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Q2 Kindly note that the references Kennedy (2003), MacLaughlin (2004) and Mobley (2002) in the citation has been changed to Kennedy et al. (2003), MacLaughlin et al. (2004) and Mobley (2000) as per the reference list.

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Does instructor presence in the classroom influence examination scores in a therapeutics course delivered via interactive video-conferencing technology?

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Abstract

Objectives: To evaluate if instructor presence in the classroom influenced examination performance and to assess student perception of performance based on instructor presence in an interactive video-conferencing (IVC) course delivered to four sites.

Methods: An anonymous seven item survey was distributed. Questions assessed perceptions of IVC technology, impact on performance and preferred method of content delivery. Additional data collected were distribution of lectures originating from each site, examination scores and cumulative examination means.

Results: Ninety percent of students prefer to receive live lectures. Distant site students were more likely to have no preference about the mode of delivery ($p < 0.01$). Overall, 77% of students perceive better examination performance on material presented by a live lecturer. Although the majority of the lectures originated from one site, there were no statistically significant differences in any of the examination means or between the sites.

Conclusions: Instructor presence was not essential for satisfactory examination performance.

Keywords: *Distance education, interactive video-conferencing, examination performance, therapeutics*

Introduction

Distance education has been an integral and rapidly advancing component of the academic process for many years, as it allows students to continue learning in spite of personal and geographical restraints. Since 1995, Nova Southeastern University, College of Pharmacy (NSU-COP) located in Fort Lauderdale, Florida has utilized two-way interactive video-conferencing (IVC) technology to deliver instructional material in its nontraditional, post-baccalaureate, Doctor of Pharmacy (PharmD) program to students located throughout Florida and Puerto Rico. In this program, students attend class in multimedia-equipped rooms that have the ability to either send (local site) or receive (distant site) transmissions. Using a synchronous format, live didactic lectures delivered at the local site are simultaneously broadcast to the distant sites. Two-way audio and visual capabilities allow the instructor and students to conduct in-class discussions as well as question and answer sessions. In 2000, the College integrated the use of IVC technology into its existing entry-level PharmD curriculum (Kennedy, Ward & Metzner, 2003; Ward, Rey, Mobley & Evans, 2003).

NSU-COP currently has three campuses: a local site in Fort Lauderdale (FTL), a distant site in West Palm Beach (WPB) and a distant site in Ponce, Puerto Rico (PR). At the FTL site, an entry-level and an international (INT) PharmD program exists. The INT program allows foreign students with a Bachelor of Science degree in

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pharmacy from an accredited program in their country of residence to pursue a PharmD. INT students are held to the same competencies as the entry-level students. Due to the existing seating capacity of the classroom, the INT students attend class in a separate multimedia classroom with IVC capability located elsewhere on the FTL campus. Since the lectures are received via IVC transmission, INT students are considered a distant site for purposes of this study; however, INT students can interact with faculty outside of class in the same manner as FTL students. With the majority of instructors based at the FTL campus, approximately 80–90% of instructional material is delivered from that site to the distant sites (Kennedy et al., 2003; Ward et al., 2003).

Concern arose regarding the impact, if any, of this educational delivery system on student academic performance. A retrospective review of examination grades in a course run in therapeutics/pathophysiology I (PHA 5610) was conducted in 2002 to assess if there was a difference in performance between students in FTL and WPB. Therapeutics/pathophysiology is a three semester, team-taught sequence with the first course being offered to students during the second semester of their second year. Within each course, the material is divided into modules each consisting of closely related topics. In 2002, 67% of the lecture material in each of the first two modules and 100% of the lecture material in the last two modules originated from FTL. The final examination means for FTL and WPB were 78 and 77%, respectively (Table I). This data suggested that instructor presence in the classroom had minimal or no effect on examination score performance.

Other studies comparing distance learning to traditional methods have been published. One such study from Ohio Northern compared students' learning during a CNS module. Within the CNS module, the Parkinson's disease material was studied in a traditional and a web-based format. Although examination scores for the Parkinson's disease submodule were lower than those of other CNS submodules, no statistical difference in examination scores was found between students randomized to the traditional versus web-based delivery of content (Faulkner, Christoff, Sweeney & Oliver, 2005). Another study compared traditional (on campus) to distance learning (off campus) in students enrolled in a nontraditional PharmD program. Differences in academic performance in the didactic curriculum were compared retrospectively. Similar to the first study, no statistically significant differences were found between the groups (Breslow, 2005).

