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First semester experiences of using the flipped classroom model in a new pharmacy school

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Abstract

Introduction: Marshall University School of Pharmacy (MUSOP) in Huntington, WV has adopted the flipped classroom model. This commentary is written from the perspectives of new and experienced faculty about their first semester experiences in using the flipped classroom and aims to inform other faculty members who would like to use the flipped classroom model.

Description: The flipped classroom method, a type of active learning style, involves students "pre-loading" the material before class, resulting in class sessions designed to apply the material in a series of active learning exercises. Faculty members were asked to describe at least one class session, explain their experiences, and provide recommendations for improvement.

Evaluation: The instructor commentaries from three, first year courses at MUSOP provide first-hand insight on how the flipped classroom model can be utilised in a school of pharmacy.

Future Plans: MUSOP will continue to use the flipped classroom model and plans to evaluate student-pharmacist perceptions of this innovative method.

Keywords: *active learning, flipped classroom, instructional methods, PharmD education*

Introduction

The traditional method of learning in the college classroom, the lecture, has been a subject of criticism. One such criticism of the didactic, instructor-centred lecture is that the lecture is a passive method of conveying basic, foundational content to students. Another criticism of the lecture is that it fails to engage students' ability to achieve higher levels of understanding (Blouin *et al*., 2009; DiPiro, 2009; Penson, 2012). An alternative style of instructional format, the 'flipped classroom', has emerged in the United States as a means of increasing student participation in class and increasing one-on-one time with the professor (Bergmann & Sams, 2012).

The flipped classroom model can be an effective means of student-centred instruction for professional students. When a flipped classroom is employed, the instructor moves from being the "sage on the stage" to a "guide on the side" (American Institute for Research, 2012). Students are expected to "pre-load" class material by reading textbook assignments, listening to a pre-recorded lectures, etc. This pre-class work essentially supplants the traditional didactic presentation that a class typically employs. Consequently, instructors are expected to develop exercises that engage students to apply the pre-loaded material, assisting students in developing a deeper understanding of course content; this process has been coined the term 'active learning' (Bonwell & Eison, 1991). Prior research has shown that active learning is perceived favourably by pharmacy students; however, research is mixed examining whether or not student performance is improved using the flipped classroom model compared to didactic lectures (Gavaza *et al*., 2012; Harpe *et al.*, 2012; McLaughlin *et al.,* 2013 O'Brocta & Swigart, 2013). Interestingly, preliminary data from a small, randomised study underway at our institution involving student mastery of pharmaceutical calculations demonstrated statistically significant increases in test scores in the active learning group (unpublished data).

This paper aims to inform faculty at other schools and colleges of pharmacy about the specific experiences of both new and experienced faculty in the delivery of the flipped classroom model, particularly related to the triumphs and challenges of using this instructional strategy.

Description

MUSOP matriculated its first Doctor of Pharmacy (PharmD) class in August 2012. The classroom environment seats 80 students and is situated so that

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students are in ten groups of eight students at a roundtable to facilitate active learning. All courses within our PharmD curriculum have adopted the flipped classroom model. Pre-class work is developed by course instructors and routinely uploaded to our online learning management system (LMS) at least 48 hours prior to the classroom session.

Our faculty members have a variety of backgrounds and levels of experience, and many are new to teaching. Faculty attended a three-day retreat in May 2012, which involved workshops on flipped classroom techniques and strategies. Faculty involved in teaching PharmD courses in the Autumn 2012 were asked to provide a course description and an example application of using the flipped classroom to allow for active learning. Details concerning three, first year courses (Pharmacy Practice I, Biopharmaceutics I, and Biomedicinal Chemistry) are included in Table I and example applications follow. All courses were then evaluated based on the course instructor observations and student course evaluations.

Table I: Course Descriptions

Course Name	Number of Instructors	Course Schedule	Course Content
Pharmacy Practice I	5	Three-hour block sessions 4 times per week for 5 weeks	Legal requirements for a prescription
			Pharmaceutical calculations
			Professionalism
			Personal Management
			Communications Skills
Biopharmaceutics I	2	Two-hour block sessions 2 times per week for 10 weeks	Physicochemical properties: solubility, stability, viscosity
			Solids
			Solutions
			Pharmaceutical excipients
			FDA drug development and approval process
Biomedicinal Chemistry	3	Two-hour block sessions once weekly for 5 weeks, then two-hour block sessions 3 times per week for 10 weeks	Basic medicinal chemistry: pH, functional groups, drug properties
			Basic biochemistry: proteins, carbohydrates, lipids, molecular interactions, metabolism, pathways

Pharmacy Practice I: Example Application of Flipped Classroom

For the pharmacist-patient communication class, students were required to log into the our LMS and: (1) read directions to the Test of Functional Health Literacy (TOFHLA) (2) fill out a teaching sample of the TOFHLA before class, and (3) read standard Consumer Medication Information (Parker *et al.*, 1995). During class, the students and instructor discussed the merits and weaknesses of TOFHLA based on students filling out the sample version. The instructor also gave instructions to the Rapid Estimate of Adult Literacy in Medicine Short Form (REALM-SF) and had the students complete that health literacy measure, taking approximately one minute for student-pairs to complete (Arozullah *et al*., 2007). A discussion about the merits and weaknesses of the REALM-SF then followed.

