Dental Hygiene Students' Perceptions of Distance Learning: Do They Change Over Time?

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Abstract

Purpose: The University of Arkansas for Medical Sciences dental hygiene program established a distant site where the didactic curriculum was broadcast via interactive video from the main campus to the distant site, supplemented with on-line learning via Blackboard. This study compared the perceptions of students towards distance learning as they progressed through the 21 month curriculum. Specifically, the study sought to answer the following questions: Is there a difference in the initial perceptions of students on the main campus and at the distant site toward distance learning? Do students' perceptions change over time with exposure to synchronous distance learning over the course of the curriculum?

Methods: All 39 subjects were women between the ages of 20 and 35 years. Of the 39 subjects, 37 were Caucasian and 2 were African-American. A 15-question Likert scale survey was administered at 4 different periods during the 21 month program to compare changes in perceptions toward distance learning as students progressed through the program. An independent sample t-test and ANOVA were utilized for statistical analysis.

Results: At the beginning of the program, independent samples t-test revealed that students at the main campus (n=34) perceived statistically significantly higher effectiveness of distance learning than students at the distant site (n=5). Repeated measures of ANOVA revealed that perceptions of students at the main campus on effectiveness and advantages of distance learning statistically significantly decreased whereas perceptions of students at distant site statistically significantly increased over time. Distance learning in the dental hygiene program was discussed, and replication of the study with larger samples of students was recommended.

Keywords: dental hygiene, education, distance learning, distance education, perceptions

This study supports the NDHRA priority area, **Professional Education and Development:** Evaluate the extent to which current dental hygiene curricula prepare dental hygienists to meet the increasingly complex oral health needs of the public.

Introduction

The concepts implicit in distance education are not a new phenomenon as they are rooted in correspondence study that originated in the U.S. more than 100 years ago, and in Europe more than 150 years ago.[1] Distance education through correspondence study grew through the mid-twentieth century and evolved from the original format of telecommunicating through the medium of the post to electronic communications through radio in the 1920s then to broadcast television in the 1950s.[1] The tremendous growth of distance education over the past few decades can be attributed to technological advances in computer-mediated communications and the Internet.[2] The Department of Dental Hygiene at the University of Arkansas for Medical Sciences experienced this growth and technological advancement when the dental hygiene program added a distant site in the 2009 fall semester. To serve those students at the distant site the didactic courses are delivered via interactive video network (IVN). As this was a new situation for the department, the opportunity presented itself to evaluate students' perceptions of distance learning over time as they progressed through the program and experienced the delivery method.

Evidence of the growth of distance education can be found in public and private surveys of institutions of higher education. The National Center for Education Statistics (NCES) is the primary Federal entity for collecting, analyzing and reporting data related to education in the U.S. and other nations. Per the NCES 2008 report on distance education, 65% of 2 year and 4 year Title IV degree-granting postsecondary institutions reported college-level credit-granting distance education courses during the 2006 to 2007 academic year.[3] The Sloan Consortium, a nonprofit organization, is an institutional and professional leadership organization dedicated to integrating online education into the mainstream of higher education.[4] The 2011 Sloan Consortium report states online education has grown to 6.1 million students enrolled in at least one online course at degree-granting postsecondary institutions as of the fall of 2010. The increase in online enrollments from 1.6 million in the fall of 2002 to 6.1 million in the fall of 2010 equates to a compound an-

nual growth rate of 18.3% as compared to the overall higher education student body annual growth rate of just over 2% in that same time period from 16.6 million in the fall of 2002 to 19.6 million in the fall of 2010.[5]

Distance Education Methods and Delivery Systems

Numerous definitions of distance education can be found in the literature and through an internet search. The U.S. Distance Learning Association defines it as, "the acquisition of knowledge and skills through mediated information and instruction."[6] The NCES has defined it as "a formal education process in which the student and instructor are not in the same place. Thus, instruction may be synchronous or asynchronous, and it may involve communication through the use of video, audio, or computer technologies, or by correspondence (which may include both written correspondence and the use of technology such as CD-ROM)."[3] Simonson defines distance education as "institution-based, formal education where the learning group is separated, and where interactive telecommunications systems are used to connect learners, resources and instructors."[1] The definition will likely continue to evolve with technological advancements. The terms distance education and distance learning have been used interchangeably in the literature, and for purposes of this discussion the terms will be considered to be synonymous.[3]

The delivery systems used to support distance education are divided into 2 categories: synchronous and asynchronous. Synchronous delivery involves the simultaneous participation of students and instructor in instruction that is provided in "real time." Examples include IVN, teleconferencing and web conferencing, and Internet chats. Conversely, asynchronous delivery, such as through e-mail, listservs, CDs, correspondence and the Internet, does not require the simultaneous participation of students and instructor and allows for students to determine their own time frame for learning.