A retrospective study evaluated the outcomes of student performance in a four part pharmacotherapy series utilizing IVC. All lectures originated from one site. Results indicated that student performance (mean grade attained) did not significantly differ between sites ($p > 0.5$) (MacLaughlin, Supernaw & Howard, 2004). Another study assessed examination performance in a pharmaceutics course where students received half of the lecture material via live delivery and half via IVC. No significant difference was noted between the two sites ($p = 0.23$). Furthermore, student performance on examination material received via IVC did not differ from the mean scores achieved on examination material received via live delivery ($p = 0.89$) (Mobley, 2000). Over a 3 year study period, there was no statistical difference in the final grades of an advanced pharmacokinetics course that was delivered via live lecture in year one, half via live lecture and half via IVC in the year two, and all via IVC in year three (Wade, Cobb, Spruill & Chisholm, 1999).

Student perception of performance with the use of IVC in a business administration course was evaluated. At the end of the course, students were asked to complete a questionnaire about the IVC technology. A significant difference in student perception of IVC as an effective mode of educational delivery was found. Unlike the distant site students, local site students perceived that IVC negatively affected their ability to learn and were less likely to enroll in another IVC course. Despite being on campus or at a distant site, performance on assignments and examinations was comparable (Bader and Roy, 1999). Another study evaluated student attitude toward the use of IVC in both a clinical pharmacokinetics and therapeutics course. Although students were developing a more favorable attitude towards the technology within a 6 week time period, overall they still preferred to receive the course material via live lecture (Chisholm, Cobb, Wade, Lautenschlager & McCall, 2000).

Based on our preliminary data and a review of the literature, the objectives of this study were two fold: to prospectively evaluate if instructor presence in the

Table I. Lecture distribution and examination means—January to May 2002.

	FTL*	WPB†
Module 1 (15 h)		
Lecture distribution‡	10 (66.7%)	5 (33.3%)
Examination mean	76%	74.3%
Module 2 (15 h)		
Lecture distribution	10 (66.7%)	5 (33.3%)
Examination mean	78.7%	76.7%
Module 3 (18 h)		
Lecture distribution	18 (100%)	0
Examination mean	78.6%	78.3%
Module 4 (20 h)		
Lecture distribution	20 (100%)	0
Examination mean	78.8%	77.8%
Cumulative examination mean	78.0%	77.0%

*FTL, Fort Lauderdale. †WPB, West Palm Beach. ‡Percentage of lecture distribution was calculated by dividing the number of hours originating from the respective site by the total number of hours allocated for the individual module.

classroom influences examination scores and to assess student perception of examination performance based on instructor presence in a team taught therapeutics/pathophysiology course being delivered via IVC technology.

Methods

In January 2003, an anonymous seven-item survey was distributed to all students enrolled on the therapeutics/pathophysiology I course (Appendix A). The survey addressed students' preference for live versus IVC lectures and their opinion on how each type of delivery affected their academic performance. Students were also asked to rank the helpfulness of four methods of contact with the instructor. Responses from the seven-item survey were compared to site examination means.

From January to May 2003, the following data were collected: distribution of lectures originating from each of the four sites, individual site examination means for each module and final course means at each site. The data were analyzed using SPSS 11.5. Comparisons between sites for several variables were compared with the χ^2-statistic.

Results

In 2003, there were a total of 190 students enrolled on therapeutics/pathophysiology I: 112 in FTL, 39 in WPB, 21 in INT and 18 in PR. Thus, there were 112 local and 78 distant site students. A total of 190 surveys were completed. No demographics other than student site were collected since the survey was anonymous.

Students were asked to indicate their lecture delivery preference; 170 (90%) students indicated that they would prefer to receive live lectures, while 6 (3%) preferred IVC and 14 (7%) had no preference. When comparing distant sites to FTL, 18% compared to 1%, respectively, had no preference for lecture delivery mode ($\chi^2 = 18, p < 0.01$).

When students were asked about the effect of having a live lecturer in the classroom, 88% of the students felt that this positively affected their overall academic performance. When asked about the effect of having the lecturer at a distant site, 65% of the students felt that this had a negative effect on their overall academic performance (85% of FTL, 45% of WPB, 38% of INT and 11% of PR), 32% felt it had no effect on academic performance and 4% felt that it positively affected their academic performance. Distant site students were more likely than FTL students to state that having the lecturer at a distant site had no effect on their academic performance (63 against 14%, respectively, $\chi^2 = 47$, $p < 0.01$).

