Assuring Excellence in Distance Pharmaceutical Education

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Assuring Excellence in Distance Pharmaceutical Education explores methods for providing quality distributive education, one of the most complex issues facing pharmacy and all of higher education today. Significant issues are identified including quality assurance guidelines, strategies for teaching and learning at a distance, research into the effectiveness of various methodologies, as well as technologies available to deliver distance education and evaluation. Practical issues such as the unique challenge in interacting with students that are not physically present are discussed. Since research provides tangible measures of performance in distance education and supports the assumption that distance learning can be quality learning, this paper concludes with 7 recommendations for colleges, 5 recommendations for AACP, and 4 recommendations for ACPE to ensure excellence in distance education programs.

Keywords: distance education, distributive education, virtual university

Between the conventional university and learning at a distance, they need not be competition or they need not be polarised; each has its own place and each can fulfill its own mission to the advantage of both. -- William Rainy Harper

INTRODUCTION

Shaped by the social, political, and economic forces of the industrial age when access to knowledge was limited and technical innovation was slow, the structure of higher education in the United States has remained relatively unchanged since the first university opened in the 1600s. Today, this structure is challenged by societal forces such as the empowerment of consumers, the surge of multiculturalism, and access to and dissemination of information via the Internet. Affected by these developments, higher education in America is in the midst of a “virtual revolution” as university education increasingly requires reaching across time and distance through distributed education technologies such as videoconferencing, online courses, and virtual universities.

Distance education (a term used interchangeably with the terms distributed education, distributed learning, and distance training) is transforming the culture of professional health education by expanding access to students, introducing novel teaching and learning methods, as well as shifting the paradigm of how instructors and students interact.

In 1993, fewer than 100 colleges and universities delivered Internet-based courses; by 1999 nearly two-thirds of the 3200 accredited 4-year colleges and graduate schools offered them. The promise and potential of distance teaching for increasing enrollments, expanding access, and enhancing the quality of student learning to accommodate the profession’s manpower and public health care needs is attractive to colleges and schools of pharmacy in this era of instant digital communication. Defining quality and assuring quality in distance education has been a paramount priority of the American Association of Colleges of Pharmacy (AACP), the American Council on Pharmaceutical Education (ACPE), and institutions of higher education nationwide. This White Paper explores distance education, one of the most complex issues facing pharmacy and all of higher education today. Significant issues are identified including quality assurance guidelines, research into effectiveness, strategies for teaching and learning at a distance, evaluation, as well as technologies available to deliver distance education. Since research provides tangible measures of performance in distance education and supports the assumption that distance learning can be
quality learning, this paper concludes with seven recommendations for colleges of pharmacy to help ensure excellence in distance education programs.

**Defining Distance Education**

The United States Distance Learning Association defines distance learning as situations in which “students may complete all or part of an educational program in a geographical location apart from the institution hosting the program.”

Distance learning is not a new phenomenon; it has existed in various forms since the advent of written language. Anna Ticknor, considered the founder of American correspondence study, established a volunteer society that encouraged at-home study for women and provided study materials to over 10,000 members in the late 1800s. During the twentieth century, the development of distributed education in the United States progressed from paper-based correspondence to one- and two-way radio, television, satellite, and cable before evolving into today’s two-way, interactive sessions using videoconferencing and/or Internet-based course management systems such as Blackboard® and WebCT®.

In an attempt to categorize different types of distance education, Coldeway developed a two by two grid framework that classifies modes of instructional delivery. Within this framework, the variables time and space have two dimensions. Instruction can be conducted at the Same or Different Time and in the Same or Different Place.

In Figure 1, Same Time/Same Place describes traditional instruction occurring within a classroom. The upper right quadrant (Different Time/Same Place) refers to a common arrangement in which students are not geographically separated, but instruction is offered at different times. An example of a Different Time/Same Place situation in pharmacy education would be the use of multiple sections or laboratories in a course. In the Same Time/Different Place scenario (bottom left quadrant), instruction occurs in "real time" or synchronous mode; although students are not committed to one place or place-bound. In these situations participants engage in such activities as chat rooms and videoconferencing.

The bottom right quadrant of the framework (Different Time/Different Place) is commonly referred to as asynchronous or delayed-time distance education. Unconstrained by time or place, participants independently select where and when they want to engage in educational activities. Some believe that only this quadrant – Different Time/Different Place – truly is distance education, however each mode has strengths, weaknesses, and applications to achieving desired outcomes. Selection of mode should be based on the resources of the institution, the needs of the student population, and ability to achieve desired outcomes. To achieve desired learning objectives in a professional program such as pharmacy, a combination of educational modes will be required. Although the four quadrant grid works well for analyzing and discussing delivery arrangements used in distance education, it does not lend itself to the current hybrid trend of hybrid programs which integrate several distance delivery modalities to optimize learning outcomes.

**Distance Education In Health Care Programs**

In general, health care educators have been slow to adopt distributed learning, in part due to the need for clinical training, but distance education methods have supplemented the training of medical and allied health students and practicing professionals since the 1960s. Quality clinical experience has been the hallmark of the Doctor of Pharmacy (PharmD) curriculum. Distance students will require geographically convenient clinical sites. Difficulties are sure to arise in terms of securing sites, quality assurance, and competition with established regional schools. Distance technologies such as video streaming and videoconferencing augment both nursing and pharmacy education. Experiential coordinators have adopted these technologies to conduct clinical site visits to efficiently monitor remote practice training sites.

Only recently has educational technology advanced such that full degree programs can be implemented. Distance delivery is being used to provide courses in geron-
Distance courses are also currently incorporated into nursing, and allied health curricula generally at a graduate level. Allied health schools are offering online masters and PhD level courses in physical therapy, occupational therapy, medical sciences and physician assistant programs. Nursing programs are following suit by offering the opportunity for registered nurses to obtain a bachelor of science in nursing by distance means. Excelsior College, a virtual university based out of New York, provides an Associate degree in nursing completely online. In Australia, a program has been effective in providing general practitioners a certificate in psychiatry with over 200 practitioners enrolled from 1998-2001. In spite of training obstacles that need to be addressed, online delivery of content is also expected to play a larger role in the future education of dental students in the United States and Canada.

The rate of adoption of distance education by pharmacy educators appears to be consistent with other health care professions. Four institutions – Creighton University, Nova Southeastern University, University of Florida and University of Oklahoma -- are currently offering complete entry-level pharmacy pathways to distant students. (telephone conversation with Ulric Chung, Assistant Executive Director, American Council on Pharmaceutical Education, June 2003). Several colleges of pharmacy including Ferris State University, University of Georgia, University of Mississippi, and University of Texas are using distributed education for a portion of their entry-level pharmacy pathways. Many colleges of pharmacy are engaged in distance education for non-traditional postgraduate PharmD degree pathways and graduate programs.

Several completely online-based medical schools are in development around the world, including the McGill project and the International Virtual Medical School Initiative (IVIMEDS) spearheaded by the University of Dundee. The IVIMEDS system with over 50 institutions including schools in North America, the United Kingdom, and Australia will span the globe. Among the 20 institutions in the United States participating are Brown University, Wake Forest University, West Virginia University, and the University of Miami. Although global in nature, curricular resources such as virtual patients are being developed that can be tailored for local geographic regions and cultures. The IVIMEDS model encourages faculty collaborations between schools and manages the high costs of technology by sharing expenses and resources among members.

Distance education examples such as the IVIMEDS model extend the opportunity for medical education to place-bound students and allow universities to increase class size in situations otherwise restricted by physical plant. This collaborative model will benefit developing countries with limited resources and make access to international medical experts possible. The level of success of efforts such as these seminal endeavors will aid in determining the basic underlying structure of medical and pharmacy education of the future.

**Administrative and Practical Issues in Providing Distance Education**

When incorporating distance education components into a program or launching a new distance initiative, there are significant structural issues requiring attention. To be successful, distance learning must be integrated into the organizational structure and vision of the college. Comprehensive planning for a program is essential to assure quality educational experiences and to provide support services for the distant student. During the program planning and development process, before the actual educational activities begin, the evaluation processes should be established. Effective program development uses evaluation to ensure that each component contributes to improved student learning. Despite investing substantial resources, several high profile institutions have been unsuccessful in distance education ventures due to a lack of comprehensive strategic planning and evaluation. According to the National Education Association (NEA), few institutions have the financial and personnel resources and the commitment necessary to provide quality distributed education. Adding educational technologies to traditional teaching methods to augment instruction also increases expenses. The NEA also indicates that cost savings with distance programs are best realized in large courses (eg, 450-900 students) with multiple sections. Clearly, if adequate hardware, software, and technical support for maintaining communication and information are not physically available or reliable due to lack of planning or financial resources, the distance education program will suffer. The same applies to staffing resources. Faculty workloads may increase with distance education delivery methods; thus in implementing distance initiatives, the number of faculty and support personnel needed should not be underestimated.

