Student perceptions and lessons learned from flipping a master's level environmental and occupational health course

Perceptions des étudiants et leçons tirées d'une classe inversée pour un cours de maîtrise en santé environnementale et professionnelle

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Abstract

The flipped classroom instructional model has emerged as an alternative to the conventional lecture-based teaching that has dominated higher education for decades. In 2013, a cohort of graduate-level public health students participated in a flipped environmental and occupational health course. We present the design, implementation, and evaluation of this course. Using data collected from a post-course survey, focus group sessions, and classroom observation, we examine student perceptions of the flipped classroom instructional model and synthesize lessons we learned relevant to flipping courses in general. Post-course survey data indicate that students had largely positive perceptions towards the flipped classroom instructional model. Four major themes emerged from the focus group data in relation to perceptions of the flipped classroom: knowledge application, content delivery, innovation, and connecting the online and in-class components. These results are promising and suggest that this approach warrants further consideration and research.

Résumé

Le modèle pédagogique de la classe inversée a émergé comme solution de rechange à l'enseignement traditionnel par cours magistraux qui a dominé l'éducation supérieure pendant des décennies. En 2013, une cohorte d'étudiants en santé publique aux cycles supérieurs a participé à un cours inversé sur la santé environnementale et professionnelle. Nous présentons la conception, la mise en œuvre et l'évaluation de ce cours. À l'aide de données recueillies par l'entremise d'un sondage après le cours, lors de séances de discussion en groupe et d'observation en classe, nous examinons les perceptions qu'ont les étudiants du modèle pédagogique de la classe inversée et résumons les leçons tirées qui sont pertinentes pour les cours inversés en général. Les données du sondage réalisé après le cours indiquent que les étudiants avaient des perceptions pour la plupart positives du modèle pédagogique de la classe inversée. Quatre

thèmes principaux ont émergé des données du groupe de discussion relativement aux perceptions sur la classe inversée : mise en application des connaissances, diffusion du contenu, innovation et lien entre les composantes en ligne et en classe. Ces résultats sont prometteurs et suggèrent que cette approche devrait faire l'objet de plus de considération et de recherche.

Introduction

The flipped classroom instructional model has emerged as a promising alternative to conventional lecture-based teaching fuelled by advances in educational technologies, widespread Internet access, and a shift toward flexible and active learning environments (Bristol, 2014; Gilboy, Heinerichs, & Pazzaglia, 2015; Kim, Kim, Khera, & Getman, 2014). The flipped classroom model (also known as the inverted classroom) falls under the blended-learning umbrella, broadly defined as the integration of in-class learning with online learning technologies (Baker, 2000; Strayer, 2012). The main characteristic of the flipped classroom is that content and material are delivered primarily outside of the face-to-face classroom environment, using online tools and educational technologies, while in-class time is used "to work through problems, advance concepts, and engage in collaborative learning" (Tucker, 2012, p. 82). Unlike the convectional lecture-based approach to teaching which "reduces education to a transfer of information" (Mazur, 2009, p. 50), this model emphasizes active learning and problem-solving, and promotes higher-order cognitive work (i.e., analysis and synthesis) (Anderson, Krathwohl, & Bloom, 2005; Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956). The role of the instructor changes from that of predominantly delivering content to one focused on facilitating discussion and promoting problem solving and knowledge application. Moreover, the flipped classroom is a student-centered approach where students are encourage to take ownership of their own learning (McLaughlin et al., 2014)

There is increasing evidence to suggest that flipping the classroom may be an effective and efficient instructional model. For example, a randomized control trial showed that using the flipped classroom model in a university level Physics course increased attendance, engagement, and comprehension of content (Deslauriers, Schelew, & Wieman, 2011). Flipping in a university-level renal pharmacotherapy course led to improved student performance on final examination scores (Pierce & Fox, 2012). Our understanding of the impacts of the flipped classroom model on learning and learning experiences has advanced significantly in recent years yet remains limited. More research is needed and there remains a substantial knowledge gap regarding student perceptions of this teaching and learning model. Perhaps most importantly, an understanding of the conditions and specific design and implementation features that promote learning and positive learning experiences in the context of higher education and public health and environmental health education more specifically is lacking (Herreid & Schiller, 2013).

This paper reports on the design, implementation, and evaluation of a master's level Environmental and Occupational Health Course (EOHC) that used a flipped classroom design. We explore the following research question: 'what are student perceptions of the flipped classroom model as experienced in the EOHC?' We also synthesize lessons that emerged from the data as well as the process and our experience of flipping a graduate-level public health course from an instructional perspective. Ultimately, we hope that this paper contributes to the

emerging dialogue around 'what is working and why' with regards to the flipped classroom model and that our experience inspires public health instructors to take advantage of the rapidly evolving educational technologies to move beyond traditional lecture-based teaching in their own classrooms.