Overall, 146 (77%) students believed that they perform better on examinations when the material is taught by a live lecturer as opposed to IVC and only one student (from WPB) felt that he/she performed better on material delivered via IVC. The remaining 43 students (23%) felt they performed equally well in both situations; 40 of these students were from distant sites: 14 PR (78% of that site), 20 WBP (50% of that site) and 6 INT (29% of that site).

Fifty-six percent of students at the FTL site were opposed to the idea of equal distribution of live lectures at each site, while no distant site students were opposed. At the INT and WPB sites, 76 and 72% strongly agreed that an equal number of lectures should originate from each site. In contrast, only 39% of the PR students strongly agreed with this statement.

When asked to rank perceived helpfulness of four methods of contact with instructors, students overwhelmingly preferred "ability to ask questions/interact with instructor during class" and "personal interaction with instructor". Eighty-two percent of distant and 96% of local students ranked "ability to ask questions/interact with instructor during class" as their first or second choice for contact with instructors. Eighty-three percent of distant and 81% of local students ranked "personal interaction with instructor" as their first or second choice for contact with instructors.

Throughout the semester, the majority of the lectures originated from FTL. No lectures originated from the INT site, whereas a small number originated from WPB and PR. When comparing between sites, there were no statistically significant differences in examination means for any of the four modules. In fact, the INT site had the highest examination mean for each module. Cumulative examination means for the four sites were: 73.2% FTL, 78.8% INT, 74.0% PR and 72.5% WPB (Table II).

Discussion

The establishment of this IVC-based PharmD program increased access and educational opportunities for students throughout Florida, Puerto Rico, and internationally. Given the newness of the approach to deliver material to traditional, entry-level pharmacy students and the fact that most instructors are located at the main campus, ongoing assessment of student performance is necessary. In the early stages of this curricular change, students frequently stated that the IVC technology was to blame for poor academic performance. This study sought to assess whether instructor presence impacted examination performance and to formally measure student perception of impact on academic performance.

Consistent with the study by Bader and Roy (1999), most of our students perceived that their academic performance was negatively affected by IVC delivery of course content, although distant site students were more accepting of this delivery method than FTL students. In an earlier study of the WPB site (Ward et al., 2003), students were asked for their opinions of the distance program. They generally recognized that the use of IVC technology afforded increased access to pharmacy education. For those with family commitments, an IVC program allowed for matriculation into the

Table II. Lecture distribution and examination means—January to May 2003.

	FTL*	INT†	PR‡	WPB¶
Module 1 (18 h)				
Lecture distribution§	12 (67.0%)	0	0	6 (33.0%)
Examination mean	76.0%	78.0%	74.0%	74.0%
Module 2 (17 h)				
Lecture distribution	12 (71.0%)	0	0	5 (29.0%)
Examination mean	72.0%	79.0%	75.0%	72.0%
Module 3 (18 h)				
Lecture distribution	16 (89.0%)	0	2 (11.0%)	0
Examination mean	72.0%	79.0%	75.0%	72.0%
Module 4 (18 h)				
Lecture distribution	18 (100%)	0	0	0
Examination mean	73.0%	79.0%	72.0%	72.0%
Cumulative examination mean	73.2%	78.8%	74.0%	72.5%

*FTL, Fort Lauderdale. †INT, International. ‡PR, Ponce, Puerto Rico. ¶WPB, West Palm Beach. §Percentage of lecture distribution was calculated by dividing the number of hours originating from the respective site by the total number of hours allocated for the individual module.

pharmacy program without relocating or commuting to FTL. This realization may account for the more positive responses provided by students at the various distant sites. Of the distant sites, PR students tended to be most accepting of this technology and felt that it impacted their performance the least. When the PR site opened, it was the only option for students in Puerto Rico to obtain a PharmD degree; thus it is believed that this also contributes to their higher acceptance rates.

In terms of helpfulness, the two most highly ranked methods of instructor contact involved "visual" interaction. The two methods of "non-visual" interaction were infrequently cited as a preferred means of instructor contact. It has been suggested in the literature that instructors can improve and/or maintain "visual" interaction with students, especially those at distant sites, by planning classroom activities that engage students at all sites and by periodically visiting the distant sites to give a lecture, provide office hours, or to hold review sessions (Kennedy et al., 2003).