Administrators should critically examine their motives for implementing distance education in professional pharmacy pathways to ensure that the resulting
Since faculty leadership is important, experienced faculty members are needed in distance education pathways to assure the quality of programs. To reduce turnover rates among highly productive faculty involved in distance education pathways, administrators should design reward systems to retain them. In light of faculty concerns, institutional reward systems should recognize multiple dimensions of scholarship including the creation of courses for alternate delivery methods and the challenges of serving a dispersed population. The academic unit's commitment to quality distance education should provide adequate compensation to reward success and recognize and support faculty in promotion and tenure decisions. Policies addressing property rights to online courses, use of copyrighted materials, videotaped productions, and learning resources in distance education need to be developed so both individual faculty members and the institution are clearly informed as to what each does or does not own. (See Appendix 1 for legal aspects of using copyright material.)

SETTING THE STAGE FOR LEARNING AT A DISTANCE

Far from hastening the demise of traditional classroom education, online learning allows for differentiation of institutions, learning styles, and pedagogy. – Diana Oblinger

Despite the long and successful history of traditional Western methods (sometimes labeled the “transmission model”) in higher education, there is recent evidence that distributed education may be as or more effective in achieving educational outcomes compared to traditional programs. Machimes and Asher conducted a meta-analysis of the effectiveness of 19 telecourses on several key questions, among them: 1) equivalency of outcomes; 2) factors associated with learner achievement; and 3) impact of technological changes on learner achievement. For the first question of whether the outcomes of traditional and distance education are the same, the calculated overall effect size was essentially zero – a finding of no difference in student outcomes between traditional and distance education. For the research question on interaction, distance education models that afforded students the opportunity to interact with the instructor had a greater positive impact on achievement than program designs that did not allow interaction with the instructor. For the question of the effect of technological innovation on learner outcomes, learners who used the latest technologies had higher achievement than students using older technology. A literature review of studies comparing distance-learning versus face-to-face learning within the United States military concluded that there were no significant differences between traditional and distance education.
among students trained either through distance learning technology or in a traditional educational classroom.\textsuperscript{57} Specifically in healthcare, the technological methods used to deliver instruction has been shown to be as effective as traditional delivery methods.\textsuperscript{17}

In addition to equivalency of outcomes, student satisfaction and the effect of learning style have also been studied. A meta-analysis that compared student satisfaction between traditional and distance pathways found a slight student preference for traditional methods but no difference in student satisfaction. In comparing only distance education modes, student satisfaction with video methods was slightly higher than with written distance education modes.\textsuperscript{56} This finding is consistent with the results of other research showing that delivery methods allowing increased interaction with the instructor had a positive impact on performance.\textsuperscript{54} Overall satisfaction with distance education appears to be good with many students indicating they would take distance education courses again.\textsuperscript{59} Learning style is not commonly identified as a factor which predicts student success in an online environment.\textsuperscript{13,14,60,61} The analysis of the impact of learning styles on success with online versus traditional education found regardless of method, students learned equally well as measured by test scores and assignment grades.\textsuperscript{53,55} There is no reason to believe that these results would differ if the subjects had been pharmacy students. However, expectations and achievement of technically adept pharmacy students who are younger and exhibit the typical range of motivations may be different than those of traditional distant students.

Although the question of which model produces better outcomes for pharmacy students has not been definitively answered, research on significant differences between online and traditional learning in other disciplines indicates that the online format produces better or equivalent outcomes.\textsuperscript{62} However, these comparisons have been criticized for not being systematic and for focusing on specific courses rather than on academic programs as a whole.\textsuperscript{63} This is an area ripe for further research. A summative evaluation of the educational effectiveness of distance programs and teaching/learning processes specific to pharmacy education should be conducted using several methods of analysis and by applying specific standards.\textsuperscript{64}

Advances in technology present numerous options for delivering quality instruction in new and creative ways. Technology-enhanced components such as web-based tools have infiltrated the traditional classroom, changing instructional delivery and blurring the lines between traditional and distance educational experiences.\textsuperscript{37} Distance education and education technologies enrich and rejuvenate the learning experience. Institutions now have the opportunity to design optimal learning experiences for its students by melding the best elements of traditional and distance education. If this potential is fully realized, these learning systems will not replicate the traditional classroom, but will be unique teaching systems individualized to meet the needs of pharmacy students. The design of effective systems will also require rigorous assessment of outcomes and identification of best practices within the profession.

Regardless of instructional delivery methods selected to achieve educational goals, institutions are responsible for developing successful learners. Conditions necessary for effective learning include a comfortable environment conducive to learning and active participation in the learning process, methods for assessing progress towards learning goals, library services, distance program facilitators, and professional development opportunities to help faculty effectively integrate technology into the classroom.\textsuperscript{61,65,66} Quality distance education starts with quality education. (telephone conversation with Ulric Chung, Assistant Executive Director, American Council on Pharmaceutical Education, June 2003) Teachers of pharmacy must be adequately trained in pedagogical theory and distance learning techniques if they are to be successful in this environment. More so than the traditional classroom, teaching at a distance requires training, preparation, and interactive techniques. Poor teaching tends to be magnified in distance education courses. Teachers who are very effective in traditional classes may not find that their teaching methods transfer easily to the distance environment. As part of the orientation process, institutions should explain the college’s expectations to students and provide practical hands-on training in the technology of choice since distant students may over-estimate their skills and struggle with unfamiliar technology.\textsuperscript{67} If computer-based technologies are incorporated into the program, institutions should assess computer navigation skills of the incoming students and should remediate those needing additional training. In the distance environment, students should be able to contact instructors during virtual office hours, by email, in chat rooms, on bulletin boards, or by telephone.\textsuperscript{61,68} Due to the “anytime/anyplace” nature of some distance education formats, students may expect instructors to be always available for feedback or questions.\textsuperscript{69} Institutions should establish guidelines for communication through media to decrease learner and faculty frustration.
Profiling successful distant students. Although institutions must provide training and create supportive learning environments, students must also accept responsibility in the learning process. Understanding the difference between memorizing information and internalizing concepts is a common problem that students face in all educational settings. To be successful, students need to assess whether they have correctly comprehended the material. If their grasp of the material is in doubt, they must proactively develop a personal learning strategy. Proactive strategies may include locating alternative reading material, forming study groups, or initiating direct communication with the instructors. Students may have unrealistic expectations regarding their education and not understand the increased level of self-discipline required for success in distance education formats. Institutions can address this issue by screening for self-discipline, independence, and motivation during the admission process.

The demographic profile of students who select distance education is not necessarily the same as that of traditional entry-level pharmacy students. Stereotypically, students who utilize distance technology are non-traditional, for example, older students with family obligations that restrict them geographically. Frequently, they have earned a post-secondary degree, have previous work experience, and are returning to college for career advancement. Research with successful adult distance students suggests that they are disciplined and self-directed learners. Although students can adapt their learning styles to succeed in a distance learning environment, those with a preference for systematic planning and with an intellectual understanding of the situation are more likely to succeed, while students preferring concrete experience and interaction with other students are less likely to succeed.

The NEA reports “in contrast to stereotypes of distance learning students as older, part-time students, NEA faculty teach as many younger students as older students and as many full-time students as part-time students.” The demographics of pharmacy students in distant education pathways are also changing as more colleges initiate distance options for entry-level students. Many of these students are similar to traditional pharmacy students. Our seemingly “natural” experiment of the two pathways needs to be researched to clarify the degree of substantial selection bias by students into distance education options. Other studies are needed to understand the differences between these two groups – those in traditional vs. those selecting or assigned to distance educational pathways – in terms of preparation, attitude, demographics, and learning outcomes.

