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Research Article

Evaluation of in-class and online discussion meetings in a biopharmaceutics problem-based learning class ☆

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Abstract

Objectives: To evaluate faculty-led discussion meetings (with about eight students) conducted face-to-face (in-class) or by synchronous, real-time videoconference (online), in a biopharmaceutics course taught in a facilitated problem-based learning (PBL) format.

Methods: Three methods were used to compare in-class versus online discussion sessions for two semesters. The first method involved three parameters that measured the quality of interactions between faculty (facilitator) and student (*Fc–St*), participation of students in the discussions (*Par*), and student–student interactions (*St–St*). The second method assessed student's perceptions of the discussions with surveys. The third method mapped the interactions (a sociogram) between faculty (facilitator) and students in a discussion.

Results: There were significantly lower scores for *Par* and *St–St* ($P < 0.05$) and a tendency for lower *Fc–St* ($P < 0.06$) in online discussions compared to in-class. The surveys indicated that the decrease in scores for online discussions was not due to technology barriers, acceptance, or satisfaction. The lower interaction scores were supported by mapping of discussions as sociograms.

Conclusion: PBL discussion meetings can be held online because of the increased availability and acceptance of the technology, but may lead to reduced interaction and participation. Our findings suggest that synchronous online discussions may require the facilitator to foster and stimulate student participation and student–student interactions in an active manner that may differ from the approach used for in-class discussions.

Keywords: Active learning; Problem-based learning; Evaluation; Discussion; Map; Sociogram; Good education principles; Online teaching

Introduction

In response to the 2016 guidelines from the Accreditation Council for Pharmacy Education (ACPE),[1] which state that development of critical thinking and problem-solving skills should be supported in the pharmacy curriculum through active learning strategies such as case studies, guided group discussions, and application of computer technologies, pharmacy education is increasingly moving from lecture-based teaching to courses that use active, student-centered, team-based, and problem-based learning (PBL). PBL is a learner-centered, active learning approach that enables integration of hypothesis and practice, and application of knowledge and expertise to find a viable answer to a definite problem, through which students gain skills in problem solving, critical thinking, and teamwork.[2] Students may also gain and retain more knowledge via PBL compared to learning by traditional methods.[3]

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PBL has become an accepted part of pharmacy education in North America and increasingly worldwide.[3–7] The comprehensive review of PBL in pharmacy by Cisneros et al.[8] is a good marker of progress through the 1990s. Subsequently, PBL applications have been described for teaching of various pharmaceutical courses such as pharmacokinetics,[9] therapeutics,[10,11] pharmaceutical sciences,[12] pharmacotherapy,[13,14] medicinal chemistry,[15] pharmacy practice,[16] intensive care,[17] and physical assessment skills.[18] A hybrid design including lectures for fundamental concepts and PBL facilitated by faculty-led discussion groups and case studies has been used in biopharmaceutics courses in the Doctor of Pharmacy (Pharm.D.) curriculum at USC for 20 years.[12,19,20]

Integration of online technology may add more flexibility to the PBL environment and may enhance traditional PBL,[21,22] however, effective integration of PBL with online technology depends on the capability of instructors and technology specifications.[23,24] The success of any course in an online environment is likely to be influenced by the perceived ease of use of the technology, which is dependent on external support and on personality differences among students.[23] A simple online intervention that minimizes the time required for student and facilitator training may be most effective, as shown in an e-learning prescription course.[25] A meta-analysis by Wong et al.[24] has shown the importance of the fit between the technical aspects of the online educational environment and the needs and priorities of learners.

In an evaluation of online education, Kirtman[26] found no difference in learning outcomes (examination and written assignment scores) between students taking a similar class online and in-class, and noted positive comments from the online classes in a student survey. Based on student surveys on the use of technology and the case method, Watson and Sutton[27] found students perceived that greater learning occurred with online asynchronous discussion boards, and that the students indicated that they preferred not to use online synchronous communication (replicate in-class discussions) for case discussions. Porter et al.[28] noted that there was no difference in pharmacy students' performance (examinations and quizzes), between an online or classroom format for an elective course on immunization. A survey given to the students indicated that those students who took the class online preferred an online format, while students who participated in the classroom format preferred the classroom. As pointed out by Kirtman,[26] a clear definition of learning outcomes is required and examination results may not always be satisfactory for comparison of outcomes from different educational approaches. Watson and Sutton[27] provided an interesting framing of their findings in the context of the seven principles of good educational practice,[29] but noted the limitation of indirect evaluation of these principles through survey of students. These studies exemplify the difficulties of evaluating online learning.

In this study, we used three methods to compare in-class versus online (synchronous) discussion sessions in a facilitated PBL course in the Pharm.D. curriculum: real-time evaluation of students by faculty, surveys of students, and observer analysis. Our goal was to evaluate our discussion sessions with these three methods, instead of relying only on examination results or surveys. These three methods allowed a detailed evaluation of the dynamics of these discussion sessions that has not been achieved in previous studies. The combination of methods allowed more robust evaluation regarding student–student and student–faculty interactions in online sessions held in a PBL format.

Methods

Discussion group schedules and data collection

The study was performed in a year-long biopharmaceutics series taught in a facilitated PBL format to about 185 first-year pharmacy students. Learning activities included didactic lectures, followed by three weeks of discussion sessions and out-of-class activities, which included students searching and reading the literature to answer a case study problem in written case study reports. Discussion groups of 30–40 minutes with 7–8 students and a facilitator were scheduled as part of case studies[12,20] assigned in the Fall and Spring semesters. The case studies were performed over three weeks and required the student groups to find biopharmaceutics data from literature sources and apply these data to solve a formulation problem or account for other literature information. The task is complex and requires considerable independent work by the students. The Fall case study (Appendix A) is focused on oral absorption and the Spring case study (Appendix B) on metabolism and drug–drug interactions. The basic principles of these areas are covered in lectures given in the period immediately before the start of the case study. A report from each group is due at the end of each week during the case study. To provide guidance in data interpretation while this report is being written, each group has scheduled discussion meetings with a faculty facilitator once or twice each week. An observer attended some of these discussion meetings at random.

The discussions were held face-to-face (in-class) or using Google^{+} Hangout videoconference software (online). A typical discussion (in-class or online) involved a facilitator asking relatively open questions to stimulate a discussion. These questions are broadly agreed upon in advance by the facilitators and are largely driven by the material in the particular week of the case study. Typical questions asked by students might involve interpretation of a specific piece of data or more basic questions of how to find information. Fundamental concepts may be reviewed in the meeting, but in a discussion format. The formats of the in-class and online meetings were essentially identical; thus, the online meetings were synchronous and scheduled in the