offered it for eleven to fifteen years (3 percent). The majority of degree completion dental hygiene programs also had offered distance education for up to five years (less than one year: 20 percent; one to five years: 60 percent). One degree completion program had distance education accessible for students for six to ten years (20 percent). No degree completion program had offered distance education for greater than ten years. (See Table 2.)

Prevalence of Courses Offered Through Distance Education

The number of courses offered via distance education in professional programs varied dramatically from one or two courses in eighteen programs to the entire curriculum in four programs. Seventy-four percent of the programs offered 1-25 percent of their curriculum via distance education; 13 percent offered 26-50 percent; 0 percent offered 51-75 percent; and as stated previously, four programs (13 percent) offered 76-100 percent of their curriculum through distance education (Figure 1a). The primary reason for providing distance education was to serve special populations (30 percent), with distance education being driven by the parent institution (18 percent) the secondary reason. Additional reasons specified were student recruitment (6 percent), dental hygiene manpower (10 percent), grant funding (8 percent), and other (28 percent), which included such areas as faculty interest, multiple campus sites, conserving faculty, student scheduling, and student time management.

The number of degree completion courses provided through distance education ranged from one course to the entire degree completion curriculum. In addition, one program that offered a master’s degree in dental hygiene provided five courses through distance education, and another offered three courses. The majority of degree completion programs provided 51-75 percent (50 percent) of their curriculum via distance education; 25 percent provided 1-25 percent; and an additional 25 percent provided 76-100 percent (Figure 1b). Similar to professional degree programs, the degree completion programs’ primary reason for offering distance education was to serve special populations (33 percent); however, addressing dental hygiene manpower issues (11 percent; and as stated previously, four programs (13 percent) offered 76-100 percent of their curriculum through distance education (Figure 1a). The primary reason for providing distance education was to serve special populations (30 percent), with distance education being driven by the parent institution (18 percent) the secondary reason. Additional reasons specified were student recruitment (6 percent), dental hygiene manpower (10 percent), grant funding (8 percent), and other (28 percent), which included such areas as faculty interest, multiple campus sites, conserving faculty, student scheduling, and student time management.

The number of degree completion courses provided through distance education ranged from one course to the entire degree completion curriculum. In addition, one program that offered a master’s degree in dental hygiene provided five courses through distance education, and another offered three courses. The majority of degree completion programs provided 51-75 percent (50 percent) of their curriculum via distance education; 25 percent provided 1-25 percent; and an additional 25 percent provided 76-100 percent (Figure 1b). Similar to professional degree programs, the degree completion programs’ primary reason for offering distance education was to serve special populations (33 percent); however, addressing dental hygiene manpower issues (11 percent; and as stated previously, four programs (13 percent) offered 76-100 percent of their curriculum through distance education (Figure 1a). The primary reason for providing distance education was to serve special populations (30 percent), with distance education being driven by the parent institution (18 percent) the secondary reason. Additional reasons specified were student recruitment (6 percent), dental hygiene manpower (10 percent), grant funding (8 percent), and other (28 percent), which included such areas as faculty interest, multiple campus sites, conserving faculty, student scheduling, and student time management.

![Figure 1a. Percent of professional dental hygiene curriculum offered through distance education](image1.png)

![Figure 1b. Percent of degree completion curriculum offered through distance education](image2.png)
reasons for its implementation. The only “other” reason (22 percent) included for degree completion programs was to implement a program where dental hygiene students could earn a baccalaureate degree. Not one professional or degree completion program listed profit-making as a reason for implementing distance education. (See Figure 2.)

Types of Students Accessing Distance Education

Twenty-three professional degree programs (77 percent) served only in-state students through distance education. Seven programs (23 percent) served both in-state and out-of-state students. Two program directors did not respond to this question. In the seven programs serving both in-state and out-of-state students, six (86 percent) had 1-25 percent of their students participating in distance education programs from out of state. One program (14 percent) had 26-50 percent of their distance education students from out of state (Figure 3).

All five (100 percent) degree completion programs served both in-state and out-of-state students. Three of these programs (60 percent) had 1-25 percent of their students participating in distance education from out of state, and two programs (40 percent) had 26-50 percent of their distance education students from out of state. Neither the professional degree programs nor the degree completion programs had greater than 50 percent of their distance education students from out of state.

Faculty Development

All but five of the professional degree programs (84 percent) and all degree completion programs (100 percent) offered their faculty formal training in distance education delivery. Forms of faculty training included in-services and workshops, support from technology services, summer institutes, mentors, online support, semester courses, and reduction in teaching hours or sabbatical leave. The most prevalent form of training was in-service sessions or workshops.

