

# Online Education: Student Pharmacist Exposure and Perceptions

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## Abstract

**Background:** The use of online learning methods is increasing in higher education and being adopted by pharmacy educators.

**Aims:** The objective of this study was to assess past exposure to online learning and interest in learning via pre-recorded online lectures with or without live active learning among student pharmacists.

**Methods:** An anonymous online survey was self-administered to third-year students enrolled in the Drug Information and Literature Evaluation course.

**Results:** The response rate was 98.3%. Forty percent of respondents had prior experience with at least one online course during their undergraduate curriculum; 36% were science courses. Most students preferred to view lectures online rather than live in-class, but 26% expressed no preference. Seventy percent felt they would be able to keep current with a course with online lectures, but desired an in-person component.

**Conclusion:** Student pharmacists have familiarity with and openness to online methods of learning within the pharmacy curriculum.

**Keywords:** *blended learning, on-line learning, pharmacy, education*

## Introduction

Higher education has traditionally provided information in an instructor-delivered didactic lecture format. During the past decade, colleges and universities have increasingly incorporated online courses into their curricula (Allen, 2011). In 2010, 6.1 million U.S. students in higher education were enrolled in at least one online class, a 10% increase from 2009 (Allen, 2011). The use of online learning is also growing in health professional education (Allen, 2011; Cook, 2008; Cook, 2010). In fact, online course enrollment is growing more rapidly in health professions education than in other disciplines including education, business, and engineering (Allen, 2011). According to U.S. 2011 data, health professions education is the only discipline that experienced a greater proportion of online learning programs with enrollment growth (Allen, 2011).

Online learning encompasses various types of course design and teaching strategies. A purely online course typically includes no face-to-face time and all materials are delivered online (Allen, 2011). When the course is designed with a

significant online interactive component (e.g. a discussion board) or with pre-recorded lectures online with an active learning activity, the course is considered a blended or hybrid course. Blended learning allows face-to-face class time to be used for meaningful learning strategies, including active learning. Active learning is a student-centered approach to learning that requires active student participation and engagement. A variety of active learning methods may be utilized to achieve student involvement in the classroom. From a resource perspective, delivering lectures online is an attractive alternative as it increases efficiencies, addressing faculty workload, classroom availability and funding issues (Wise, 2010; Crouch, 2009; Blouin, 2009; Means, 2009). However, these efficiencies have been debated in the literature (Tabata, 2008) with challenges to constructing these courses, especially the upfront time and technology investment (Tabata, 2008; Bacow, 2012). In addition, data are scarce on the true cost-benefit ratio (Blouin, 2009; Bacow, 2012).

Blended and online learning has been shown to be an effective method for health professions students including

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nursing, medicine, and pharmacy (Crouch, 2009; Bata-Jones, 2004; Jenkins, 2008; Bollmeier, 2011; Lancaster, 2013; Seybert, 2011; Zapantis, 2008). A meta-analysis comprised mostly of studies in higher education, including health professions, found that online education accomplishes increased achievement of learning outcomes and student satisfaction (Means, 2009). In pharmacy education, pre-recorded online lectures combined with active learning have been instituted in therapeutics (Crouch, 2009; Lancaster, 2011; Seybert, 2011; Zapantis, 2008) and drug information courses (Bollmeier, 2011). In pharmacotherapy courses with online lectures, students demonstrated learning by their performance on examinations (Lancaster, 2011; Seybert, 2011) and quizzes (Crouch, 2009). Although most of the published reports in therapeutics courses received positive evaluations (Crouch, 2009; Bollmeier, 2011; Seybert, 2011; Zapantis, 2008) Lancaster *et al.* received a mixed response from students (2011). In a drug information course, there was no difference in examination performance, but pre-recorded online lectures were perceived positively by students (Bollmeier 2011).

Recent questions have emerged on the most effective and efficient teaching method for the professional pharmacy curriculum (Moore, 2005). The traditional lecture format may not be the best method to teach the current generation of student pharmacists or to meet our expectations of the pharmacy profession. Blouin *et al.* (2008, 2009) stated that student pharmacists may not value class attendance, especially if the only activity is lecturing by a faculty member. This observation is found throughout in higher education literature, in which students prefer to utilize more technology in their education, and express satisfaction with online educational programs (Allen, 2011; Crouch, 2009; Bata-Jones, 2004; Jenkins, 2008; Bollmeier, 2011). Today's students enjoy the flexibility of accessing online lectures from anywhere at any time, as well as the ability to review content as needed (Means, 2009). The profession's expectations include self-directed learning to keep current with evidence-based medicine, utilization of technology, while strengthening critical thinking and problem solving skills. In the United States, the Accreditation Council for Pharmacy Education standards require that professional pharmacy education develops problem solving and critical thinking skills through active learning strategies and innovative teaching techniques (Accreditation Council for Pharmacy Education). Because online education is being adopted by pharmacy educators, the purpose of this study was to assess past exposure to online learning and interest in learning via pre-recorded online lectures with or without live active learning among student pharmacists in their third professional year.

