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# TECHNOLOGY IN PHARMACY EDUCATION

## Establishing and Maintaining a Satellite Campus Connected by Synchronous Video Conferencing

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Pharmacy education has experienced substantial growth in the number of new schools and existing schools establishing satellite campuses. Several models have previously been used to connect primary and satellite campuses. We describe the Auburn University Harrison School of Pharmacy's (AUHSOP's) experiences using synchronous video conferencing between the Auburn University campus in Auburn and a satellite campus in Mobile, Alabama. We focus on the technology considerations related to planning, construction, implementation, and continued use of the various resources that support our program. Students' perceptions of their experiences related to technology also are described.

**Keywords:** satellite, video conference, technology, campus, distance

## INTRODUCTION

Pharmacy education has undergone rapid expansion of programs and extension of existing programs through satellite campuses using a variety of curricular methods and technology systems.[1] Auburn University Harrison School of Pharmacy (AUHSOP) has maintained clinical education centers with resident clinical faculty members across the state for over 20 years as part of its doctor of pharmacy (PharmD) curriculum. Beginning in 1995, Auburn established a clinical education center in Mobile in collaboration with the University of South Alabama School of Medicine. Clinical clerkships were conducted by 3 full-time equivalent (FTE) faculty members for approximately 20 advanced practice students in the region in 2005. In 2006, the University of South Alabama and Auburn University signed a memorandum of understanding to collaborate in opening a satellite campus at University of South Alabama's campus in Mobile.

Several important factors were identified in the process of determining the need for a satellite campus. At the time, there were 2 pharmacy schools in Alabama: AUHSOP and Samford's McWhorter School of Pharmacy in Birmingham. Workforce shortages within the state were geographically variable. However, definite shortages existed in rural areas and along the Gulf Coast to the extent that Alabama had the highest demand for pharmacists in the nation.[2] While Auburn wanted to help meet the manpower needs of the state, space restrictions prevented expansion of AUHSOP in Auburn. However, the University of South Alabama indicated an interest in adding pharmacy education to their other health sciences programs to provide interdisciplinary health professions education.

In an effort to conserve state resources, the Alabama Commission of Higher Education encourages all state institutions to collaborate in offering graduate degrees through distance technology to increase accessibility. The advantages for the state of a satellite PharmD program in Mobile were a quicker start-up process, a streamlined accreditation process, and a location in the area of highest need of pharmacists within the state. In addition, a satellite campus would require less space, smaller support staff, fewer faculty members, and have lower overall fixed costs.

In this paper, we review the process to plan for and carry out implementation of a sattelite campus with a focus on technology needs as they related to physical plant, curriculum, faculty, and student performance and student satisfaction.

## PLANNING AND ESTABLISHMENT OF THE SATELLITE CAMPUS

To oversee the planning process, the AUHSOP dean formed an ad-hoc committee composed of 20 school personnel including faculty members, staff members, and administrative representatives from all departments, offices, and divisions within AUHSOP to ensure input from all stakeholders. The dean worked with administrators at the University of South Alabama to develop a formal agreement establishing the satellite campus. The AUHSOP committee was responsible for all other aspects of establishing

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the satellite campus including facilities planning, admissions and student services, technology infrastructure, personnel resources, curricular needs, marketing, and operations. The committee was led by a chair and an administrative faculty member whose responsibilities focused on technology use. Committee members met weekly for approximately 9 months prior to the scheduled first day of classes in fall 2007.

**Role of Curriculum**

The AUHSOP PharmD curriculum, which incorporates team-based learning throughout, played an important role in driving technology, resource, and facilities decisions. Our introductory pharmacy practice experience (IPPE) meets in groups of approximately 16 students across the first through third (P1-P3) years. With students on 2 campuses, it was important that groups be able to meet via video conference. Additionally, our P3 year is predominantly small-group learning and relies on clinically trained facilitators to guide the learning process. Facilitators are located throughout the state and are not necessarily in Auburn or Mobile with the group they are facilitating, making video conferencing a core component of instruction in our P3 year. Lastly, our skills laboratory spans the P1-P3 years and includes examination rooms for instruction. Planning included development of a similar laboratory at the satellite campus, with the intention of conducting laboratory sections on the 2 campuses simultaneously, using content experts for teaching from either campus via video conference technology.

The variety of activities embedded in the curriculum called for physical space to include large auditorium spaces as well as plenty of small group rooms. It called for flexibility to change the configuration of tables and chairs in a large auditorium from a lecture environment to a space suitable for small group interaction and for electrical outlets and data ports to be accessible in either arrangement. Wireless connectivity also was a requirement throughout both spaces. Not only would students from both campuses need to be able to connect and attend classes and team meetings together, but faculty members at remote sites throughout the state needed to connect as well through video conference technology. In most cases, rooms would need to be equipped to send content from a computer to distant sites. The committee worked diligently to consider these curriculum demands in planning the physical space and technology.