Types of Technology and Courses in Distance Education

The most commonly used type of distance education delivery in both the professional degree programs and degree completion programs was asynchronous computer-based distance education (62 percent and 56 percent, respectively). This was composed primarily of online courses; however, it was reported that in six programs CD-ROM only courses were also used. Other common forms of distance education were synchronous computer-based delivery; videostreaming and chat (5 percent P.D.; 22 per-
cent D.C.) and synchronous video delivery; and telecourse, ITV, or point to point broadband (19 percent P.D.; 22 percent D.C.). Five professional degree programs (14 percent) offered asynchronous video courses, such as videotapes, broadcast, or rural distance TV. Print-based delivery was used by five professional degree programs and one degree completion program; however, this was in addition to one of the other forms of distance education and not the sole delivery method. No programs utilized asynchronous or synchronous audio-based delivery for distance education (Figure 4).

A wide variety of dental hygiene courses were offered using distance education (Figure 5). As stated previously, four professional degree programs provide their entire didactic curriculum using distance education, while one degree completion program and another program delivered all but two courses through distance learning. The professional degree courses in order from most commonly offered to least commonly offered were: Periodontology (7), Oral Pathology (6), Dental Anatomy (6), Nutrition (6), Radiography (3), Pharmacology (4), All Dental Hygiene Courses (4), Clinical Seminars (3), Public Health (3), Ethics (3), Dental Materials (2), Head and Neck Anatomy (2), Infection Control (2), Dental Terminology (1), Medical Emergencies (1), Dental Office Management (1), Dental Specialties (1), Advanced Clinical Techniques (1), Biostatistics (1), Prevention of Dental Disease (1), Current Issues in Dental Practice (1), Evidence Based Dental Hygiene Practice (1), Dental Hygiene Orientation (1), and Continuing Education Courses (1). One of each of the following degree completion courses were offered through distance education: Introduction to Research Design, Principles of Dental Hygiene Education, Scientific Writing, Instructional Methods, Advanced Clinical Issues, Investigation of Health, Prevention of Dental Disease, and all B.S. degree completion courses.

Advantages and Limitations of Distance Education

Both professional degree and degree completion dental hygiene programs reported several advantages for using distance education to deliver dental hygiene courses (Table 3). The most frequently reported advantages were convenient access for students, student access at multiple sites, students attending school while maintaining employment, ability to teach outside the classroom and/or local area, and flexibility in the curriculum to attract students. Additional advantages reported were creativity in learning, enhanced critical thinking, simplicity, improved student computer skills, ability of students to interact in a nonthreatening environment, expansion of dental health care by the establishment of a dental hygiene clinical facility at the distant site that serves a previously underserved population, organization
Satisfaction with Distance Education

Overall, the professional degree programs were satisfied with distance education. On a scale of 1 to 5 with 1 being very satisfied and 5 being not satisfied, twenty-five programs (81 percent) rated their distance education programs at a 1, 2, or 3. Six programs (19 percent) were less than satisfied with their distance education initiatives, rating them either a 4 or 5 (Figure 6). Two programs did not respond to the question.

All degree completion programs rated their distance education programs a 1, 2, or 3, using the same scale as above. Two programs (40 percent) were very satisfied, rating the distance education a 1; two programs (40 percent) rated their distance education

Table 3. Advantages of distance education reported by dental hygiene program directors

<table>
<thead>
<tr>
<th>Most Commonly Reported Advantages</th>
<th>Other Reported Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convenient access for students</td>
<td>Creativity in learning</td>
</tr>
<tr>
<td>Student access at multiple sites</td>
<td>Enhanced critical thinking skills</td>
</tr>
<tr>
<td>Students attending school while maintaining employment</td>
<td>Simplicity</td>
</tr>
<tr>
<td>Ability to teach outside the classroom or local/area</td>
<td>Improved student computer skills</td>
</tr>
<tr>
<td>Flexibility in the curriculum to attract students</td>
<td>Ability of students to interact in a non-threatening environment</td>
</tr>
<tr>
<td>Organization and efficiency</td>
<td>Establishment of a new dental hygiene clinic at the distance education site that serves a previously underserved population</td>
</tr>
<tr>
<td>Better utilize faculty resources</td>
<td>Improved learner interaction expansion of accredited dental hygiene programs to reduce the risk of preceptor-trained dental hygienists</td>
</tr>
</tbody>
</table>

Table 4. Disadvantages of distance education reported by dental hygiene program directors

<table>
<thead>
<tr>
<th>Most Commonly Reported Disadvantages</th>
<th>Other Reported Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited computer access, equipment, and skills of students</td>
<td>Cost</td>
</tr>
<tr>
<td>Decreased student contact and discussion</td>
<td>Learning curve for faculty and students to use technology</td>
</tr>
<tr>
<td>Technological issues</td>
<td>Testing difficulties</td>
</tr>
<tr>
<td>Labor-intensive demands on faculty</td>
<td>Assertive students overpower others</td>
</tr>
<tr>
<td></td>
<td>Attention span of students at distant sites</td>
</tr>
<tr>
<td></td>
<td>Limited value for preclinical and clinical coursework</td>
</tr>
</tbody>
</table>
a 2; and the remaining program (20 percent) rated it a 3 on the satisfaction scale.