## Methods

An anonymous online survey was designed and self-administered within our learning management system, Blackboard (Blackboard Inc., Washington, DC). Third-year student pharmacists enrolled in the required Drug Information and Literature Evaluation course at our College of Pharmacy August through December 2010 had access to the survey for 14 days. The ten question multiple choice survey instrument (Appendix A) evaluated students' previous exposure to online learning in their undergraduate education and their desire for

similar formats in the pharmacy curriculum. Responding to the survey was voluntary, but extra credit was awarded to students who fully completed the survey. The survey collected basic demographic information and asked respondents to answer questions for their general interest in online methods of learning in the pharmacy curriculum, rather than for a specific course. Live lectures were defined as those in which a faculty member delivered instructional content in person synchronously from either campus (main or distant campus) regardless of the student location. Lectures viewed using Mediasite (Sonic Foundry, Madison, Wisconsin) were categorized as online lectures.

Results were downloaded and stored in electronic tables. Microsoft Excel (Microsoft Corp., Redmond, WA) was used for data analysis including descriptive statistics. An independent t-test and chi Square were used to evaluate differences in demographics by campus for continuous and categorical data, respectively. SAS 9.3 (SAS, Inc, Cary, NC) was used for statistical analysis;  $p < 0.05$  was considered significant.

The investigational review board granted expedited approval for this project.

## Results

Of 177 students in the course, 174 completed the online survey (98.3% response rate). Sixty-four percent ( $n=115$ ) of the students were based on the main campus, while the remaining 36% ( $n=62$ ) were based on the distant campus (Table I). These proportions are similar to the overall distribution of the student body between campuses.

**Table I: Demographics of Survey Third-year Student Pharmacists**

	Distant campus n=62	Main campus n=115	Overall n=177	P value
<b>Academic performance</b>				
Entering GPA	3.43+0.35 (2.44-4)	3.50+0.31 (2.81-4)	3.48+0.33 (2.44-4)	>0.05
PCAT	77.76+13.23 (41-99)	75.41+14.34 (41-99)	76.19+14.0 (41-99)	>0.05
<b>Previous academic degree</b>				
Bachelor's of Science	45 (73%)	78 (68%)	123 (70%)	>0.05
Bachelor's of Arts	3 (5%)	8 (7%)	11 (6%)	
Other degree	0 (0%)	2 (2%)	2 (1%)	
No degree	14 (22%)	27 (23%)	41 (23%)	

\*No differences were observed in GPA, PCAT scores, or prior academic degrees between groups.

Forty percent ( $n=70$ ) of the respondents had prior experience with at least one online course during their undergraduate curriculum. Of those who had prior experience with online courses, 36% ( $n=25$ ) of these students had taken online science courses during their undergraduate training. Of those students who did not have prior experience with an online course, 52% ( $n=54$ ) would have been interested in an online course had it been available as an undergraduate student.

As shown in Table II, 43% ( $n=75$ ) of students preferred to view lectures through Mediasite rather than live in class

(31%; n=54); however, 26% (n=45) of respondents expressed no preference. Students perceived learning the most from lectures viewed on Mediasite, followed by live lectures with and without the use of an audience response system, technology using wireless hardware and presentation software to poll both local and distant students (Table II). Fewer students reported learning preferences for live or Mediasite lecture with in-class recitations or live lecture with mandatory reading (Table II). The campus location of the lecturer (the main or distant campus) also appeared to be unimportant as indicated by few students selecting a preference for live lectures delivered from their home city (14%; n=25). The majority (71%; n=123) of students felt they would be able to keep current with a course with lectures only available online.