Biopharmaceutics I: Example Application of Flipped Classroom

The class session involving the FDA development and approval process required students to access a one page handout in our LMS, which provided pre-class instructions, a link for students to access a research and development brochure, and a list of questions the students should be able to answer after reading. During the class session, the students and instructor first discussed the questions concerning the drug development and approval process. Following that exercise, each group was given an abstract from a phase I, II or III trial with the name of the drug removed and a set of instructions to (1) choose a brand and generic name, (2) design their drug product, and (3) present key findings from the trial to convince the other groups to 'approve' their drug product. Based on the information each group provided, the remaining groups first determined the phase of the trial, then voted to approve or reject the drug product using "clicker" technology.

Biomedicinal Chemistry: Example Application of Flipped Classroom

For the class session involving the topic of proteins, students were required to read an instructor-created handout accessible in our LMS before class. Once class commenced, the instructor first facilitated a class discussion, then each group was assigned a unique protein-related topic. Student groups searched the internet and created a five-slide PowerPoint presentation. Representatives from each group presented their findings to the entire class. Groups were also instructed to post their findings in a discussion group on our LMS to facilitate the entire class's access to the discussion.

Evaluation

Observations

For full class discussion-based activities, students actively participated and helped steer the course of the discussions. Similarly, individual table discussions were productive, with a high level of student involvement. Such participation and productivity were observed directly in the Pharmacy Practice I application example. For activities involving the creation of a presentation or other type of assignment (Biopharmaceutics I and Biomedical Chemistry examples), group dynamics worked well for most student groups, which led to

satisfactory completion of assignments during class sessions. Instructors also observed improved instructor-student relationships in all courses during the Autumn semester. Commentarial results from student course evaluations were generally positive regarding active learning in the classroom. Students wrote most supportive comments regarding the connection of active learning activity to tested material; in other words, students favoured active learning activities that directly related to exam questions.

However, there were challenges to overcome when utilising the flipped classroom method, both in this course as well as throughout the curriculum. Even though students had an orientation session that acclimated them to the flipped classroom concept, it seemed the students still faced a significant learning curve understanding how the flipped classroom worked and what they were required to do before each class. There were instances of students not managing their time efficiently and therefore struggling to keep up with the course expectations. Instructors had a difficult time initially understanding how much class time to allocate to discussions and activities. Additionally, executing active learning activities when only one instructor was present proved to be challenging; even with detailed instructions and examples, multiple student questions during breakout sessions delayed activity completion. Students also seemed to rely on the recorded discussions and group presentations rather than taking detailed notes during the class session. From the students' perspective, students were critical of active learning sessions that lacked a true connection to the material presented or seemed more like busy work.

Recommendations

To circumvent these observed difficulties, course instructors could provide a more robust introduction to the flipped classroom model to better familiarise students. Moreover, instructors could develop a detailed timing schedule of activities to allow for better use of class time. Curricular deployment should also reflect the increased demands for active learning sessions, assigning an appropriate number of faculty members to assist with activity facilitation. To address student preparedness, instructors could incorporate quizzes, either before or during class, as motivation to prepare effectively and forgo recording class discussions to make students take notes during class.

Future Plans

Other professional schools, such as Stanford Medical School, have embraced the flipped classroom, which has led to increased positive student reviews and class attendance (Prober & Heath, 2012). Moreover, a recent meta-analysis of science, engineering and mathematics courses in undergraduate education indicated increases in student performance on examinations and higher passing rates when active learning is incorporated compared to traditional lecturing (Freeman *et al*., 2014). Our program continues to use the flipped classroom method as our educational platform.

We have created a cross-disciplinary research group that is developing study designs to evaluate the strengths and weaknesses of using the flipped classroom model in MUSOP's curriculum. Future research should examine comparing student performance on written exams and Objective Structured Clinical Exams (OSCEs) while randomly allocating students to the flipped classroom and a traditional pedagogy. Prospective research should also examine how the flipped classroom is associated with faculty effectiveness throughout the curriculum. And lastly, future research should examine ways to engage students in the material more than in traditional didactic classes.

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