Moving to a Distance Education Environment. It is always a challenge to prove that innovations in instructional techniques are an improvement over traditional methods. As the art of teaching evolves from the traditional face-to-face classroom setting to instructing students at a distance, instructors must assess and adapt their teaching styles. “Distance education requires new ways of thinking about teaching and learning and challenges deeply held assumptions and long-established practices.” When space and/or time separates the instructor and students, conventional methods of learning are changed. Instructors not only need to examine and modify their teaching techniques to achieve instructional objectives at a distance, they must continuously assess achievement of learning outcomes, and keep abreast of innovations in education. A fundamental question about distributed learning was whether the conventional classroom model should be replicated in distance education. Although reproducing the face-to-face component of a traditional classroom can now be easily accomplished with videoconferencing methods, the American Council on Education states, “Distributed learning is much more than an online substitute for lectures. Distributed learning extends the opportunities for interaction between faculty and student.” The challenge for higher education is to understand each available technology and apply it to create new and effective learning situations.

Distance education should reach beyond teaching students what to learn to encompass how to learn, retrieve pertinent data, synthesize information, and develop a logical, comprehensive idea or conclusion. The problem-based learning (PBL) method is a student-centered approach to teaching that is particularly suited to distance education learning. Constructivist learning principles are the foundation of this complex, interactive process where students internally integrate researched information to derive a solution to a problem. Instead of the “lecture” format that necessitates memorizing information, PBL cultivates the concept of becoming a proactive, life-long learner. Students educated in a PBL model are self-directed and motivated learners who continue to build upon the foundation of that which was previously learned. Ideally, students retain information and apply basic concepts to new problems.

The Challenge of Providing Interaction

Most distance learning courses resemble traditional classroom courses or poor imitations talking heads, lots of text, and streaming video. – Arthur Levine
Contemporary educational theory increasingly values interactive exchanges among students.\textsuperscript{74} Significant learning occurs when the learner actively builds his or her own knowledge foundation and shares the results of the learning experience with others. Early research with computer-assisted instruction showed that students who work in isolation from their peers do not control learning situations productively. Technology-assisted cooperative learning can improve learner control and increase student motivation.\textsuperscript{75–79} Social interaction and peer conversations appear to support higher order thinking and cognitive learning outcomes, which are essential components of intellectual work necessary for the growth of knowledge.\textsuperscript{80–82} Educational researchers propose that interaction is fundamental to the effectiveness of distance learning.\textsuperscript{83} In health education in particular, the degree to which education successfully prepares caring competent practitioners may largely depend upon interpersonal interactions between students and teachers.\textsuperscript{84} It is undoubtedly this belief that led the American Pharmacists Association (APhA) to adopt the following policy statement: “Distance education components of first professional pharmacy degree programs must be constructed in such a way to assure socialization into the profession and understanding the ethos and essence of the profession, as such development is primarily derived through practical experience and interaction with faculty, colleagues and patients.”\textsuperscript{85} Technology alone does not offer guidance, socialization, and personal engagement. Faculty trained as facilitators or mentors add a “human touch to distance learning.”\textsuperscript{86} Their physical presence, or in certain circumstances virtual presence, nurtures a connection to the college or school, and the pharmacy profession in addition to reducing transactional distance. Face to face mentoring, even captured in “virtual space”, enriches the effectiveness of distant learning.\textsuperscript{12} The importance of interaction for the distant learner was championed by Moore who introduced three types of interaction thought to be essential in distance learning: Learner-Instructor, Learner-Content, and Learner-Learner.\textsuperscript{83} A fourth component of interaction, Learner-Interface, is important in enabling the student to successfully interact with the mediating technology.\textsuperscript{86} In addition to the suggestion that the success of a distance-learning model is directly related to the degree of dialogue within the student-teacher relationship, the organization of the learning materials is a crucial factor. Components necessary for the effectiveness of distant education interaction include:\textsuperscript{83,84}

- Dialogue – the communication between student and instructor;
- Structure – the degree of individualization of course content for the learner;
- Transactional Distance – the student’s perception of interpersonal closeness between the instructor and student, among students, and between other students and the teachers.

A crucial element in the success of a distance learning program is effective communication between instructor and learner.\textsuperscript{87–89} Communication is the means for integration and balance of the teacher, student, and content components in an educational transaction.\textsuperscript{90} Johnson and Johnson noted, “There are cognitive consequences of discussing what one is learning with classmates. Social interaction is essential for effective learning, the transformation of the mind, and the development of expertise.”\textsuperscript{91} These intellectual and social exchanges among distant students are critical to prevent feelings of social and intellectual isolation and to “provide outlets to exchange ideas, seek advice, and explore new avenues for thinking.”\textsuperscript{92} Effective interaction should be an objective when designing a program and optimized through program assessment.

Collaborative learning (also called group or cooperative learning) is an educational method that supports dialogue, interaction between students, and reduces transactional distance. Collaborative learning encourages social interaction and reduces feelings of learning in a vacuum. Well-suited for higher-order learning, this method has its roots in social constructivism, in which a social environment is designed to stimulate critical discourse, information discovery and knowledge construction.\textsuperscript{93}

Distance education programs using computer conferencing enable teaching and learning to shift toward a more collaborative approach. Although computer conferencing may support a collaborative environment in which students share their learning with others, no single technology or combination of technologies can stimulate critical thinking. Collaborative learning is more than the simple exchange of information and requires critical discourse in order to create new understandings among the students.\textsuperscript{94} Thus, while systems may provide considerable cognitive presence and facilitate critical reflection and discourse, distance learning environments must be purposefully designed to promote the collaborative process.\textsuperscript{95} Useful learning methodologies that generate complex social environments do not succeed without an active moderator or facilitator.\textsuperscript{96} If critical thinking is a desired learning outcome, as it should be in all Pharm.D. pathways, then learning activities that capitalize on the interactive potential of the medium must be planned and developed.\textsuperscript{97}
In the cluster model (often included in the Hybrid Distance Learning model\textsuperscript{12}), instruction is transmitted from a central location such as the main campus or a teacher travels to deliver instruction at a site convenient to the students. Instruction is synchronously or asynchronously delivered by a variety of technology-assisted methods. This model combines the best of several educational modalities by assembling students from a geographic area together as a learning cohort, beginning the program at the same time, and progressing through the educational experience as a group. The cluster is designed to serve as both an administrative unit and educational vehicle for the program. Each cluster operates under the direction of a local coordinator or facilitator employed and trained by the main institution. The standard student to facilitator ratio ranges from 12:1 to 25:1.\textsuperscript{12,98} The onsite facilitator, coordinates administrative details and cluster activities, serving to guide, mentor, and advise students in the cohort.\textsuperscript{98}

In this model, when lectures are transmitted via synchronous technologies (such as interactive videoconferencing), the site facilitator is present during the delivery of course material. The facilitator coordinates course logistics, addresses problems with the delivery method, distributes materials/handouts, answers student questions, as well as monitors and administers examinations.\textsuperscript{99} When instructional modules are provided asynchronously from a variety of media, the facilitator may be responsible for ensuring understanding of the course content.\textsuperscript{100} On a scheduled basis, the facilitator and students meet face-to-face or in a virtual conference to review course materials, exchange ideas, support each other, or conduct hands-on-training such as problem-based learning or laboratory exercises. In one established pathway for doctoral level pharmacy students, local facilitators assemble student clusters at a minimum of once monthly. When not feasible to convene a local cohort, students gather weekly with a regional facilitator using teleconferencing enhanced by an electronic classroom such as Placeware.\textsuperscript{61,12}

There are several advantages to the cluster model in distance education. Regardless of the delivery mode selected, the facilitator monitors quality of learning and puts a human face on the program by providing distant students with a readily accessible mentor and problem solver. The face-to-face interaction between students and the facilitator creates “an esprit de corps that develops an institutional loyalty and alumni relationships atypical of many distance education programs.”\textsuperscript{112} The facilitator essentially becomes a resource for students experiencing problems with technology or course content, elevating the overall learning.\textsuperscript{12,99}

Distance lectures require extensive planning and preparation when compared to traditional lectures.\textsuperscript{70,101-103} Although some distance education models (for example, those incorporating interactive videoconferencing technology) mimic the traditional classroom, teaching approaches need adjustment to maximize learning. For example, instructors could minimize lecture time and allow for active participation among the distant sites.\textsuperscript{61,101,102} Instructors must carefully select lecture materials since delivery via videoconferencing takes more time than traditional education. The ability of a student to view instructional materials is essential to their feeling of being in control of their learning. Students express frustration when attending classes without proper instructional materials. Therefore, instructors must adequately prepare course materials with required readings for distribution, audiovisual presentation, and planned sessions for interaction with the distant sites well in advance.\textsuperscript{103} If possible, course materials should be provided electronically (e.g., online) for ease of student access. Delivering at least one lecture from each remote videoconferenced site is an effective method to strengthen relationships with students.\textsuperscript{101,102}

As in traditional classroom models, it is important for faculty members to develop a relationship with students early in a computer-based course. Once a relationship foundation has been established, the next challenge is to facilitate and motivate ongoing interest in the course. Maintaining student contact or interaction, whether in a synchronous or asynchronous environment, is the key to successfully teaching at a distance.\textsuperscript{104} The challenge is to determine the correct amount of human interaction to educate a skilled practitioner.\textsuperscript{7} Table 1 highlights some key strategies for effective teaching at a distance.