**Table II: Student learning preference in pharmacy curriculum<sup>#</sup>**

	n (%)
<b>Lecture viewing preference</b>	
Mediasite	75 (43)
Live in-class	54 (31)
No preference	45 (26)
<b>Preferred style of learning</b>	
Lecture viewed on Mediasite	96 (55)
Live lecture from either campus	85 (49)
Live lecture followed by Mediasite viewing	69 (40)
Live lecture with clickers	63 (36)
Live lecture from home city	25 (14)
Live lecture with recitation component	25 (14)
Live lecture with mandatory reading	22 (13)
Lecture on Mediasite followed by recitation	19 (11)
<b>For a course with Mediasite lectures</b>	
<i>Interest in live class time</i>	
Active learning activities	69 (40)
Select live lectures	36 (21)
Both active learning and live lectures	48 (28)
Not necessary to meet	20 (11)
<i>Frequency of live class time</i>	
Twice monthly	82 (47)
Weekly	53 (30)
Once monthly	39 (22)

<sup>#</sup>Respondents could select multiple options. The denominator is the number of respondents (174).

For a course with online lectures, 89% (n=153) of students had an interest in meeting for an in-person component, for either select live lectures, active learning activities, or both (Table II). For a course composed of online lectures and active learning, almost half of the students (47%; n=82) felt meeting twice monthly was a sufficient frequency for live classroom time. Email (53%; n=92) or online discussion groups (44%; n=76) were the two primary preferences for student communication with the faculty of a course with a significant online component.

The top three courses which students expressed interest in having online lectures with an active learning component were Pharmacy Practice Management (82%; n=143), Pharmacy Law (77%; n=134) and Drug Information and Literature Evaluation (60%; n=105) (Table III). Few students

recommended Medicinal Chemistry, Pharmacology, or Therapeutics.

**Table III: Students' selections for which courses they may prefer as online lectures with active learning component**

Course	Number of students (%)
Management	143 (82)
Pharmacy Law	134 (77)
Drug Information & Literature Evaluation	105 (60)
Electives	94 (54)
OTC	77 (44)
Pharmaceutics	73 (42)
Pharmacy Calculations	49 (28)
Therapeutics	32 (18)
Pharmacology	30 (17)
Medicinal Chemistry	21 (12)

## Discussion

These results suggest that student pharmacists have an interest in online modes of content delivery. Online delivery of course content is becoming increasingly popular (National Survey of Student Engagement 2008), and this is reflected in the previous undergraduate course work of the students surveyed. As personnel and financial resources become sparser in academic institutions, the use of online learning modalities may continue to become more attractive. Online courses have been shown to provide a cost-savings of US\$31-105 per student and allow for increased student enrollment without significant additional expense (Bishop 2006). However, the cost of developing online course can be significant and range from US\$6000-1,000,000 for a three credit hour web-based course. There is a wide variability in the range of costs because of differing methods of online course delivery and some estimates do not account for overhead costs (Rumble 2001). In addition, research has shown that it takes more time to provide online instruction (Rumble, 2001), averaging 18 hours of faculty time to create one hour of online instruction (Boettcher, 1999). However, employing online components of learning may address issues of student access.

Online learning can help students gain basic, foundational concepts prior to class, and apply those concepts to more complex problem-solving in the classroom. This method of learning can also be used for distance learning, prior to laboratory sessions, continuing education programs and other type of practice-based learning. As Blouin *et al.* noted (2009), shifting the delivery of basic information outside of the classroom allows for faculty to make the most of class time, engaging students in critical thinking applications and allowing them to develop communication skills and professional socialization.

According to our survey results, a larger proportion of students were in favor of incorporating online methods of learning in the Management, Pharmacy Law, and Drug Information & Literature Evaluation courses. It is possible that these results are reflective of the course popularity and/or students' perception that these classes may have less intensive coursework as compared to the pharmacotherapy courses. In

addition, these courses have difficulty with classroom attendance if graded activities are not included. It could be argued that, if the intent is to promote higher levels of learning in the classroom, then pre-recorded lectures online with active learning may also prove useful in courses like Therapeutics, Medicinal Chemistry, and Pharmacokinetics. Results from a recent systematic review (Rowe, 2012) suggest that blended learning techniques in healthcare education may improve application skills of students. A caveat may be that some courses that are taught at the Doctor of Pharmacy level are more likely to include significant year-to-year changes than other courses. Therefore, recorded lectures would need to be frequently updated, requiring additional resources.