In addition to the synchronous or asynchronous delivery method, distance education can be qualified as online, blended/hybrid, Web facilitated or traditional. Schlosser et al defined blended learning as "A class that is conducted both by face-to-face classroom meetings and distance learning activities."[1] Therefore, blended learning integrates the strengths of synchronous and asynchronous delivery through the combination of traditional classroom face-to-face learning experiences with online learning experiences. The Sloan Consortium report provides descriptions of online, blended/hybrid, Web facilitated and traditional course delivery:

- An online course delivers all or most (80% or more) of the course content online with no face-to-face meetings
- A blended/hybrid course delivers a substantial proportion (30 to 79%) of the content online and typically has a reduced number of face-to-face meetings
- The web facilitated course is essentially a traditional face-to-face course that uses web-based technology e.g. a learning management system or web pages to post the course syllabus and assignments
- The traditional course delivers content orally or in writing and uses no online technology[5]

Distance Education Methods and Student Performance

Little difference has been demonstrated between program outcomes and undergraduate dental hygiene student performance when utilizing distance education methods in the delivery of didactic courses in the dental hygiene curriculum. Whether the delivery method is synchronous via interactive video to multiple sites or online, studies found no significant difference between students' scores on the national board examination or grade point averages (GPAs).[7-10] In contrast, Gallagher et al found better performance in the distance education group as compared to a traditional group.[11] A statistically significant difference was observed in student performance between the web-based and traditional formats, with the web-based students scoring higher total final points. Conclusions of the study suggest student characteristics, such as age and previous experience with online coursework, influenced the outcomes.[11]

Students' Perceptions of Distance Learning Methods

While many dental hygiene programs offer some form of distance education in their curriculum, such as web-based, interactive video, and blended or hybrid courses, most programs utilize some combination of traditional classroom and distance education methodologies.[12] In undergraduate dental hygiene education, the development of clinical skills typically requires face to face instruction which precludes the use of asynchronous distance education methodologies. However, clinical skill sets have already been achieved by the degree completion or graduate dental hygiene student, thus making asynchronous delivery of distance education viable for these groups of students.[13] Blended or hybrid courses are commonly found in undergraduate dental hygiene curricula while asynchronous courses offered completely online are typically offered as bachelor degree completion programs and master's degree programs in dental hygiene.[14,15]

Much of the early literature on the use of distance education in dental hygiene programs highlighted students' perceptions of the advantages of the methodology, such as convenience, accommodation with personal and family needs, and overall program flexibility.[16] Grimes found the overall satisfaction level of students enrolled in an online dental terminology course to be positive. While students found the online course to provide convenience and access, they also cited technical issues and isolationism as drawbacks.[17] In a qualitative study of bachelor degree completion students, Tsokris found no difference between students who had taken all their coursework online and those who had taken a combination of online and traditional classroom courses in regards to their perceived quality of the learning experience.[18] Evaluations for undergraduate dental hygiene and dental students' attitudes and opinions towards and preferences for blended or online courses indicate student satisfaction with distance methods.[19-21] However, students did comment on the need for faculty training in distance learning methods.[19]

Student perceptions have been evaluated in other fields of study, such as criminal justice and business. Dobbs et al analyzed differences in perceptions between criminal justice students who had taken online courses and those who had not and found significant differences in perceptions between the 2 groups but only in their strength of agreement/disagreement.[2] O'Malley et al surveyed students enrolled in business, finance, accounting and information science courses on their perceptions of distance education courses and the traditional classroom.[22] They found that students did not perceive online (asynchronous, online) and distance learning (synchronous, interactive video) courses to be similar. While online courses were perceived as time saving, convenient and flexible, students did not report learning more in online courses compared to traditional courses and reported concerns in regards to being able to contribute to discussions. Overall, students preferred the traditional classroom but wanted more online courses. Students were much less complimentary of distance learning and did not perceive it to be as effective as the traditional classroom and did not prefer to take additional distance learning courses.