**Facilities Planning**

The satellite campus was to be housed on the University of South Alabama's campus in Mobile, which was 225 miles away from the AUHSOP. Accordingly, facilities planning involved working closely with representatives from University of South Alabama. The space to be occupied was approximately 14,000 square feet. Four committee members worked with architects at the University of South Alabama to develop blueprints, based on curriculum needs. Specifically, renovation involved demolition of several existing walls and construction of offices, team rooms, classrooms, a skills laboratory, a common area, a reception area, and an information technology closet.

The planning committee was concerned about the potential perception of inequality across campuses.[1] Members of the team made frequent trips to Mobile during the planning and construction process, holding meetings with the architects and information technology staff members, reviewing construction progress, working with technicians on hardware placement, making decisions about faculty and staff office locations, and in general attempting to prevent problems inherent with any construction project. From our perspective, facilities and technology planning were inseparable and critical. Considerable time was spent working with construction personnel, in conjunction with technology vendors, to address issues such as where to hang video conference equipment and where to drill floor cores for placement of power, video conference, and networking cables.

The Mobile campus was designed to mimic the Auburn campus so that classrooms and offices were similar to Auburn and finished with identical paint, carpet, and furniture to create the same physical atmosphere on both campuses. When the classrooms were connected over video conference, students would see an identical setting to their own, whether they were in Mobile or Auburn. Students and faculty members could travel between campuses and be comfortable with the equipment and surroundings.

**Technology Planning**

Teams from the Offices of Information Technology of both universities were assembled to provide telecommunication, commodity network access, and support. AUHSOP contracted with an audio, video, and Web collaboration services company for the design and installation of audio/visual and video conferencing equipment for the Mobile site. This company in turn subcontracted with a company specializing in network services to provide a dedicated network with guaranteed bandwidth between Auburn and Mobile explicitly for video conferencing. AUHSOP also entered into a service agreement with the video conference contractor to provide remote equipment monitoring (REM), hardware redundancy strategies, and Engage, an online Web-based tool for scheduling video conference calls that prevents overbooking of resources, such as endpoints and rooms. AUHSOP uses Engage to

program automated video conference calls to ensure that they start and end at the appropriate times, but its capabilities were not sufficient to schedule all classrooms and meeting rooms, the toll free number, nor non-programmed point-to-point video conference calls in a single calendar.

An information technology specialist was hired during the planning process to ensure successful operation of the technology connecting the campuses and spent a month in Auburn getting in-depth training on all aspects of video conferencing, networking, general IT support, and audio/visual technologies. The IT specialist transferred to the satellite location 1 month prior to opening the campus to provide additional oversight as construction and installation progressed.

**Infrastructure.** A previously installed video conference bridge, housed on the Auburn campus, would manage all multipoint video conferences. The video conference bridge allowed for multiple codecs or endpoints (as well as the recording system) to join at a virtual ''meeting place'' where all video and content streams converge. An extant video conference-based recording system would be used to record, distribute, and archive course lectures and other content via live and on-demand streaming, providing access for off-campus users, as well as for review of difficult concepts previously recorded. Desirable features of the recording system during initial implementation included large storage capacity (1.5 terabytes), reliability, a user-friendly Web interface, user permissions management, and the capacity to record and stream content as well as video and audio.

Including the equipment planned for Mobile, nearly 100 video conference endpoints would be installed in auditoria, lecture halls, team rooms, conference rooms, off-site faculty offices, clinics, and laboratories across both campuses. Mobile campus team rooms would mirror Auburn with flat panel plasma displays and conferencing codecs (endpoints capable of sharing content). Two large lecture rooms also would mirror the Auburn auditoria, including audience microphones and teaching stations.

**Training.** Faculty members had limited experience using video conference technology to deliver synchronous instruction over distance. In recognition of the significance of the project, the planning committee developed a training strategy that focused on faculty members and students. The 3-pronged strategy included: (1) hands-on training for faculty members, (2) technology orientation for students, and (3) additional technology training for students at the Mobile campus.

Faculty member training was triaged such that faculty members teaching the first semester were trained first. Three hours were set aside for formal training, which included demonstrations of the video conference and teaching station equipment and hands-on usage by the trainees. Training was mandatory and included a skills checklist that each trainee had to complete and submit to the planning committee. Faculty members were encouraged to experiment with the technology any time the classroom was available. Formal training was provided at the beginning of each semester until all personnel were trained.