Our survey has several limitations. Our students have significant exposure to technology and are allowed to use Mediasite for lecture review for most required coursework, even though all lectures have been delivered live in the classroom. This may have increased students' comfort level with viewing lectures online. Therefore, these results may not be generalizable to other colleges or schools of pharmacy that do not have access to or infrastructure to support acquisition and implementation of this type of technology. In addition, our survey did not address the level of difficulty of previous courses that students completed using online learning modalities (*i.e.* introductory- versus advanced-level courses) or student performance in these courses. Also, the impact of past experience with online learning and socialization or professionalization of being in the classroom was not evaluated. A decreased sense of community was described in fully online graduate courses when compared to blended learning courses (Rovai, 2004). However, the sense of community in the blended learning course was equivalent to traditional courses with live lectures (Rovai, 2004). This suggests that the active learning component of the blended learning course instilled a sense of community. A survey investigating the engagement of undergraduate students taking courses delivered primarily online also found that online learning had little impact on socialization and professional networks in undergraduate courses (National Survey of Student Engagement 2008). The framework of most professional pharmacy programs is unique in that students generally move through standard core classes together, particularly for the foundational part of the curriculum. This results in students developing a sense of community as part of their professional development and socialization. Therefore, even if a few courses over the duration of the pharmacy curricula were delivered completely online, it would likely have minimal impact on their development in professionalism and socialization.

These results have relevance to pharmacy education as they may be used to support the addition of online methods of learning into the pharmacy curriculum. Applicants and newly enrolled student pharmacists may be interested in and expect online methods of learning in the pharmacy curriculum since they are increasingly more likely to have experienced it during their pre-pharmacy college education. In addition, with decreasing resources and faculty shortages, online methods of course delivery may be one way to use technology to deliver the curriculum more efficiently, while optimizing classroom time for active learning strategies. While incorporating a significant online component to a course requires some infrastructure, in developed countries the technology is often readily available and widely utilized in many institutions of higher education. However, subscribing to these technologies

can be costly and require information technology support. The authors could not identify any other articles discussing student pharmacist past exposure to and perceptions of online methods of learning in the professional curriculum.

## Conclusion

Student pharmacists at our institution are familiar with and open to online methods of learning as a component of their education. Pharmacy educators may find this information helpful in making decisions about ways to use technology to enhance their teaching to meet the needs of the current generation of students while using their time in the classroom more efficiently.

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## References

- Accreditation Council for Pharmacy Education. Accreditation Standards and Guidelines for the Professional Program in Pharmacy Leading to the Doctor of Pharmacy Degree (2007) Version 2.0. The Accreditation Council for Pharmacy Education Inc (online). Available at: <https://www.acpe-accredit.org/pdf/finals2007guidelines2.0.pdf>. Accessed 22nd May, 2013.
- Allen, I.E. & Seaman, J. (2011) Going the distance: online education in the United States. Needham, MA: SCOPE (Sloan Center for Online Education at Olin and Babson Colleges).
- Bacow, L.S., Bowen, W.G., Guthrie, K.M., Lack, K.A. & Long, M.P. (2012) Barriers to adoption of online learning systems in U.S. higher education (online). Available at: <http://www.sr.ithaka.org/research-publications/barriers-adoption-online-learning-systems-us-higher-education>. Accessed 22 May, 2013.
- Bata-Jones, B. & Avery, M.D. (2004) Teaching pharmacology to graduate nursing students; evaluation and comparison of web-based and face-to-face methods. *Journal of Nursing Education*, **43**, 185-9.
- Bishop, T. (2006) Sloan Consortium research highlights: Cost effectiveness of online education (online). Available at: [sloanconsortium.org/publications/books/pdfce\\_summary.pdf](http://sloanconsortium.org/publications/books/pdfce_summary.pdf). Accessed 1 October, 2013.
- Blouin, R.A., Joyner, P.U. & Pollack, G.M. (2008) Preparing for a Renaissance in pharmacy education: the need, opportunity, and capacity for change. *American Journal of Pharmaceutical Education*, **72**, Article 42.
- Blouin, R.A., Riffée, W.H., Robinson, E.T., Beck, D.E., Green, C., Joyner, P.U., Persky, A.M. & Pollack, G.M. (2009) AACP Curricular Change Summit Supplement: Roles of innovation in education delivery. *American Journal of Pharmaceutical Education*, **73**, Article 154.

Boettcher, J.V. (1999) How much time does it cost to develop a distance learning course? It all depends (online). Available at: <http://www.cren.net/~jboettch/dlmay.htm>. Accessed 1 October, 2013.

Bollmeier, S.G., Wenger, P.J., Forinash, A.B. & Gleason, B.L. (2011) Impact of an online self-paced lecture to teach primary literature evaluation to second professional year students. *Currents in Pharmacy Teaching and Learning*, **3**, 148-153.

Cook, D.A., Levinson, A.J., Garside, S., Dupras, D.M., Erwin, P.J. & Montori, V.M. (2008) Internet-based learning in the health professions: A meta-analysis. *Journal of the American Medical Association*, **300**, 1181-1196.