Two factors related to satisfaction level were examined: the length of time that distance education was offered, and type of distance education offered. Using a 2-way ordinal contingency table, it was determined that there was no association between length of time that distance education was offered and satisfaction level (p=0.795). In addition, it was determined that the type of degree offered was not a confounding variable. A Jonckheere-Terpstra Test determined that satisfaction level did not differ among the types of distance education used (p > .05).

Discussion

The survey results indicate that distance education programs have been utilized in many community colleges, colleges, and universities with dental hygiene programs for some time. Nevertheless, dental hygiene programs (22 percent) are recently beginning to implement programs offered through technology-based distance education methods. Dental hygiene is somewhat behind our colleagues in nursing, as 51 percent of nursing programs had implemented distance education by 1998.24

A significant disparity exists in the percentage of courses offered through distance education. Many programs seem to be embarking on this new methodology by offering one or two courses. The majority of programs only offered 1-25 percent of their curriculum using distance technology. Conversely, several programs provide multiple courses via distance learning, with four programs providing their entire curriculum at a distance.

The majority of students served by distance education are in-state students, yet eleven programs are serving both in-state and out-of-state students. In those programs less than half of the students were from out of state. These findings are similar to the results by Potempa et al.,34 which reported that the majority of nursing students served by distance education were in-state students. Therefore, it seems that in dental hygiene the use of distance education is not increasing out-of-state student numbers. This finding could be related to the fact that the majority of programs are only offering a limited number of courses via distance education.

Respondents used many types of distance education methods. The varieties of distance technologies used reflect the changing state of the art in distance education.4,5 Programs reported high use of asynchronous computer-based delivery methods. These types of technology allow for student access at times convenient for them. Synchronous computer-based and video-based delivery was also utilized frequently. This form of distance education increases faculty/student interaction, which has been reported to be a limitation of distance education. Nonetheless, Grimes36 suggested that continual faculty/student interaction is essential for a successful distance education experience.

From the responses of the program directors, it can be determined that almost all the dental hygiene courses at the professional degree level and the degree completion level can be taught using distance education, with the exception of preclinical and clinical courses. All didactic material can be provided to students using some form of technology at a distance from the parent institution. The concept of distance learning should be considered in programs or areas where student recruitment rates are diminishing or where dental hygiene human resource needs are a concern, particularly in remote geographical areas.

The advantages and limitations of using distance education to deliver dental hygiene course material identified by respondents were similar to those found in previous studies. The predominant advantages found in this study included convenient access for students, student access at multiple sites, students attending school while maintaining employment, ability to teach outside the classroom and/or
local area, flexibility in the curriculum to attract students, ability of faculty to make changes to the curriculum, student responsibility, increased discussion, and improved learner interaction. Advantages unique to dental hygiene programs were the establishment of a new dental hygiene clinic associated with the distant site that serves a previously underserved population and expansion of accredited dental hygiene programs to reduce the risk of preceptor-trained dental hygienists.

Limitations of distance education included limited computer access, equipment and skills of students, decreased student contact and discussion, technological issues, technical support from college, labor-intensive demands on faculty, cost, learning curve for faculty and students to use technology, testing difficulties, assertive students overpowering others, and attention span of students at distant sites.37-40

The limited value of distance education for preclinical and clinical coursework was a unique finding to dental hygiene in comparison to previous studies in the literature.

Thirty dental hygiene programs (83 percent) reported that they were either satisfied or more than satisfied with the distance education initiatives. Six programs (17 percent) were less than satisfied. Surprisingly, the length of time that distance education was offered by the dental hygiene program was not related to satisfaction level. It would seem reasonable to assume that the longer the time that distance education was offered, the more satisfied the programs’ directors would be as they made necessary modifications. However, when distance education is new to the program, the novelty of using a new method of educational delivery may tend to increase satisfaction level ratings.

The study suggested that there was no relationship between type of distance education used and satisfaction level. Therefore, the type of distance education selected should be determined by the program depending upon access to, knowledge of, and comfort level with the various forms.

Distance learning is being used by a substantial number of dental hygiene programs. Considering all factors investigated in this study, we conclude that the majority of programs are satisfied that distance education is an adequate alternative to traditional “bricks and mortar” approaches for providing dental hygiene education.

REFERENCES