Based on recommendations from ACPE, a workshop on ''Best Practices in Distance Education'' was conducted during the summer prior to the satellite campus opening. The workshop included topics such as having faculty members refrain from wearing white or bright clothing, using large fonts and fewer bullet points on presentation materials, making eye contact with students at the far-ends of the classroom, and asking questions directed at the distant site. Frequent reminders about these guidelines were distributed through e-mail and given at faculty meetings.

Entering P1 students received distance education training during orientation. The training focused on what to expect, best practices for video conferencing, and what not to do during a video conference session. Students whose IPPE teams include a distant site received additional training related to team room equipment that would be used for IPPE meetings.

### Contingency Planning

**Facilities.** Due to the short timeframe for implementation and the potential for the new facilities not being ready when classes began, backup space elsewhere on the University of South Alabama campus was identified for classes, offices, and team rooms. During the build-out, the necessity and appropriateness of using this space was periodically evaluated as the start date approached.

**Technology.** Due to the critical nature that information and video conference technology would play in the program, back-up and contingency plans for the information and video conference technology were developed using multiple ''what-if'' scenarios. These topics were included in faculty and student training.

## FIRST THREE YEARS OF OPERATION

### Technology Testing Prior to First Day of Classes

By August 2007, the technology in the rooms planned for use during the first semester was functional. Testing involved establishing and terminating multiple point-to-point connections between the 2 campuses. During these connections, we shared content, checked audio levels, checked video conference camera angles and controls, tested audience microphones, and tested the recording system. Testing was conducted in the traditional lecture style classroom, 3 team rooms, the faculty conference room, and the skills laboratory. The timeline for completion

of the campus required prioritization of these rooms; however, it was difficult to complete the remaining rooms after classes began. Scheduling work in class spaces around teaching became a barrier to completion of the project. The remaining large classroom, seminar room, and 6 team rooms all required technology installation over the following/subsequent months.

Initial plans for the skills laboratory at the satellite campus did not turn out as planned. The laboratory and 3 adjoining examination rooms were equipped with video conference equipment. The laboratory mirrored Auburn in that it contained chairs and tables on wheels, teaching equipment, and video conference equipment, including an omni-directional, ceiling-mounted microphone in the center of the laboratory. After multiple attempts to connect the laboratory sections in Mobile with the Auburn campus, we determined that the laboratory setting was not compatible with video conferencing due to the ''hands on'' demonstration nature of the laboratory and the rotation of students that occurs during any single laboratory. Additionally, the peripheral noise picked up by the ceiling-mounted microphone made it too noisy for an instructor in Auburn to conduct an intelligible conversation with students in Mobile. Consequently, a faculty member was appointed as a local coordinator for the laboratory in Mobile, and other local faculty members rotate serving as facilitators for the weekly laboratories.

**First Day of Classes**

The satellite campus opened on schedule. Unfortunately, the dedicated network failed on the first day of classes, even though testing had been successful the previous day. Planning and consideration of fail-over steps ensured that classes continued without interruption. Standard telephony provided an audio feed between the 2 campuses as the problem was being addressed by technical staff members. Students in Mobile were connected for all classes on day 1, though live video was not available. The issue was resolved with the help of IT support on both campuses and vendor-managed services, and both video and audio functioned well between campuses the next day.

The inability to connect between campuses gave our technology teams an opportunity to put the fail-over plans into action and use the contingency plan in a real-life situation. Our efforts to provide step-by-step guidance to resolve this type of issue were successful. Our vendors were quick to provide technical support, and worked in concert to rapidly correct a complex problem related to network routing that only became evident when the multi-point call was connected via the conferencing bridge.

**Completion of the Technology Installation**

With the shortened implementation time for the satellite campus, several classrooms were not fully functional on the first days of classes, but many rooms were not necessary during the first semester because we only had P1 students in Mobile. Installation of all rooms was complete by the beginning of the second semester, largely due to the efforts of the IT specialist hired for the Mobile campus.

**Scheduling**

A major issue because of its impact on the morale and workload of faculty members, staff members, and students was the complexity of scheduling. The limited dedicated bandwidth between Auburn and Mobile, limited video conference bridge capacity, a combination of point-to-point and multi-point video conference calls, differing needs of end users, frequent schedule changes, a finite number of rooms, online office hours, and other variables made scheduling complex and beyond the capabilities of Engage. A specialized master scheduling calendar was implemented, along with an online reservation request form.