**Table 1**

**Evaluation of Distance Education-based Pharmacy Degree Pathways**

*Distance learning remains immature and experimental. Higher education institutions need to innovate and allow distance learning to evolve and develop – but they cannot do so wholly unchecked. – Arthur Levine*\textsuperscript{69}

The evaluation of any pharmacy education pathway should focus on ways to improve both the delivery of instruction and achievement of professional competencies by students. With the introduction of distance education into pharmacy entry-level pathways, administrators can no longer simply assume that traditional teaching methods are by definition good. The ultimate goal of
Table 1. Application of Distance Teaching Strategies

Strategies

Asynchronous Strategies

- For optimal web-based instruction, explicit instructions, structured learning activities, provision of guides, examples, case studies, moderated purposeful discussions and debates, computer-based simulation, self-checking review, and web-based resources should be used.135
- Immediate and appropriate feedback enhances student motivation.136
- Time independence permits reflection and development of critical thinking skills
- Active moderator is necessary to maintain discussions.
- A summary of each topic area or discussion is beneficial to students.

Synchronous Strategies

- Participation from students at all distance sites must be expected. Thus, planned interaction with the distance site classroom is essential.103
- Instructors should minimize lecture time and allow for active participation between the distant sites.61, 101, 102
- Instructional materials must be provided to all students in advance.
- Provide for additional time to present instructional material via videoconferencing.
- Consistency should be maintained across all sites/learners.

Evaluation is to determine whether the educational program meets its goals for student achievement. The evaluation process assesses whether the specific learning goals have been met or whether unintended results have been achieved.

A comprehensive program evaluation of either distance or traditional learning is comprised of three essential components: preformative evaluation, formative evaluation, and summative evaluation. Preformative evaluation comprehensively assesses faculty and student needs during the planning process. During this phase, intended goals are clarified and strategies are set for the educational pathway. Formative evaluation is conducted during the program of study. Formative evaluation provides feedback and determines modifications or adjustments that can be made to improve the teaching/learning process. The final concluding evaluation phase is a summative evaluation, which allows students to judge the overall merit of their experience. Using a variety of techniques to gather data, comprehensive summative evaluations give decision makers information needed to continuously improve the educational program.105

Baseline evaluation of distance education pathways in pharmacy should be designed to:

- Ensure that student competencies are monitored and achieved
- Achieve faculty development and retention goals
- Improve processes related to distance education
- Maintain adherence to ACPE accreditation standards

Learning Outcomes Evaluation

Following the national accreditation standards, student achievement of professional competencies is the paramount measure of success for pharmacy programs.106 Pharmacy students need reassurance that they are learning the skills and competencies to become successful practitioners. This may be especially true of today’s students enrolled in distance education initiatives. Assessment of distance students should be multifaceted and at least equivalent to that of traditional students.
These measures include grades, performance on national pharmacy licensure examination, and results from alternative assessments such as portfolio evaluations that focus on students’ ability to use critical-thinking skills. Additional items to evaluate distance courses could include the effectiveness and efficiency of delivery systems, academic resources, student services, and access to faculty. All learning outcomes should be continuously monitored and reviewed to ensure utility and appropriateness to the school of pharmacy’s mission.

At a minimum, the experience of a distance learning student should be as intellectually rich and rewarding as the experience of a student in a traditional classroom. To monitor the program, formative and summative assessments of distance students’ interests, motivations, attitudes, and satisfaction, including delivery methods, would be helpful to further quality improvements. Student satisfaction with the instruction is an important variable to assess. In annual or summative exit surveys, questions concerning loyalty to the school, course or class, could discern the level of connectedness or transactional distance perceived by a student. Professionalism could be assessed by measuring membership in professional societies, participation in school activities and community service, and professional presentations or posters at regional or national meetings. Of course, retention indicators such as matriculation and graduation rates also are rough measures of success in any higher education program. In pharmacy education, program effectiveness could be tracked by data on enrollment, costs, and successful or innovative uses of technology.

Accreditation

Accreditation is a process of external review that examines and makes a judgment about fundamental criteria of an institution’s operation that are important to quality. Although accreditation agencies have reviewed distance education programs since the establishment of correspondence schools, the challenge is now greater with widespread adoption of synchronous and asynchronous learning environments with a variety of instructional modes and delivery technologies. Since geographic boundaries no longer limit the reach of educational resources to pharmacy students, higher education and its accrediting bodies are struggling to balance innovation and student access with a quality review based on the traditional onsite presence of physical and intellectual assets.

The quality of instruction in health professional education may be assessed in additional ways including professionalism, access to resources such as a library, laboratories, and faculty and student achievement of outcomes. In addition to a traditional evaluation, quality measures in pharmacy education should also include life experiences designed for professional socialization and affective development through student-to-student interaction, two areas in which distance learning has been vulnerable to criticism.

The American Council on Pharmaceutical Education (ACPE) recommends institutions offering traditional or distance education pathways ensure that graduating students achieve a comparable set of competencies, knowledge, skills, and values. All pharmacy programs are reviewed on eight key standards 1) Mission, Planning and Assessment 2) Organization and Administration; 3) Curriculum; 4) Students 5) Faculty 6) Library and Learning Resources; 7) Physical and Practice Facilities and 8) Financial Resources.

While accrediting agencies are carefully monitoring distance education, it is generally felt that distance learning represents an alternative delivery system that should assist and not interfere with student achievement. Specialized healthcare accrediting agencies, including those responsible for pharmacy, nursing, and medical programs have not felt the need to develop separate accreditation standards, policies, or procedures for distance learning. A view that these accrediting bodies have taken is that since a clear distinction between distance learning and the traditional classroom does not always exist, separate criteria and assessment processes may not be necessary. Just as a hybrid (eg, blended or mixed) model of delivery which includes both asynchronous online components combined with face-to-face meetings is emerging as a preference for educational delivery, a pragmatic model for accessing distance programs within a certain mixed context will surely emerge. ACPE is currently developing guidelines for distance education for each of its program accreditation standards. This guidance should prove to be useful for pharmacy educators in designing and implementing distance initiatives.

The substantial investment of resources, planning, and technical expertise by faculty and institutions and may necessitate collaborative resource sharing by institutions. The Southern Regional Education Board (SREB) has developed a successful academic collaboration within its Electronic Campus program. The Electronic Campus offers distance learning courses in selected programs at in-state tuition rates for residents of the 16 SREB states. Currently over 8,000 courses in more than 250 degree programs at more than 300 private and public colleges and universities participate in the
Table 2. Southern Regional Electronic Board Guiding Principles

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<th>Principles</th>
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</thead>
<tbody>
<tr>
<td>States should take advantage of statewide, regional, and national networks for sharing high quality offerings, and reciprocity should be maximized.</td>
</tr>
<tr>
<td>States should demonstrate a commitment to innovation and a desire to move the best of these practices into mainstream activities.</td>
</tr>
<tr>
<td>State quality assurance policies should focus on the needs of the student.</td>
</tr>
<tr>
<td>State policies should be shaped with the understanding that “distance” is not a defining characteristic of learning processes; rather it is one among several factors to take into account in designing effective programs.</td>
</tr>
</tbody>
</table>

The Institute for Higher Education Policy (IHEP) is a non-profit, non-partisan organization whose mission is to foster access to and quality in postsecondary education. The Institute promotes innovative solutions to the important and complex issues facing higher education. In their publication *Quality On the Line,* 24 benchmarks considered essential to ensuring excellence in e-learning are classified into seven categories of quality measures. The following twelve benchmarks from four of their evaluation categories – Institutional Structure, Student Support Processes, Faculty Support, and the Teaching and Learning Processes – were thought to be directly pertinent to pharmacy education. The following twelve quality benchmarks presented for debate are presented in Table 3.