Cook, D.A., Levinson, A.J., Garside, S., Dupras, D.M., Erwin, P.J. & Montori, V.M. (2010) Instructional design variation in internet-based learning for health professions education: a systematic review and meta-analysis. *Academic Medicine*, **85**, 909-922.

Crouch, M.A. (2009) An advanced cardiovascular pharmacotherapy course blending online and face-to-face instruction. *American Journal of Pharmaceutical Education*, **73**, Article 51.

Jenkins, S., Goel, R. & Morrell, D. (2008) Computer-assisted instruction versus traditional lecture for medical student teaching of dermatology morphology: a randomized control trial. *Journal of the American Academy of Dermatology*, **59**, 255-9.

Lancaster, J.W., McQueeney, M.L. & Van Amburgh, J.A. (2011) Online lecture delivery paired with in class problem-based learning...Does it enhance student learning? *Currents in Pharmacy Teaching and Learning*, **3**, 23-29.

Means, B., Toyama, Y., Murphy, R., Bakia, M. & Jones, K. (2009) U.S. Department of Education, Office of Planning, Evaluation, and Policy Development, Evaluation of evidence-based practices in online learning: a meta-analysis and review of online learning studies. Washington, D.C., 2009 (online). Available at: <http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf>. Accessed 22 May, 2013.

Moore, J.C. (2005) The Sloan Consortium Quality Framework and the Five Pillars. Newburyport, Mass: The Sloan Consortium (online). Available at: <http://sloanconsortium.org/publications/books/qualityframework.pdf>. Accessed 22 May, 2013.

National Survey of Student Engagement (2008) Promoting Engagement for All Students: The Imperative to Look Within: 2008 Results (online). Available at: [http://nsse.iub.edu/NSSE\\_2008\\_Results/docs/withhold/NSSE2008\\_Results\\_revised\\_11-14-2008.pdf](http://nsse.iub.edu/NSSE_2008_Results/docs/withhold/NSSE2008_Results_revised_11-14-2008.pdf). Accessed 22 May, 2013.

Rowe, M., Frantz, J. & Bozalek, V. (2012) The role of blended learning in the clinical education of healthcare students: a systematic review. *Medical Teacher*, **34**, e216-e221.

Rovai, A.P. & Jordan, H. (2004) Blended learning and sense of community: a comparative analysis with traditional and fully online graduate courses. *The International Review of Research in Open and Distance Learning*, **5**, 1-17.

Rumble, G. (2001) The costs and costing of networked learning (online). Available at: <http://sloanconsortium.org/jaln/v5n2/costs-and-costing-networked-learning>. Accessed 1 October, 2013.

Seybert, A.L. & Kane-Gill, S.L. (2011) Elective course in acute care using online learning and patient simulation. *American Journal of Pharmaceutical Education*, **75**, Article 54.

Tabata, L.N. & Johnsrud, L.K. (2008) The impact of faculty attitudes toward technology, distance education, and innovation. *Research in Higher Education*, **49**, 625-646.

Wise, B. (2010) The online learning imperative: a solution to three looming crises in education. *Education Digest*, **76**, 52-58.

Zapantis, A., Machado, C., Nemire, R. & Leung, S. (2008) An elective course in adult acute care medicine using a hybrid delivery system. *American Journal of Pharmaceutical Education*, **72**, Article 105.

## Appendix A

### Survey questions

1. Were you enrolled in an online course during your undergraduate curriculum?
2. If yes, were any of these courses science classes?
3. If available, would you have been interested in participating in online courses during your undergraduate courses?
4. Which of the following modes of delivery do you typically prefer for lectures in the pharmacy curriculum (live lecture, mediasite, or no preference)?
5. Please indicate which type of presentation you learn the most from (select multiple if applicable):
6. If lectures were ONLY available on Mediasite® (and not delivered 'live'), do you feel that you would be able to keep pace with the course by viewing lectures weekly as scheduled?
7. If you took a course where the lectures were viewed using Mediasite®, would you like to meet 'live' for some lectures or an active learning component (i.e., recitations)?
8. If there was a course where the lectures were viewed using Mediasite®, how frequently throughout the semester would you like to meet 'live' for recitation (or lab) sessions?
9. If you took a course where the lectures were viewed using Mediasite®, what would you prefer most as an available means of asking instructors questions?
10. Of the courses listed below, which would you be interested in having lectures only available on Mediasite® with a recitation or lab component?
  - a. OTC
  - b. Medicinal Chemistry
  - c. Pharmaceutics
  - d. Pharmacy Calculations
  - e. Pharmacology
  - f. Therapeutics
  - g. Management
  - h. Drug Information and Literature Evaluation
  - i. Pharmacy Law
  - j. Electives