As technological variations in the delivery of education continue to become more prevalent, little research has been done specifically on the change in undergraduate dental hygiene student perceptions to the delivery method over time. In the fall of 2009, the Department of Dental Hygiene at the University of Arkansas for Medical Sciences (UAMS) in Little Rock, Arkansas established a distant site approximately 180 miles from UAMS in Mountain Home, Arkansas allowing 5 students at the distant site to receive the same classroom instruction, at the same time, and by the same faculty, as the students at the main campus. Synchronous delivery was accomplished using an IVN to broadcast didactic courses from the main campus to the distant site. The didactic courses were traditional or web facilitated through the utilization of a learning management system. In May 2011, those 5 students in Mountain Home received Bachelor of Science degrees along with the 34 graduates who attended the dental hygiene program in Little Rock. The newly created distant site presented the opportunity to study student perceptions as they progressed through the curriculum.

The purpose of this study was to compare the perceptions of the students at both program locations towards distance learning as they progressed through the 21 month curriculum. The study sought to answer the following research questions:

1. Is there a difference in the initial perceptions of students on the main campus and at the distant site toward distance learning?
2. Do students' perceptions change over time with exposure to synchronous distance learning over the course of the curriculum?

Methods and Materials

The study was approved by the UAMS Institutional Review Board. A total of 39 dental hygiene students participated in the study: 34 students at the main campus and 5 at the distant site. All students were women with a mean age of 23.10 years. The mean age of the 34 students at the main campus was 23 years and that of the 5 students at the distant site was 23.8 years. Thirty-seven were Caucasian, and 2 African-American. The distance education program employed synchronous delivery using an IVN to present the traditional classroom instruction supplemented by online learning via Blackboard, a learning management system. A paper survey was administered at both sites at 4 different periods during the 21 month program: matriculation, end of the first semester, end of the second semester and program completion (fourth semester). Students signed informed consents before taking the survey. The survey assessed dental hygiene students' perceptions on effectiveness and advantages of distance education.

Survey Instrument

The survey was developed and validated by O'Malley and McCraw, and adapted for this study.[22] According to O'Malley and McCraw, questionnaire items were developed based on the work of Moore and Benbasat.[22,23] After revision of items by 2 inde-

pendent experts, items that were ambiguous were reworded or eliminated and items that did not tap the construct were eliminated from their survey.[22] Five items that were related to effectiveness and 9 items that were related to advantages of distance education in comparison to traditional learning were applied in the O'Malley and McCraw study and in this study.[22] Additionally, in this study a new item was added to the items related to effectiveness: "Distance learning requires the instructor to teach differently." The survey included 15 questions on the Likert scale (1-strongly disagree, 2-disagree, 3-not sure, 4-agree, 5-strongly agree). The survey was not previously used with dental hygiene students. However, Cronbach's alpha for questions that assessed effectiveness (questions 1 to 5) was 0.81 and advantages of distance education (questions 6 to 15) was 0.79 which indicated a high level of internal consistency for each group of items in this study.

Statistical Analysis

An independent sample t-test was conducted to assess initial differences between students' perceptions of distance learning in the traditional class on the main campus and those of students at the distant site. Repeated measures of ANOVA were conducted to assess differences in students' perceptions about distance learning over the course of the dental hygiene curriculum.

Results

At the beginning of the program, students at the main campus perceived statistically significantly higher effectiveness of distance learning than students at the distant site, but not advantages of distance learning. Over time students' perceptions of effectiveness and advantages of distance learning statistically significantly decreased at the main campus whereas at the distant site students' perceptions of these statistically significantly increased.

According to tests of normality, Kolmogorov-Smirnov and Shapiro Willk, assumptions of normality were met for both groups on effectiveness and advantages of distance learning ($p>0.05$). According to Levene's test, assumptions of equality of variances were also met ($p>0.05$). Independent sample t-tests revealed a statistically significant difference between students on the main campus ($M=2.42$, $SD=0.57$, $n=34$) and at the distant site ($M=3.04$, $SD=0.43$, $n=5$) in their initial perceptions on effectiveness ($t(37)=-2.35$, $d=1.23$, $p<0.05$), but not on advantages of distance learning ($p>0.05$). According to the Mauchly's test of sphericity, assumptions of sphericity for both groups were met ($p>0.05$). Results of repeated measures of ANOVA showed that students' perceptions on the main campus statistically significantly decreased over time on effectiveness ($F(3)=28.96$, $\eta^2=0.47$, $p<0.05$), and advantages of distance learning ($F(3)=14.80$, $p<0.05$, $\eta^2=0.31$, $p<0.05$). Students at the distant site statistically significantly increased their perceptions over time on effectiveness ($F(3)=3.51$, $\eta^2=0.47$, $p<0.05$), and advantages of distance learning ($F(3)=5.12$, $\eta^2=0.56$, $p<0.05$). Tables I and II provide addition information on means, standard deviations and confidence intervals of students' scores on the survey at the main campus on four occasions.