In addition to the scheduling tool, personnel also were needed on both campuses to manage the process. Once the system was in place, end users who needed to schedule a video conference connection could do so via a secure portal on the AUHSOP intranet. Once the request is submitted, the information is transferred to the master calendar. Personnel manually input the request, and verify that there are no conflicts or double booking of rooms or hardware, that total bandwidth between campuses will not exceed capacity, and that the number of concurrent connections does not exceed total bridge capacity. The average number of scheduled events varies per day (average of 30), with the beginning of each semester being the busiest time. One person on each campus manages the room schedule, and a third person programs the video conference connections. These activities account for approximately a third of these individuals' job responsibilities.

Another issue identified when the satellite campus opened required modifications to class start and end times. The video conference between classes must initiate 5 minutes prior to the scheduled start time in order to provide time to troubleshoot problems should they occur. Consequently, the class in session must end on time, without exception, in order for the following class to start at its scheduled time. This became an issue with many faculty members who were used to running over if they had not completed their material for the day. These issues are some of the most difficult to address because they are rooted in the culture of the school. The conferencing system

provides a warning tone which we have programmed to alert users that their scheduled time ends in 5 minutes.

**Bandwidth Needs**

The initial installation included 2 separate networks. The University of South Alabama provided commodity network lines for general Web access for AUHSOP personnel in Mobile. The vendors installed a dedicated T1 (1.544 mbps, or megabits per second) line explicitly for video conference traffic between the Auburn and Mobile campuses. With only a P1 class on the satellite campus initially, video conference needs were limited to 1 course at a time. The connection between classes was transmitted at 768 kbps (kilobits per second). Concurrent video conference calls, such as meetings, could connect at only 384 mbps because video capabilities for a class were a higher priority. While two 768 kbps calls add up to only 1.536 mbps, network "overhead" adds unusable bytes between data packets which consume additional bandwidth, preventing 2 simultaneous 768 kbps calls.

Long-term plans called for the network vendor to install a T1 line each year for 3 years to provide increased bandwidth as enrollment at the satellite campus grew. This was an expensive but necessary solution because adequate bandwidth was essential to meet ACPE requirements for a seamless teaching and learning environment. We later determined that we did not need an additional T1 line for third-year courses because the curriculum included fewer large group courses that required video conferencing. We were able to use the existing bandwidth provided by the 2 T1 lines installed for the P1 and P2 years to meet the needs of the P3 year. Although this consolidation required more attention to scheduling to avoid overloading the network, it saved a substantial amount of fiscal resources.

**Downtime**

Aside from the day 1 failure of the network, downtime has been minimal. Over the course of the first year that the satellite campus was in operation, only 3 instances of classes being unable to properly connect occurred. The day 1 failure occurred due to incorrect routing information that pushed all video traffic to an incorrect network address. The remaining failures were related to teaching-station hardware issues. Overall downtime during the first year, excluding day 1 issues, was approximately 4 hours. In the third year of operation, there was 1 occurrence of the T1 line failing during Integrative Pharmacotherapy (P3 problem-based learning therapeutics course) orientation for the P3 students (class of 2011). Based on all video conference connectivity over the course of the first year, we experienced less than 1% downtime (approximately 12 hours downtime/2000 hours connectivity). Over the course of 3 years, this dropped to 0.3% downtime (20 hours downtime/6000 hours connectivity).

**Additional Network Challenges**

During the course of the network installation, the most difficult part of our dedicated line connectivity occurred at "the last mile," which is a term for the access linkage between primary network providers and the end user. The "last mile" is not necessarily a mile in length, but instead is the final hurdle between the user and the Internet. In our case, the last mile service provider dropped their Mobile line in the wrong location, which delayed finalization of the T1 network, thus delaying testing. The last mile provider had to come back to the Mobile campus to correct their error, which took several weeks to complete.

**Technology Life Cycle and Upgrades**

Network and hardware upgrades were another issue that received additional planning and forethought. In several cases, upgrades to routers and switches have caused problems within our network. For example, an upgrade to the Auburn campus firewall closed certain ports required by our conferencing units for full connectivity, leading to the inability to display content generated by the Mobile campus. Also, upgrades to an Auburn campus router blocked all video traffic coming from Mobile. We learned that this was a known issue with the router upgrade, and we were able to quickly resolve the issue by resetting the router to the previous version. All constituents must work closely together when planning and conducting hardware and software upgrades to ensure successful implementation.

Also, each conferencing and networking component must have a stable power supply. Uninterruptible power supply devices are critical for all infrastructure components. In several cases within our infrastructure, components hit by power surges (or unplanned outages) have suffered power supply or other electrical damage. Even with the best of support and warranties, a single component that is taken down by fluctuations in the power supply can take up to 24 hours or more to repair or replace, potentially impacting multiple courses.