**OVERVIEW OF EDUCATIONAL TECHNOLOGIES**

The future of distributed learning – and of higher education – “will not be a one-size-fits-all approach.” At this point, there is no easy answer to the question of which instructional philosophy or delivery approach is best suited to deliver quality entry-level pharmacy education. Each method offers distinct advantages or disadvantages that must be considered within the context of the vision, mission, and objectives of the college or program. Generally, no one technology is superior to another; however, some technologies are better suited to achieving particular desired learning outcomes. Also clear is that distance education technology should not be used to perpetuate poor educational practice.109

In most instances, colleges will need to pragmatically incorporate multiple approaches and technologies to optimize learning. Before deciding on a technological solution, the first step in achieving quality in a distributed environment is to identify desired educational outcomes. Student effort expended grappling with complicated technology decreases focus on the content or instruction, and thus diminishes learning. Constant interruptions from malfunctioning hardware, poorly programmed software, or improper installation can quickly frustrate students. Unpredictable technology and learning systems that are difficult to use become barriers to learning. Learning outcomes may not be achieved when attention turns to technology issues, rather than focusing upon course material.

Technology for distributed education is expensive to purchase and maintain and requires an ongoing commitment of resources for an educational program to be successful. As such, colleges or schools of pharmacy must thoroughly assess available resources and finances before designing distance pathways. In order to avoid the frustrations and expense of implementing a soon-to-be-obsolete system, the potential of future technologies should be considered in the decision making process.

**Print Material**

Paper-based education materials such as textbooks and handouts are low cost and convenient for both instructors and students. Incorporating hard-copy materials into courses is straightforward and circumvents nettlesome issues common with other technologies. Programmed instruction, a precursor to interactive learning, was paper-based. In the distance environment, paper-based courses suffer from distribution problems, frequent time delays, and an inherent lack of interaction.
Table 3. IHEP Suggested Quality Benchmarks for Excellence in Distance Education

**Benchmarks**

**Institutional Structure:**
- Before being admitted to an on-line program, students are advised about the program to determine if they possess the self-motivation and commitment to learn at a distance and if they have access to the minimal technology required by the course design.
- Students have access to sufficient library resources that may include a “virtual library” accessible through the Web.
- Questions directed to student service personnel are answered accurately and in a timely manner with a structured system in place to address student complaints.

**Student Support Processes:**
- Technical support is available to students throughout the duration of the program including practice sessions prior to the beginning of the course, detailed instructions regarding the media used, and convenient access to technical support staff.
- Hands-on training and information is provided to prepare and aid students in securing learning material through electronic databases, interlibrary loans, government archives, news services and other sources.

**Faculty Support**
- Faculty members are educated in teaching strategies and best educational practices.
- Faculty members are trained in pertinent technologies.
- Faculty members are provided technical assistance during course development, implementation, and delivery stages.
- Peer mentoring is available for faculty members in course development, implementation, and delivery stages.
- A safe environment is provided to encourage experimentation

**Teaching and Learning Processes**
- Students are instructed on the proper methods of research and evaluation of information.
- Alternative methods of communication are provided for student interaction with faculty and other students. These may include email, bulletin boards and voice-mail.
- Constructive and timely feedback is provided for student projects and assignments

While hardcopy print materials can be successfully incorporated into technologically advanced systems, the portable document format (PDF) is an effective way to provide written materials to students electronically. However, the cost savings from electronic documents may soon be cost overruns if local students individually print the documents in the college’s computer laboratory. If this is a possibility, bulk photocopying may be a more cost effective option for the institution.

**Audio Technologies**

Before interactive videoconferencing was feasible, institutions relied on audio or voice technologies to provide courses for distant students. Audiotapes containing continuing education lectures were popular in the health sciences and pharmacy. Cassette tapes are inexpensive
and readily accessible, but for degree-based coursework are limited by low interactivity, the amount of content that each tape can hold, and the number of cassette tapes needed for longer lectures.\textsuperscript{10}

The use of audioconferencing for real-time synchronous communications continues to be a simple and cost effective means for participatory interaction. Audioconferencing requires only basic, reliable, and readily available technology – i.e., telephones, a conference phone (small groups) or audiobridge (larger groups). Interactivity is limited with this system and its lack of a visual component may decrease student attention and complicate the presentation of complex pharmacy concepts.

Numerous distributed learning systems rely on the telephone and voicemail as a means for student and instructor interaction. These programs should provide a toll-free number to assure accessible communication. Voicemail is a low cost, easy to use mechanism for communication between students and instructors.

Although learning style is not usually identified as predictive of success in online environments,\textsuperscript{53,55,111} students with different learning styles may benefit from visual images and diagrams to help them understand ideas and principles. Audio alone is a weak delivery mechanism for instruction dependent upon visual cues or delayed-time asynchronous interaction. However, in courses where visual cues are not required, audioconferencing may be a successful method for conducting small group discussions or help sessions. The integration of audioconferencing with other voice technologies into more sophisticated distributed learning systems may benefit the learner.

**Computer-based Technologies**

Innovations in digital technologies have quickly advanced computer-based education to the forefront of distributed learning. The NEA suggests that Internet or Web-based courses (ie, e-learning) will be the preeminent distant education approach in the near future.\textsuperscript{45} Remedial and background information can be provided for students, discussions involving all students can be designed and initiated, and tests can be administered online. Asynchronous computer conferencing has the capacity to support communication among participants while providing temporal and geographic independence.\textsuperscript{112} With computer-based technologies, educational institutions can offer a full range of online instruction from individual classes to full degree pathways while providing learning experiences that would be impossible in a traditional classroom. With unparalleled ease, Web-based computer-mediated communication tools provide distance and time-independent interactions among learners. The construct of a fixed time-dependent class is no longer a limitation. The real growth of e-learning may be in supplementing traditional instruction, even in courses that are not exclusively online. Most learning environments can benefit from the addition of computer technologies through applications such as email, complex course management systems (eg, Blackboard\textsuperscript{®} and WebCT\textsuperscript{®}), or videostreaming.

Real-time synchronous tools provide immediate feedback, encourage spontaneous interaction, and closely resemble a traditional classroom. Real-time communication is facilitated by synchronous computer conferencing tools such as text-based chat rooms, instant messaging, and virtual or electronic classrooms that incorporate the use of shared whiteboards, documents, and PowerPoint\textsuperscript{®} presentations. Synchronous computer conferencing is a preferred method for small groups of students, but as the number of participants in a session increases, the ability to maintain a logical, coherent discussion decreases.\textsuperscript{93} With synchronous tools, students also need to be online at the same time, which can be difficult for working students or those participating from different time zones. In the synchronous computer conferencing environment, the audio component with its high computer resource needs poses transmission problems. Some pharmacy programs avoid this potential problem during computer conferences by transmitting audio via telephone.\textsuperscript{12}

Asynchronous tools are time and place independent, allowing students to access content at times and locations convenient to them. Asynchronous tools permit communication while encouraging interactivity through applications such as bulletin boards, newsgroups, and email. In this learning mode, students are free to access, read, and post messages at their convenience, often devoting time locating additional materials and/or reflecting on the topic.\textsuperscript{113} Learning in an asynchronous environment can be self-paced allowing students the opportunity to review or remediate and can result in a higher level of critical thinking than achieved with synchronous tools.\textsuperscript{113} However, large groups using asynchronous tools without appropriate oversight or an active facilitator/moderator may miss this inherent opportunity for reflection.\textsuperscript{93} Students educated in the electronic age are comfortable with these communication tools and those who might otherwise remain silent – the introverted or easily intimidated – may find these tools better suited to their personalities.\textsuperscript{114}

The interaction created by the use of asynchronous and synchronous communication tools may benefit stu-
Appendix A

American Journal of Pharmaceutical Education 2003; 67 (3) Article 94.

students, however it also may increase faculty workload. Answering hundreds of emails or participating in frequent unscheduled online discussions takes time.\textsuperscript{115,116} It is commonly assumed that distance courses require additional time, but this may not be true in all cases. Some data indicates that total teaching and maintenance time is less in a distance course than that in a traditional course.\textsuperscript{117} Appropriate training can teach faculty members to plan in advance and develop strategies to keep from becoming overloaded.\textsuperscript{118} Pre-packaged course management systems (examples include Blackboard\textsuperscript{®} and WebCT\textsuperscript{®}) allow faculty members without extensive computer skills to integrate different synchronous and asynchronous components into a distance or traditional course. Strong features of these course management systems are tools that allow faculty to centralize information, create handouts, facilitate discussions, or compile grades.