Method

Study Participants

Study participants (n=42) were students enrolled in the 2013 fall session of an EOHC at a Canadian university. All participants were graduate students in their first or second year of study in the Master of Public Health (MPH) program. Primary areas of interest among the students within the broad field of public health ranged from gender and health to social inequities and health.

Description of Course

The EOHC is a core and required course in the MPH program offered by the Faculty of Health Sciences at a Canadian university. Content for the EOHC is based on core academic competencies outlined by the Association of Schools of Public Health (ASPH) for MPH graduates. The core competencies "delineate fundamental knowledge, attitudes, and skills that every MPH student, regardless of their major field, should possess upon graduation" (Moser, 2008, p. 1559).
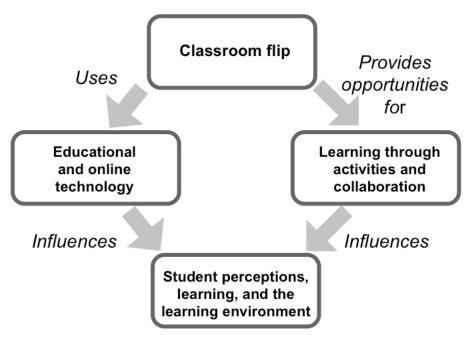

Figure 1. Flipped classroom framework (adapted from Strayer, 2012).

The goal of the EOHC was for students to gain general familiarity with the fundamental principles and primary areas of knowledge that are important to the broad field of environmental and occupational health (EOH). The course aimed to expose students to numerous EOH issues

and to encourage critical thinking and reflection on these issues. The course consisted of nine modules: 1) Introduction to environmental health; 2) Environmental disasters; 3) Environmental and occupational health principles I; 4) Environmental and occupational health principles II; 5) Human susceptibility; 6) Outdoor air pollution; 7) The built environment; 8) Occupational health and worker safety; and 9) Global environmental change and health.

Canvas by Instructure (http://www.instructure.com/) was used as the learning management system and served three main purposes in the context of this design: 1) as a repository for vodcasts (pre-recorded video podcasts) and all other instructional and student materials (e.g., the syllabus, readings, detailed learning activity worksheets, etc.); 2) as a space for threaded asynchronous online discussions among students (moderated by the course teaching assistant (TA)); and 3) as a medium for communication between students and the instructional team (e.g., to ask the TA and instructor specific questions about material covered in the vodcasts). The instructional team for the course consisted of an instructor (TT), a TA, an educational support consultant (BB), and an evaluator who took the leading role in designing and conducting the research presented in this paper (LPG). The course instructor had taught the environmental and occupational health course for the MPH program for seven years using a conventional lecture-based design. The instructor was motivated to experiment with a flipped design because of its novelty and because it enabled him to meet an oft-stated desire of the students for more interaction among students and with the instructor. Along with developing vodcasts, the primary role of the instructor in this flipped course was the design of interactive and practice-based learning activities, then as a facilitator and guide for students as they applied the content and concepts through these activities during in-class time. The primary role of the TA was assisting in the classroom activity, marking, and managing Canvas.

Recognizing that the flipped classroom was a new experience for most students in the course, the syllabus clearly outlined motivation for flipping the course, as well as details about expectations for engagement and participation. Each week, students were assigned a module and were responsible for viewing vodcasts (approximately 1-hour in length) and completing additional reading material (1-2 articles per module) to prepare for in-class sessions. The lecture vodcasts were adapted from original lecture material used in previous years when the EOHC was taught using a traditional face-to-face, lecture-based approach. Vodcasts were approximately one hour in length and recorded using Techsmith's Camtasia (http://www.techsmith.com/camtasia-features.html). In-class time was designed to facilitate collaborative, active learning and problem solving activities where students applied the content presented in the weekly vodcast. Depending on the intended learning outcomes of each module, the nature and structure of the face-to-face, in-class learning activities varied (see Table 1 for a detailed description of three examples). For instance, four in-class activities included a written component that was submitted and marked. Depending on the nature of the activity, it was either completed during a three-hour session with all of the students or the class was split in half (approximately 20 students in each group) and two 90-minutes sessions were carried out. When class time was split into two 90-minute sessions, students who were not participating in the in-class activity worked on their small group case-study projects (consisting of a final paper and a poster presentation). Students completed a final exam at the end of the semester that incorporated multiple choice and short answer application questions.

Following each in-class session, the instructional team held a debrief meeting to identify successes and weaknesses of the session and to reflect on general lessons learned regarding the flipped classroom model in general. Reflection was guided by Rolfe et al.'s (2001) framework for reflective practice based on three simple questions: 'What'? 'So what'?, and 'Now what?' (Rolfe, Freshwater, & Jasper, 2001). This formative, reflective, process produced insights that were often incorporated into upcoming modules. In this way, the design of the EOHC was iterative.