Considerable attention must be given to issues such as warranties and hardware end-of-life during the planning and implementation process. AUHSOP's contract with our video conference equipment vendor to maintain warranties on all critical infrastructure equipment was imperative. We chose to continue onsite repair/replacement coverage of the critical elements, such as the bridge and content sharing codecs, throughout their lifespan. Other components with lower initial cost were not covered

because they could be replaced more easily. Some video conference hardware is nearing end of life, so AUHSOP has set up what is essentially an escrow account to replace it when the time comes.

Hardware upgrades are a fact of life with all technology. New high definition conferencing codecs use improved algorithms and decreased bandwidth, while significantly improving the video quality. Costs of these new endpoints typically fall within the same range as the previous components. AUHSOP plans to begin upgrades as end of life is reached, with replacement of the technology in the most frequently used rooms occurring first.

### Recording System

The course recording system in use at the time the satellite campus went live was StarBak INV. BurstPoint (Westborough, MA) has since acquired Starbak, and we have switched to a recording solution provided by Polycom (Pleasanton, CA). The recording system was used to record, distribute, and archive course lectures and content via live and on-demand streaming, and provide access for off-campus users as well as facilitate student review of any course session. At the time, our usage patterns were unique among the vendor's existing customer base. Along with the vendor, we experienced "growing pains" related to the sheer volume of recordings played simultaneously as well as the overall number of recordings that accumulated throughout the academic year.

The course recording system remains key to the success of the program. Although the "live" system has experienced little down time, the availability of course recordings is crucial to students. It is the back up if the video conference connection malfunctions. Students can log into the course system and watch the system in real time. If there is a sound or video problem during class, they can go back and watch it at a later time. It is also used extensively as study support. Students use the recordings (which include content) as a way to review content they need to watch for increased comprehension. The system has experienced several periods of downtime during the first 3 years of use. When course recordings are unavailable, students are dependent on the live video conference connection and more traditional methods, such as class notes.

## STUDENT PERCEPTIONS

The findings from studies of academic achievement by students in distance education programs in general and multi-campus pharmacy programs in particular have varied.[3-9] We developed a survey instrument to capture P1 students' (class of 2011) opinions regarding their experiences with various aspects of the program, including items pertaining to technology use and effectiveness. The survey was initially administered in 2008 at the beginning of spring semester over a 14-day period. Twelve days after the initial invitation to complete the survey was sent, a reminder was sent with 2 days remaining for data collection. Data were collected confidentially and recorded anonymously. Participation was voluntary and no incentives were provided.

The survey was administered again during the second semester of the 2009-2010 academic year, this time to the P1 (class of 2013), P2 (class of 2012), and P3 (class of 2011) classes. Mann-Whitney U tests were conducted to examine differences between student perceptions on the 2 campuses. The Mann-Whitney U test also was used to examine differences between the class of 2011 and the class of 2013 during their respective P1 years. Additionally, the Kruskal-Wallis test was used to examine differences among the 3 classes regarding level of comfort in interacting between the 2 campuses via video conference during IPPE team meetings. Student comments regarding participation in an IPPE team with members on both campuses were sought. Results from some of the survey questions are presented here.

Sixty-two P1 students (class of 2011) completed questionnaires (42% response rate) in 2008. Response rates for the 2010 survey were 69% (n = 110) for P1 students (class of 2013); 54% (n = 85) for P2 students (class of 2012); and 56% (n=74) for P3 students (class of 2011). Gender and age demographics for the respondents were representative of the classes in both the 2008 and 2010 surveys (62% to 76%, female; >73%, age 20-25 years).

Significant differences were found in use of the recording system as a substitute for attending class and as a review tool between the P1 students in the classes of 2011 and 2013. During their P1 year, a significantly higher percentage of students in the class of 2013 skipped the 2 large lecture classes (Table 1) in favor of watching the recording than did their counterparts in the class of 2011. For one of the large lecture courses as well as for the skills laboratory course, the class of 2013 was more likely to use the recording system as a tool to review for a quiz or test (Table 1).

There also were significant differences between P1 students (class of 2013) at the 2 campuses. Although watching a recording instead of attending class was popular among students on both campuses, the frequency with which Auburn campus students did so was higher, with 68% using the recording system 3 or more times per week compared to 41% of respondents on the Mobile campus (Table 2). A significantly greater percentage of