Captivating and convenient computer technologies are finding their way into distance educational models. The tablet personal computer (PC), similar in size to a paper notepad, is appearing in classrooms and meetings. Coupled with a wireless system, the tablet PC captures handwritten notes and permits easy access to online course materials. Notebook computers and personal digital assistants (PDAs) are used in the classroom to access information and facilitate data collection through polling and database programs now that wireless networks are becoming more common. Clerkship students can collect data, research information, and complete assessment forms and surveys using PDAs or a cellular telephone.

Application sharing can be accomplished from several different web-based tools and readily available software packages including Microsoft’s NetMeeting\textsuperscript{TM}. The ability to view a document and edit it with a student in real-time provides an attractive but time-consuming dimension to distributed learning. Mechanisms that allow faculty members to easily comment on electronic papers, including the tracking feature of Word\textsuperscript{®} and functions which allow handwritten corrections on the tablet PC, are necessary for immediate feedback to distant students and for efficient use of faculty time.

In a perfect education system, technology is transparent to faculty and student participants. However, technology is rarely fail-safe and prone to causing interruptions and frustrations in the learning process. While easy to learn and use, most commercial systems require institutional support for student and faculty users. Course management systems make it easy to post text-based coursework. Developing courses that optimize online capabilities (including graphics, video, animation, etc.) may necessitate the assistance of trained technical staff and additional faculty time. Colleges of pharmacy considering this avenue for distance education should provide a helpdesk, adequate hardware and software personnel, as well as instructional designers familiar with distant delivery methods. A well-trained technician and readily available support system will aid transparency in today’s less than perfect technological world.

Artfully mixing and matching multiple technologies based on pedagogy needs will be required to achieve most program goals. Electronic classrooms provide instruction with visual (eg, PowerPoint, white board, web sites, video, and animation) and audio capabilities as well as delivering text-based synchronous tools. The addition of visual and audio cues increases the probability that students with different learning styles will be reached.

Computer-based systems offer unique learning opportunities that would be impossible in a traditional classroom. Though self-paced, interactive, or non-linear modules are possible, the development, maintenance, and delivery of quality computer-based coursework is expensive in terms of resources and time. Audio and video components necessitate broadband connections (eg, cable modem or DSL), which may be prohibitively expensive or not available to students living in rural areas. Although most online courses today continue to be primarily text based, the students of tomorrow will expect e-learning to augment classroom instruction in addition to fully interactive courses replete with graphics, animations, audio, and video. Such sophisticated computer-based courses require substantial resources, strategic planning, and technical expertise by faculty and institutions and may necessitate collaborative resource sharing by institutions.

Video-based Technologies

There are several different media available for the transmission or delivery of video including videotape, cable, satellite, integrated services digital network (ISDN) lines, and computer-based Internet Protocol (IP) networks. However, the transmission medium is not as important as the direction of the video signals, which may be one-way (from instructor to student only) or two-way (from instructor to student and student to instructor). Two-way signals are preferable due to the increased opportunity for interactivity.\textsuperscript{10} Videotapes are convenient, inexpensive, simple, and used to show practical demonstrations, documentaries, professional interviews, and taped television programs.
Videocassette recorders (VCR’s) are routinely available and require no special training to operate. Highest quality video productions may require professional technical assistance, but faculty members can easily create effective learning videos on their own. Video-tape can deliver instruction to absent or distant students, but lacks interaction and introduces distribution problems. Mailing videotapes can be costly and may cause unnecessary scheduling delays. Some institutions may find it cost effective to outsource this task to a firm with duplication and distribution capabilities.

Instruction delivered via cable broadcast, a one-way video and audio system, has a limited potential for interaction. Combining with telephone communication can mitigate this limitation. The cost for cable transmission depends on the local cable or broadcast system; transmitting outside a local area becomes prohibitively expensive. Usually intended to be a synchronous means of delivery, instruction may be taped to watch or review at convenient times. The introduction of digital cable video may provide additional channels for distribution of instruction and increased interactivity. Cable-based instruction is encumbered by problems of low interactivity, prohibitive costs, and requirements for advanced scheduling. Computer based videostreaming avoids many of the disadvantages of cable-based instruction but suffers from low interactivity and requires a reliable Internet connection.

Videoconferencing (teleconferencing in which still or moving pictures can be transmitted simultaneously with voice) can be designed and implemented in a number of ways but is ideally suited for synchronous, interactive delivery. In addition to classroom teaching, videoconferencing has been used for remote health and pharmacy applications, including clinical diagnosis, patient counseling, and remote imaging. This potential could be used in experiential components of the pharmacy curriculum. Due to recent Health Insurance Portability and Accountability Act (HIPAA) security requirements, reliable session encryption is now mandatory for these types of health applications.

The first videoconferencing programs were distributed via analog television and satellites, followed by the evolution of digital video systems using computer networks. While video technologies may provide the visual and audio realism of a traditional classroom, other aspects of this delivery mode must be considered. The use of videoconferencing requires a large capital investment in equipment (video and sound), classroom design (lighting, seating, and floor plan), faculty and student training, and technical support personnel. Depending on the type of videoconferencing used, it may or may not achieve optimal interactivity.

Satellite videoconferencing is usually configured for one-way video and two-way audio using a telephone-based conference call or audiobridge. This arrangement exceeds the level of interaction provided by videotapes, but is encumbered by the lack of two-way video. Satellite transmission can be expensive both in terms of equipment and airtime. Adoption of satellite technology for educational videoconferencing is limited by the high cost of two-way transmission, the need to schedule satellite time in advance, and the limited capacity for interaction in one-way systems. Although a satellite uplink dish is extremely expensive, schools can generally afford a cost-effective downlink receiving dish for continuing education or training programs.

Interactive videoconferencing, sometimes referred to as compressed video, synchronizes audio and video transmission between multiple locations. Delivered via ISDN, T1 lines, or the Internet, videoconferencing simulates a traditional classroom exchange. Transmissions that involve two locations are referred to as point-to-point and those connecting multiple sites are known as multi-point connections. Requiring specialized hardware and/or software, especially for multipoint and ISDN/T1 connections, interactive videoconferencing is more difficult to implement than other technologies. Current standards such as the International Telecommunication Union (ITU) standard H.320 for ISDN or T1 and the H.323 standard for desktop or Internet Protocol (IP) conferencing provide standardization and high quality transmission. All major vendors support these standards, but most also provide proprietary software. The use of the proprietary software may make connections with older systems from other vendors difficult to impossible.

Desktop videoconferencing uses a personal computer equipped with a camera and microphone allowing transmission of video and audio to other sites. Remote sites also transmit video and audio resulting in true two-way communication. Students must have a high-speed connection to provide smooth video and audio signals. Although categorized as a desktop technology, PC are generally not powerful enough to provide high quality video. Therefore, the necessary compression and decompression component (codec) is typically integrated into the videoconferencing system.

A codec, named for the audio and video compressing and decompressing functions it performs, is the heart and the main enabler of the videoconference. A codec is used to minimize or compress image and sound data so
that the files are smaller and easier to store and transmit. In order to view the file, it must be expanded (or decompressed) to its original form. While codecs may be hardware or software based, hardware codecs are generally faster and contain their own processing power so they do not rely on the underlying system or PC. Software codecs are less expensive and easier to install, however, they tend to produce lower quality output.\textsuperscript{119} Codecs can be included on a PCI bus card, but external USB videoconferencing devices that provide plug and play capability are now common. Desktop or home-based videoconferencing should be limited to classes with small numbers of students to permit maximum interactivity. When linking to multiple sites or if the number of students with desktop systems exceeds ten, it becomes difficult for the instructor to maintain interactivity with students.

The limitations of PC-based products and the continued unreliability of public IP networks have resulted in the use of more expensive stand-alone or room-based systems rather than desktop videoconferencing products for most classroom situations.\textsuperscript{119} Room-based videoconferencing requires a system at each of the broadcast locations and, if more than two sites are connected, a multipoint control unit (MCU). Minimal equipment for a multipoint videoconferencing session includes a main camera or video source at each endpoint or site. Multipoint calls require the use of an MCU in order to achieve two-way interaction. Institutions may purchase their own MCU or may lease time on a unit. With the MCU, the broadcast and remote sites are able to transmit video, audio, and digital images, resulting in true real-time (or at least near real-time) two-way video and audio communications.