Despite the students' initial perception that they would perform better if material were delivered live as opposed to via IVC, the results of this study indicate that instructor presence in the classroom did not impact examination performance. There were no statistically significant differences noted between the four sites on examination scores. These findings are consistent with other published literature that compared the academic performance of students enrolled in courses that offered both traditional (live) and non-traditional (distant) lecture delivery (Faulkner et al., 2005; Breslow, 2005; MacLaughlin et al., 2004; Mobley, 2000; Wade et al., 1999). One strength of this study is that lectures were distributed between three (FTL, WPB and PR) of the four sites, allowing the other site (INT) to serve as a control. Interestingly, the site with no live lectures (INT) achieved the highest mean on each of the four examinations. Possible explanations for this finding are that all INT students had a Bachelor of Science in pharmacy prior to entering our program, tended to be older students, and may have had higher motivation (Schlosser and Anderson, 1994). Although considered a distant site, the INT students have equal opportunities for contact with instructors as FTL students due to their location on the main campus.

As the surveys were anonymous, it was impossible to match individual student responses with their specific examination scores. Although a direct analysis would provide an accurate correlation between student perception and actual examination performance, anonymity was deemed necessary to maintain the integrity of survey responses. Another limitation is that this study assessed the influence of instructor presence on examination performance, it did not address whether or not students perform better if an instructor is present or absent in the classroom. Other areas not addressed include the influence of an educational environment rather than delivery mode and instructor presence on academic performance. In other words, do students perform better when they are surrounded by other students in related areas of study? At the FTL site, pharmacy students are surrounded by and possibly interact with students from the Colleges of Medicine, Dentistry, and Allied Health and Nursing as opposed to students in PR and WPB.

Since these findings were similar to other literature suggesting that IVC technology and instructor presence in the classroom do not impact academic performance, other issues in the area of IVC based programs need to be assessed. These include predictors of successful performance (i.e. grade point averages, pharmacy admission examinations, etc.), optimal learner characteristics (i.e.motivation for success, age, etc.), learning styles, ability to achieve educational outcomes (i.e. capstone assessment), and success rates (i.e. graduating grade point averages, licensure examinations) of students completing such programs.

Conclusion

Overall, students preferred to receive their lectures in a live format. A majority of students perceived that their examination performance was positively influenced by instructor presence in the classroom; however, performance on the examinations was equivalent regardless of lecture origination. Students at the distant sites, where few or no live lectures were given, were more likely to state that they perform equally well despite lecture origination. These data indicate that although equal distribution of lecture origination is not essential for satisfactory examination performance, it may increase student perception of their ability to succeed academically.

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Appendix A

Interactive video-conferencing technology survey

This survey is completely anonymous and will have no bearing on your grade in this course. Please clearly circle the answer that corresponds to your opinion on the following questions. Your participation is appreciated, thank you.

1. Please indicate your site.

   Davie International

   Puerto Rico West Palm Beach

2. In which of the following formats do you prefer to receive your lectures? (Please circle only one response)
   a. By a live lecturer (in the same classroom)
   b. Via interactive video-conferencing technology (lecturer at a distant site)
   c. I have no preference

3. Please rank the following in order of how helpful you believe they are in enhancing your academic performance. (1 = most helpful, 2 = second most helpful, etc... Please use each number only once)

	Rank
Ability to ask questions/interact with instructor during class	
Personal interaction with the instructor	
Telephone interaction with the instructor	
Written/e-mail/chat room interaction with the instructor	

4. I perform better on examination material taught: (Please circle only one response)
   a. By a live lecturer (in the same classroom)
   b. Via interactive video-conferencing technology (lecturer at a distant site)
   c. I perform equally well in both circumstances

5. I believe that an equal number of lectures should be taught by a live lecturer (in the classroom) for each site.

   Strongly agree Agree No opinion

   Disagree Strongly disagree

6. Courses/subjects taught via interactive video-conferencing technology (lecturer at a distant site)...
   a. Negatively affect my academic performance
   b. Positively affect my academic performance
   c. Have no effect on my academic performance

7. Courses/subjects taught with a live lecturer (in the classroom)...
   a. Negatively affect my academic performance
   b. Positively affect my academic performance
   c. Have no effect on my academic performance