Table 1. Impact of Class Recording Capabilities on P1 Pharmacy Students' Class Attendance

| | | 3+ times per week, No. (%) | 1-2 times per week, No. (%) | None, No. (%) | Total |
|---|---|---|---|---|---|
| How frequently did you use Starbak instead of attending class? | | | | | |
| Drug and Diseases I[a] | 2011 Class | 0 | 17 (27.4) | 45 (72.6) | 62 |
| | 2013 Class | 70 (63.6) | 39 (35.5) | 1 (0.9) | 110 |
| Patient Centered Skills[b] | 2011 Class | 1 (1.6) | 8 (12.9) | 53 (85.5) | 62 |
| | 2013 Class | 99 (90.0) | 11 (10.0) | 0 (0.0) | 110 |
| How frequently did you use Starbak as a tool to review for a quiz/examination? | | | | | |
| Drug and Diseases I | 2011 Class | 5 (8.1) | 37 (59.7) | 20 (32.3) | 62 |
| | 2013 Class | 12 (10.9) | 67 (60.9) | 31 (28.2) | 110 |
| Patient Centered Skills[c] | 2011 Class | 1 (1.6) | 3 (4.8) | 58 (93.5) | 62 |
| | 2013 Class | 91 (82.7) | 14 (12.7) | 5 (4.5) | 110 |
| Contemporary Aspects of Pharmacy Practice I[d] | 2011 Class | 1 (1.6) | 3 (4.8) | 58 (93.5) | 62 |
| | 2013 Class | 90 (81.8) | 15 (13.6) | 5 (4.5) | 110 |

[a] Mann-Whitney U = 6,449.00; $p < 0.001$.
[b] Mann-Whitney U = 6,715.50; $p < 0.001$.
[c] Mann-Whitney U = 6,574.50; $p < 0.001$.
[d] Mann-Whitney U = 6,572.50; $p < 0.001$.

students on the Mobile campus indicated that the technology allowed them to ask questions of the instructors during Contemporary Aspects of Pharmacy Practice pre-laboratory lectures (Table 3). In the Drugs and Diseases course, which originated on the Auburn campus, 53% of Mobile respondents indicated feeling isolated from the instructors, whereas less than 23% of Auburn respondents felt isolated (Mann-Whitney $U = 1{,}165.00$; $p = 0.001$).

There also were significant differences between P2 class of 2012 students on the Auburn and Mobile campuses regarding use of the digital recording system in certain courses, whether the technology facilitated asking questions in class, and to what extent the technology distracted students from paying attention. In Contemporary Aspects of Pharmacy Practice laboratory, approximately 27% of Auburn students reported using Starbak 1-2 times per week in place of attending the prelaboratory lectures, whereas none of the Mobile campus students reported doing so (Mann-Whitney $U = 564.00$, $p = 0.034$). Both groups used Starbak to review for tests and quizzes, but use among

Table 2. Impact of Class Recording Capabilities on First-Year Pharmacy Students' Class Attendance at a Traditional and Satellite Campus[a]

| | Student Using Starbak Recording System | | | |
|---|---|---|---|---|
| Course and Campus | 3+ times per week, No. (%) | 1-2 times per week, No. (%) | None, No. (%) | Total |
| Drug and Diseases I[b] | | | | |
| Auburn | 63 (67.7) | 30 (32.3) | 0 | 93 |
| Mobile | 7 (41.2) | 9 (52.9) | 1 (5.9) | 17 |
| All | 70 (63.6) | 39 (35.5) | 1 (0.9) | 110 |
| Patient Centered Skills | | | | |
| Auburn | 83 (89.2) | 10 (10.8) | 0 | 93 |
| Mobile | 16 (94.1) | 1 (5.9) | 0 | 17 |
| All | 99 (90.0) | 11 (10.0) | 0 | 110 |

[a] Class of 2013.
[b] Mann-Whitney U = 565.50; $p = 0.026$.

Table 3. First-Year Pharmacy Students' Perceptions of Their Ability to Ask Questions of the Instructor in a Traditional and Satellite Classroom[a]

| Statement: "The technology allowed me to ask questions of the instructor in this course" | Strongly Disagree, No. (%) | Disagree, No. (%) | Neither Agree nor Disagree, No. (%) | Agree, No. (%) | Strongly Agree, No. (%) | Total |
|---|---|---|---|---|---|---|
| Drug and Diseases I | | | | | | |
| Auburn | 2 (2.2) | 5 (5.4) | 32 (34.4) | 41 (44.1) | 13 (14.0) | 93 |
| Mobile | 1 (5.9) | 3 (17.6) | 1 (5.9) | 6 (35.3) | 6 (35.3) | 17 |
| All | 3 (2.7) | 8 (7.3) | 33 (30.0) | 47 (42.7) | 19 (17.3) | 110 |
| Patient Centered Skills | | | | | | |
| Auburn | 2 (2.2) | 3 (3.2) | 42 (45.2) | 35 (37.6) | 11 (11.8) | 93 |
| Mobile | 1 (5.9) | 2 (11.8) | 1 (5.9) | 8 (47.1) | 5 (29.4) | 17 |
| All | 3 (2.7) | 5 (4.5) | 43 (39.1) | 43 (39.1) | 16 (14.5) | 110 |
| Contemporary Aspects of Pharmacy Practice I[b] | | | | | | |
| Auburn | 2 (2.2) | 3 (3.2) | 39 (41.9) | 38 (40.9) | 11 (11.8) | 93 |
| Mobile | 1 (5.9) | 0 (0.0) | 3 (17.6) | 7 (41.2) | 6 (35.3) | 17 |
| All | 3 (2.7) | 3 (2.7) | 42 (38.2) | 45 (40.9) | 17 (15.5) | 110 |