High-resolution camera equipment is necessary to provide quality video input. Cameras that allow remote control and other features such as tilt, zoom, auto-focus, and auto-tracking are desirable but expensive. One or more large format televisions or a projector and screen must be available to display the remote video. Video for small groups or desktop users may be displayed on a computer monitor.

With videoconferencing, audio is often considered more important than video. Good quality microphones and speakers are critical components. In larger classrooms, push-to-talk (table top) or ceiling microphones distributed throughout the room offer ease-of-use and allow students at all sites to hear questions and comments. Unsynchronized audio and video transmissions that result in students seeing the speaker’s lips move before hearing his voice can be distracting. Newer systems and larger bandwidths have decreased transmission latency (the amount of time required before activity at one site is seen or heard at another) and improved the synchronization between video and audio. Push-to-talk technology offers the benefit of automatic camera tracking to the activated microphone, providing a better visual image. By clearly showing the individual on camera, students at other sites can recognize the speaker, promoting socialization among students. Output from all peripheral devices typically used in a classroom including computer-based presentations (eg, PowerPoint), overhead projectors (document camera), white board display, videotapes, and data may be sent via videoconferencing. Systems can be configured to allow one site to always be on the screen or voice-activated allowing video from the location of the speaker to be displayed to all sites.

System failures and network disconnections are inevitable components of videoconferencing. Some programs have avoided these bothersome difficulties by taping the main broadcast and providing it to distant students on compact disk, digital video disk or via online videostreaming. However, this backup technique diminishes interactivity, the main advantage of videoconferencing. This loss of interactivity can be regained in other ways such as convening for discussion after viewing a lecture. Students such as those in rural areas who do not have access to broadband connections can be served by combining the technology with other synchronous delivery systems, including electronic classrooms, audioconferencing, or the use of a cluster or facilitator model. The use of regularly scheduled face-to-face cohort meetings of regionally grouped students increases both interactivity and socialization among these students.\textsuperscript{12}

Videoconferencing offers the potential of appropriate interaction in a classroom including discussions, facial expressions, and body language but it is not without its disadvantages. The equipment necessary at all sites can be expensive both to purchase and maintain and system disconnects and failures do occur, interrupting lecture and causing a loss of valuable classroom time. Newer videoconferencing systems have minimized latency and improved synchronization but these continue to be areas that must be monitored closely. Since videoconferencing broadcasts are typically synchronous, students and instructors must be present at the same time at specific sites, similar to a traditional classroom.

Videoconferencing emulates the traditional classroom but it requires additional planning and preparation. Faculty members require training and resources to learn to operate the equipment and manage distant class-
rooms. All faculty or lecturers need appropriate guidance to be successful in videoconferencing. Programs that use off-campus adjunct faculty or clinical practitioners as lecturers need to provide structured training sessions and qualified and knowledgeable technicians.

To date there is no easy answer as to which technology will provide the best quality pharmacy education. Most colleges of pharmacy will find that no one technology will be able to meet the desired outcomes for an entry-level PharmD degree pathway. Meeting the needs for post-baccalaureate PharmD students and continuing education programs is somewhat easier since the desired outcomes are not as broad or all encompassing. Although the transmission model of the traditional classroom has effectively delivered information, new teaching models are evolving to complement the capabilities of emerging technologies. When implementing new systems, it is important that faculty and administrators not attempt to replicate the traditional classroom but reflect on effective ways to achieve desired learning outcomes. Artfully mixing and matching multiple technologies will be needed to achieve most program goals. Administrators should be aware that introducing technologies into the curriculum can be expensive and requires significant training for faculty, readily available support, technical and instructional design expertise, and an investment in equipment (which becomes obsolete faster that one would expect).120 As noted in a recent attempt to implement an undergraduate medical curriculum at McGill University, “the merging of technology and pedagogy requires a substantial commitment of resources and recognition of faculty time and change-management issues.”37,69 However, distributed education is not going away and its use throughout higher education will continue to increase.36,50,69 Ideally, colleges and schools of pharmacy will study and evaluate educational technologies in light of their own needs and implement systems that provide quality student education while moving the profession forward.

SUMMARY

A combination of social, demographic and political changes continuously modifies the future of higher education. No single factor shapes the critical choices that become the future. Having said this, digital technology has changed everything about the future of higher education. It has changed the operating assumptions inside the colleges and universities, and the competitive environment in which higher education institutions operate. – Leroy Dubeck45,46

External pressures and fiscal constraints are converging with rapid technological change to significantly reshape the culture of higher and professional education. Societal forces such as the empowerment of consumers, the surge of multiculturalism, and access to and dissemination of information across time and distance through distributed education technologies are revolutionizing higher education. Once considered unconventional and on the fringe, distributed learning is now accepted as an integral component of mainstream instruction.36,80

The march to distance learning is shifting the way major universities and accrediting agencies of higher education assess teaching and learning.84,121,122 Colleges and schools of pharmacy are attracted by the promise and potential of distributed education for opening access, increasing enrollments to accommodate professional manpower demands and enhancing the quality of student learning.50,69 This distributed education movement is transforming the culture of professional health education by introducing new categories of students, new teaching methods, new ways that students learn, as well as shifting the paradigm of how instructors and students interact.

Although distance education pathways may be seen by some as an inexpensive way to meet demands for additional health care practitioners through mass education, clearly there are no silver bullets which will resolve problems faced by institutions such as draconian budget cuts and faculty shortages. However, the technologies, standards, and services in use today form the basis for successful implementation of effective and high-quality entry-level pharmacy programs of tomorrow. Progress is ongoing in areas to increase the quality and quantity of services available, reduce inefficiencies, and improve the effectiveness of teaching and learning at a distance.

Distance or distributed learning can be disseminated by an array of educational techniques and technologies. However, no technology is culturally neutral or without consequences. It is not yet known what implications adoption of these modes of teaching and learning will have on the culture of pharmacy education and more importantly, on the profession of pharmacy. Pharmacy is striving to expand its role as a health care profession with greater direct patient interaction and an increased responsibility for patient outcomes. Colleges and schools, regardless of method of educational delivery, should ensure that graduates leave with the knowledge, skills, and interpersonal competencies necessary to fulfill the pharmacy needs of patients in the twenty-first century.
There is still much to learn regarding the ramifications, costs and benefits associated with bringing a select group of students into distance model of pharmacy education. The successful integration of teaching technology requires significant changes in infrastructure. In order for distance education to be successful, institutions must respond to these changes in a business-like manner and certainly more rapidly than in the past. Goals of quality and aspirations for increased productivity will only be achieved by finding the right combination of individualized interactive access to information for students and faculty, guidance and support for and from faculty, as well as strong institutional commitment to and support for quality outcomes.

RECOMMENDATIONS AND DISCUSSION POINTS

Colleges and Schools of Pharmacy

1. Recommendation for Strategic Planning:
   Distance education must be an integral part of the college’s strategic plan. Specifically, adequate budgeting for staff, technology, student services, and training for all areas of education must be addressed.

2. Recommendation for Program Evaluation:
   Institutions should have a continuous quality improvement (CQI) program to ensure that students achieve desired competencies and that an optimal learning environment is maintained.

3. Recommendation for Faculty Development and Support:
   Providing faculty training at the institutional level is essential to assure quality education. Timely and effective training is required for faculty to deliver instruction at a distance. Initial and ongoing faculty development on educational theory, best practices in teaching, and selected technologies should be available. Through workshops, faculty can learn approaches to improve teaching outcomes and enhance the interpersonal dimension of distance learning. Instructors should receive technical assistance in course development and assistance in transitioning to the distance environment. Assistance through training and peer evaluations should be maintained during the duration of the program.

4. Recommendation for Faculty Recognition and Compensation:
   Acknowledging the range of faculty needs and motivations, institutions should use a variety of methods to recognize faculty. Colleges and schools of pharmacy should incorporate appropriate compensation policies when planning distance education initiatives and recognize the work in the promotion and tenure process.

5. Recommendation for Collaborative Initiatives:
   The feasibility of institutions sharing course resources has been increased by the convergence of computing and communications technology, growth of the Web, and modularization of curricula. The colleges and schools of pharmacy should study the feasibility and cost-benefit of developing cooperative or collaborative programs for use by multiple institutions.

6. Recommendation for Selecting Students:
   Before being admitted to a distance education pathway, pharmacy students should be screened to determine if they possess the self-motivation and commitment to learn at a distance. Competence with the technology required by the course design should be assessed and remediated if necessary. Distinguishing characteristics of students successful in the distant environment should be identified to assist in future student admissions.