Discussion

The start of a new distant site of the UAMS Department of Dental Hygiene presented the opportunity to investigate students' perceptions of distance education. A review of the literature revealed that little research comparing students' perceptions of effectiveness and advantages of distance learning initially and over time in the distance education setting has been done.

Initially, the study showed there was a difference between students' perceptions of effectiveness of distance learning at the distant site and main campus, but no difference between the 2 groups' perceptions of advantages of distance learning. In the study by Dobbs et al, differences in perceptions were in the strength of agreement/disagreement, not in the direction of agreement/disagreement between the two groups.[2] However, the UAMS Department of Dental Hygiene study revealed that over time students' perceptions at the main campus and distant site did change but in opposite directions - as the distant site students' perceptions of distance learning became more positive, the main campus students' perceptions became more negative. It can be hypothesized that because students in Mountain Home chose to attend the program at the distant site, they were a self-selecting group with positive perceptions toward distance delivery of education. The opportunity to earn a degree closer to their home could have influenced their more positive perceptions toward the end of the fourth semester. Accordingly, students in Little Rock did not select distance delivery and, on occasion, found technical issues with the IVN as distracting. Further research needs to be conducted to ascertain why the perceptions of these 2 groups moved in opposite directions. The study should be replicated on a new cohort of students to evaluate/compare the perceptions between cohorts of students but, if possible, with larger sample sizes than in the present study. The addition of focus group interviews of students at the 2 sites could provide insight into the differing attitudes and perceptions.

Table I: Means, Standard Deviations and Confidence Intervals for Scores of Students on the Main Campus (n=34)

	Effectiveness of distance learning			Advantages of distance learning		
Occasion	M	SD	95% CI	M	SD	95 % CI
1	2.42	0.57	2.2 to 2.6	2.93	0.53	2.7 to 3.1
2	1.94	0.55	1.7 to 2.1	2.53	0.46	2.4 to 2.7
3	1.71	0.66	1.5 to 1.9	2.46	0.66	2.2 to 2.7
4	1.53	0.49	1.4 to 1.7	2.32	0.49	2.1 to 2.5

Table II: Means, Standard Deviations and Confidence Intervals for Scores of Students on the Distant Campus (n=5)

	Effectiveness of distance learning			Advantages of distance learning		
Occasion	M	SD	95% CI	M	SD	95 % CI
1	3.04	0.43	2.5 to 3.6	3.26	0.42	2.7 to 3.8
2	3.28	0.46	2.7 to 3.8	3.68	0.53	3.0 to 4.3
3	3.28	0.23	3.0 to 3.6	3.64	0.32	3.2 to 4.0
4	3.56	0.50	2.9 to 4.2	3.78	0.41	3.3 to 4.3

A factor that was not examined in this initial research was faculty familiarity with the technology, specifically the IVN. As suggested in the research conducted by McCann et al, students expect faculty to perform well in this area.[19] Faculty did have introductory training on the use of IVN but were by no means experts at the time synchronous distance education started. Did faculty's lack of experience with IVN impact students' perceptions? If this study is conducted again, the fact that faculty now has experience utilizing an interactive video network should be considered when evaluating results.

Further research could include retrospective analysis of other data sets collected by the department compared to the information gained through this research which may give a better understanding of how distance education could be improved in the Department of Dental Hygiene at the University of Arkansas for Medical Sciences. Specifically, the department administers student course evaluations at mid-semester for most courses. There are several questions in the assessment that could be analyzed in comparison to students' perceptions of distance education.

Limitations of the Study

Results of the present study should be interpreted in light of study limitations. First, the sample size at the distant site was small. The maximum number of students enrolled per class at the distant site was 5, whereas the maximum number of students enrolled at the main campus is 34, which limited the estimates of population values for the small group in comparison to the larger group of students. Another limitation is the lack of randomization because the students in Mountain Home self-selected for distance education whereas the students in Little Rock did not.

Conclusion

The study has implications for improvement of teaching and learning in distance learning courses. A literature review revealed that little research has been done on the change in students' perceptions of the distance education delivery methodology over time and what factors might influence that change.

Because distance education methodologies are utilized at many undergraduate dental hygiene programs,[12] the study could be replicated at other institutions to increase the understanding of students' perceptions over time of distance education and improve teaching and learning in education. Similar research could be conducted in other allied health education settings as well and in other different education settings.

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