[a] Class of 2013.
[b] Whitney $U = 1{,}040.50$, $p = 0.027$.

students on the Mobile campus was significantly higher for the Drugs and Diseases course (Mann-Whitney $U = 271.50$; $p = 0.016$). For all courses, a significantly greater percentage of Mobile students indicated that the technology allowed them to ask questions of the instructor (Table 4). Lectures for all courses were given on the Auburn campus, so technology was likely not a factor in whether Auburn students were able to easily ask questions during class.

Table 4. Second-Year (Class of 2012) Pharmacy Students' Perceptions of Their Ability to Ask Questions of the Instructor in a Traditional and Satellite Classroom

| Class | Strongly Disagree, No (%) | Disagree, No (%) | Neither Agree nor Disagree, No (%) | Agree, No (%) | Strongly Agree, No (%) | Total |
|---|---|---|---|---|---|---|
| Drugs and Diseases III[a] | | | | | | |
| Auburn | 1 (1.4) | 5 (6.8) | 37 (50.7) | 22 (30.1) | 8 (11.0) | 73 |
| Mobile | 0 (0.0) | 0 (0.0) | 3 (25.0) | 5 (41.7) | 4 (33.3) | 12 |
| All | 1 (1.2) | 5 (5.9) | 40 (47.1) | 27 (31.8) | 12 (14.1) | 85 |
| Drug Products I[b] | | | | | | |
| Auburn | 2 (2.7) | 6 (8.2) | 34 (46.6) | 23 (31.5) | 8 (11.0) | 73 |
| Mobile | 0 (0.0) | 0 (0.0) | 3 (25.0) | 5 (41.7) | 4 (33.3) | 12 |
| All | 2 (2.4) | 6 (7.1) | 37 (43.5) | 28 (32.9) | 12 (14.1) | 85 |
| Management I[c] | | | | | | |
| Auburn | 1 (1.4) | 6 (8.2) | 34 (46.6) | 24 (32.9) | 8 (11.0) | 73 |
| Mobile | 0 (0.0) | 0 (0.0) | 3 (25.0) | 5 (41.7) | 4 (33.3) | 12 |
| All | 1 (1.2) | 6 (7.1) | 37 (43.5) | 29 (34.1) | 12 (14.1) | 85 |
| Contemporary Aspects of Pharmacy Practice III[d] | | | | | | |
| Auburn | 1 (1.4) | 5 (6.8) | 36 (49.3) | 23 (31.5) | 8 (11.0) | 73 |
| Mobile | 0 (0.0) | 0 (0.0) | 3 (25.0) | 5 (41.7) | 4 (33.3) | 12 |
| All | 1 (1.2) | 5 (5.9) | 39 (45.9) | 28 (32.9) | 12 (14.1) | 85 |

[a] Mann-Whitney $U = 619.50$; $p = 0.014$.
[b] Mann-Whitney $U = 618.50$; $p = 0.015$.
[c] Mann-Whitney $U = 613.00$; $p = 0.018$.
[d] Mann-Whitney $U = 615.50$; $p = 0.016$.

Finally, 83% of Mobile students disagreed or strongly disagreed that the technology made it difficult at times to pay attention in the Management course, while just over 53% of Auburn students gave this response, and more than 27% indicated they neither agreed nor disagreed with the statement (Mann-Whitney $U = 261.00$, $p = 0.019$).

Among the P3 students of the class of 2011, significant group differences were found regarding perceptions of whether the technology enhanced learning or made it difficult to pay attention, the visibility of content, and feeling isolated from the instructor. Forty-five percent of Auburn campus students agreed that the technology used in the skills course (Contemporary Aspects of Pharmacy Practice) enhanced their ability to learn compared to only 12% of Mobile students ($p = 0.011$). The majority (79%) of Auburn students agreed or strongly agreed that the content was clearly visible on the screens used in the Kinetics course, compared to 31% of Mobile students ($p = 0.014$). Half of Mobile students but only 25% of Auburn students indicated that the technology made it difficult at times to pay attention in the Biostatistics course ($p = 0.039$). Finally, more Mobile campus students indicated that they felt isolated from the instructor in Biostatistics ($p = 0.041$), Kinetics ($p = 0.006$), and Contemporary Aspects of Pharmacy Practice ($p = 0.027$) courses.