7. Recommendation for Socialization:
   Professionalization is vital, but colleges and schools of pharmacy should not carry the full burden alone. Inherent weaknesses in some modes of distance education – the lack of interaction, structured activities for reflection and feedback, and the lack of a strong mentoring relationship with faculty – present opportunities for schools to work with professional pharmacy associations to expand their participatory role in the education of new practitioners. Professional associations should proactively increase their responsibility for the socialization and professionalization of pharmacy students in both traditional and distance pathways to ensure young professionals appropriately learn to be caring health care practitioners.

Recommendations for AACP

8. Recommendation for Strategic Planning:
   Distance education must be an integral part of the college’s strategic plan. AACP should publish articles showcasing exemplary examples of how institutions have incorporated distance education efforts in to their plans.

9. Recommendation for Faculty Development and Support:
   Providing faculty training at the institutional level is essential to assure quality education. AACP should publish articles on programs that prepare faculty to deliver instruction at a distance.

10. Recommendation for Faculty Recognition and Compensation:
Recognition of faculty efforts as scholarly activity has been a barrier to innovation in some fields. AACP should showcase the variety of methods to recognize the work in the promotion and tenure process faculty and appropriate compensation policies.

11. Recommendation for Collaborative Initiatives:

The convergence of computing and communications technology, growth of the Web, and modularization of curricula has made collaborative initiatives possible. AACP should assist schools in determining the feasibility and cost-benefit of developing cooperative or collaborative programs for use by multiple institutions.

12. Recommendation for Selecting Students:

AACP should sponsor multi-institutional research on distinguishing and correlating characteristics of students who are successful in various distant environments.

Recommendations for ACPE

13. Recommendation for Strategic Planning:

Since distance education is an integral part of the college’s strategic plan, ACPE should include criteria for inclusion in its guidelines. Specifically, adequate budgeting for staff, technology, student services, and training for all areas of education must be addressed.

14. Recommendation for Faculty Development and Support:

ACPE should recommend guidelines for institutionalized faculty training to assure quality education. Criteria should include timeliness and effectiveness of training to enable faculty to deliver instruction at a distance. Initial and ongoing faculty development on educational theory, best practices in teaching, and selected technologies should be available.

15. Recommendation for Selecting Students:

ACPE should include in its guidelines recommendations that the admissions process of schools or colleges of pharmacy consider characteristics, such as self-motivation and commitment, which may help predict student success in distance learning.

16. Recommendation for Socialization:

ACPE should insure programs address professionalization and socialization of students enrolled in all pathways.

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GLOSSARY

asynchronous: Communication that occurs without respect to time and, as such, does not depend on users being online at the same time. Also referred to as delayed communication. 56,125,126

bandwidth: A general measure of how much information can be over a communication link in a given time period.

broadband: Telecommunication in which a wide band of frequencies is available for transmitting information. Cable and DSL Internet connections are considered broadband services.

cable modem: A device that enables Internet connection on a personal computer through a local cable television line at a data rate far exceeding telephone modems.

collaboration: A systematic instructional strategy in which groups work together towards a common goal. The use of groups in computer conferencing rely on collaboration to promote dialogical interchange and reflexivity [Duffy, 1996 #205] going beyond simple information exchange. 127

collaborative learning: A learning theory which has its roots in social constructivism. It establishes a social environment where critical discourse is valued and where students are encouraged to test the limits of traditional sources of knowledge. 93

computer conferencing: A collaborative application of computer-mediated communication. 93

computer-mediated communication: Describes the integrated use of telecommunications, computers and computer networks to provide new tools for teaching and learning. 128

constructivism: Although there is diversity in the definition of constructivism, there is general agreement that "learning is an active process of constructing rather than acquiring knowledge and instruction is a process of supporting that construction rather than communicating knowledge." 127

course management systems: Software that enables both synchronous and asynchronous student participation with the learning content, other students and instructor. Course management systems include tools to facilitate course design, content authoring, and content management. Tools to administer assessment and track student usage are also expected. 129

critical thinking: Thinking that facilitates judgment because it relies on criteria, is self-correcting and is sensitive to context. 130 "A broad construct encompassing both problem solving and creative thinking.” 131

distance learning: Learning which occurs when there is a separation in time and/or space between the learner and the instructor. More than a geographic separation of learners and teachers, it is a distance of understandings and perceptions that must be overcome by teachers and learners.

DSL: Digital Subscriber Line and its variant Asymmetric Digital Subscriber Line (ADSL) are technologies that enable a high bandwidth Internet connection through ordinary copper telephone lines. A fast, continuously available Internet connection that uses a phone line and a DSL modem, but which does not tie up the use of the phone for voice transmission. DSL is about the same speed as cable modem, both of which transmit data at speeds far exceeding those of telephone modems.

face-to-face communication: Communication during which all of the participants are located in the presence of one-another, permitting verbal communication as well as communication via body language, intonation and facial cues.

interaction: Collaborative construction of new knowledge through social negotiation, or a constructivist learning experience at the group level. 132

ISDN: Integrated Services Digital Network is a set of standards for digital transmission over ordinary copper telephone lines in which analog or voice data is integrated with digital data over the same network. A Basic Rate Interface (BRI) channel can transmit up to 128 Kbps. Multiple channels are used to transmit the bandwidth needed for synchronous videoconferencing.

quality assurance: "The overall processes which lead to high performance and academic rigor. These processes include national and state level standards, best practices and policies that lead to the continuous im-
provement of teaching and learning in higher education.”

**social constructivism:** A learning theory that argues that knowledge is constructed by individuals based on experience and is dependent on social interaction and collaboration with others. Based on this theory, the teaching and learning process is seen as a form of discussion or conversation that leads to agreement on the meaning.\textsuperscript{126,133}

**social presence:** The degree to which individuals project themselves through the medium\textsuperscript{93} or are perceived as "real" in mediated communication.\textsuperscript{134}

**synchronous:** Communication occurs when two or more people are communicating with each other at the same time and is dependent on users being online simultaneously. Also referred to as real-time communication.\textsuperscript{56,125,126}

**T1:** Most commonly used digital line in the United States. T1 lines use copper wire and span long distances and are capable of handling large amounts of data and transmit at very fast rates of speed.
Appendix 1. Copyright Issues

Other issues associated with distributed education are process-related concerns regarding the creation and protection of intellectual capital. Faculty members must understand the copyright issues involved in both the creation and delivery of distance education coursework.

Attention to copyright laws is needed for written materials. The process of videotaping live lectures for distance education students brings up issues relating to broadcasting rules and rights. The foundation of copyright law in the United States is the Copyright Act of 1976. For years, distance education was hampered by rules allowing traditional classrooms greater freedom in the display of material and performances than was possible through distance transmission. Specifically, section 110 (1) (sometimes called the 'classroom exemption'), allows an absolute exemption to copyright if the following provisions are met: 1) occurs in a non-profit educational institution; 2) face-to-face instruction; 3) occurs in a place devoted to instruction (classroom or laboratory); and 4) if the work is an audiovisual work, the copy must have been made legally. Section 110 (2) which dealt with instructional transmission placed several restrictions on the faculty such as performances were limited to non-dramatic literary and musical works and similar to Section 110 (1) that the place of reception be a location normally devoted to instruction.

The recent passage of the TEACH (Technology, Education, and Copyright Harmonization) Act has leveled the playing field between distance and traditional education. The TEACH Act amended section 110 (2) by expanding the categories of works that could be displayed, removing the concept of where the material is received, allowing institutions to digitize works where digital versions do not exist, and allowing institutions to store the material on a protected server for asynchronous display. The TEACH Act does not provide for an absolute exemption as does section 110 (1) and the display of material is restricted to “reasonable and limited portions.”

In addition to the added freedom afforded by the TEACH Act, instructors can also fall back upon the Fair Use section 107 of the Copyright Act of 1976. Section 107 states that the fair use of a copyrighted work, including such use by reproduction in copies or phonorecords or any other means specified by that section for purposes such as criticism, comment, news reporting, teaching, scholarship or research, is not an infringement of copyright. The fair use doctrine is not absolute and the courts use four criteria to determine whether a use is fair. The four criteria are:

1) purpose and character of the use
2) nature of the copyright work
3) amount or substantiality of the portion used
4) effect on the market for the work by its use

Non-profit educational institutions are usually viewed favorably when applying the first criteria pertaining to intent. While not an absolute rule, courts typically consider up to 10 percent of the amount or portion as reasonable.