Respondents who had introductory pharmacy practice experience team members from both campuses (n=87) were asked to rate their level of comfort in interacting between the campuses during meetings. The majority of students from all 3 classes indicated they either felt very comfortable, comfortable, or neutral on the issue. No significant differences were found among the 3 classes ($p = 0.420$). However, a comparison across campuses revealed a significant difference in responses, with about 73% of Mobile students indicating they felt comfortable or very comfortable interacting through video conference in Introductory Pharmacy Practice Experience, while only 40% of Auburn students indicated the same ($p = 0.001$).

## DISCUSSION

Not surprisingly students on the Mobile campus were more comfortable with the video conference technology than their counterparts on the Auburn campus. They depended on it more because most course content originated in Auburn, where the largest number of faculty members reside. The technology seemed to work well to enable students to ask questions from a distance, regardless of the course. However, given differences in responses between students on the 2 campuses regarding such courses as Biostatistics and Pharmacokinetics, math-based and skills-based courses seem to be inherently more difficult to teach effectively via video conference than traditional lecture courses, which basically deliver content with little or no hands-on component.

Comparisons between the classes of 2011 and 2013 provided interesting results in that use of the recording system both as a review tool and as a substitute for attending class increased. Although 90% of the P1 class of 2013 respondents indicated that they used the recording system in place of attending the Patient Centered Skills class 3 or more times a week, that particular class was only scheduled to meet twice a week. This suggests that when students missed a class they may have found it necessary to view a recording more than once to understand what was missed. The fact that Auburn students more frequently used the recording system in place of attending class may be explained by the difference in class sizes, ie, it is easier to skip class unnoticed in a 125-student class than in a 25-student class.

Future assessment and discussion among faculty members needs to occur regarding the increased use of recordings as a substitute for class attendance and what effect, if any, this may have on student learning. Finally, continued efforts are necessary to ensure that Mobile students enjoy a sense of connectedness with the Auburn campus.

Some of our most difficult challenges have not been related to technology, but instead are reflections of what happens when technology changes how people work. In addition to the impact on class start and end times, the use of video conferencing has impacted several aspects of our program. For example, after considering multiple methods to address student questions during an examination (when the instructor and student are not located in the same room), we decided to not allow questions during examinations. Students are instructed to write any questions they have on the examination for review by the instructor after the examination is over.

Video conferencing also has impacted how we conduct meetings and other non-class events. Noises such as clicking a pen or tapping on a table transmit loudly via the conferencing system. Side conversations and mumbled comments also create considerable noise. We also had to learn to allow for the slight delay that occurs during video conference to give others an opportunity to talk.

In anticipation of these challenges, we created policies for curricular and student life operations between the 2 campuses. Much of the policy content focuses on new ways of conducting various aspects of our program due to the use of video conferencing. One of the most visible cultural changes has been the widespread acceptance and use of our course recording system by students. Other cultural changes continue to occur, including reminders to faculty members to specifically engage students on the other end of the video conference as well as reminders that

classes must end when the video conference connection terminates.

Scheduling of rooms and video conference connections was one of the greatest unforeseen complexities for this program. We have yet to identify commercially available software to automate the scheduling process by monitoring and managing the various components comprising a meeting, handling scheduling requests and adequately addressing conflicts, so we continue to rely heavily on support personnel.

We have reported on the experiences of one program; other programs' experiences with technology issues for a satellite campus may differ. Although student perception data are included, a complete report of all data is not presented. Additionally, no data were collected on faculty members' perceptions of the technology. We did not fully describe the indirect and direct costs of people and technology, nor the costs of optimally designing a room equipped for video conference activity.

## CONCLUSION

Careful planning and coordination resulted in the successful establishment of a satellite pharmacy school campus that uses state-of-the-art video conferencing equipment to educate approximately 75 pharmacy students. The network and video conference equipment have been reliable (nearly 100% up-time over the first 3 years) and students indicate favorable views towards technology use, especially use of the recording system. Possible areas for improvement include ensuring that students at the distant site do not feel isolated from the instructor and that content is always visible for them. Our most significant challenges have been scheduling, changes in how we work, and other issues related to our culture. Involving all stakeholders in the planning, implementation, and ongoing use of the technology was and continues to be critical to our success. Technology replacement, repair, and upgrade represent significant future expenses.

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