Table 1
Description of a selection of in-class learning activities

Activity Name	Learning Outcome	Activity Description
Linking thinking for environmental health [1]	To identify and then consider the linkages between major health issues and the environment.	Each student selects a health issue of interest. Working on their own, students create an influence diagram on a large blank piece of paper that explicitly illustrates the links between their selected health issue and the environment or environmental factors. In pairs, the students describe their influence diagram to one another. Finally, the instructor facilitates a discussion around the following questions: "Was it difficult to integrate the environment and/or environmental factors into the influence diagram for your selected health issue? Why or why not?" [1]
Building Assessment: Is your building healthy?	To understand the public health implications of building design and performance, particularly pertaining to indoor environments.	The students are taken on a building tour of two buildings on campus. During the tour, the students are instructed to make observations, assess potential health hazards, and complete the Healthy Buildings Checklist. Following the building tour, the instructor facilitates a group discussion around the following questions: What are some of the general observations made about the buildings? What were the similarities' and differences between these two buildings? What are some of the hazards identified in the buildings? How might you go about making changes to prevent ill-health or injury given what you have seen and learned?
Toxicology, epidemiology, and risk assessment problem set	To gain a better understanding of the fundamentals of toxicology and the risk assessment framework.	Students work in pairs to solve problems applying the fundamental toxicology, epidemiology, and risk assessment concepts.

[1] Adapted from (McCullagh, Hunter, Houle, Massey, & Waltner-Toews, 2012)

Data Collection and Analysis

A mixed-method approach was used which included a post-course survey, focus group interviews, and field-notes collected during classroom observation and instructional team debriefs. The post-course survey included 16 items pertaining to student learning experiences and general perceptions of the course and the flipped classroom model. Items were assessed using a 5-point Likert scale (strongly disagree, disagree, neutral, agree, strongly agree). For reporting of these items, agreement (strongly agree and agree) and disagreement (strongly disagree and disagree) were combined. The survey instrument was developed by LPG, reviewed by three colleagues, and pre-tested in a pilot study by an earlier cohort of MPH students in 2013. Students (n=35) completed the post-course survey (on paper) after the final examination (after completing the final exam the students went to another room to complete survey). Completing the post-course survey was optional; the response rate was 81%.

To gain a more in-depth understanding of student experience and perceptions of the flipped classroom model, we (LPG) collected, audiotaped, and transcribed qualitative data from two separate one-hour focus group sessions with six students in each session (n=12). The focus group sessions were conducted one-week following the final exam, before the students were given their final grades. Open-ended queries addressed learning experiences and perceptions of the flipped classroom model in general. Preliminary analysis of the survey data was conducted prior to the focus groups session such that survey data helped inform the open-ended queries used in the focus groups sessions. The data were analyzed using qualitative thematic analysis (LPG) and guided by the research question. First, the transcribed text was read in its entirety to get a general overview and sense of the data. During a second reading of the transcript, the data were coded with emerging themes. A selection of quotes from the focus group data is reported to reflect findings.

Finally, classroom observation was conducted and field-notes were collected (LPG) during weekly in-class sessions as well as during the instructional team debrief meetings. Field-notes from classroom observations and debrief meetings were used, in addition to findings from the post-course survey and the focus group interviews, to identify lessons learned from the process and experience of flipping the course. These insights also proved invaluable as a way of corroborating and guiding iterative modifications over the 12-week course.

Descriptive statistical analyses were conducted using R statistical software version 2.13.0. Given the manageable length of the single focus group session, we used Microsoft Word to analyze the qualitative data (Ryan, 2004).

Ethics approval was obtained from Simon Fraser University. Recruitment was carried-out by LPG during the first class session. All participants gave written informed consent and the voluntary nature of the study was underscored. Students were assured confidentiality with the instructor and TA accessing only de-identified evaluation data after the grades were finalized.

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Findings

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Results for this study are presented in two main sections: results from the post-course survey and results from focus group interviews. The discussion and conclusion section draws on these

findings along with field-notes from classroom observation and from instructional team debrief meetings to synthesize and present lessons learned. These lessons are relevant for the design and implementation of courses using the flipped classroom model in the context of higher education in general. These data will be used to improve the EOHC itself by guiding further iterations and design modifications for subsequent deliveries of this course.

Results from the post-course survey show that student perceptions of the flipped classroom model were generally favorable, although there is some diversity across students. Certain aspects of the flipped EOHC that were not as favorably received represent areas for improvement in the future. Table 2 presents descriptive statistics of the post-course survey items focusing on learning experience and perceptions of flipped classroom model and the EOHC.

In response to the item "Overall, I enjoyed taking a course using the flipped classroom design", 60% of students agreed or strongly agreed. Also, nearly half of the students agreed or strongly agreed with the statement "Other instructors in the Faculty of Health Sciences should consider using a flipped classroom model." Although only 37% of students agreed that they would rather take a course using a flipped classroom model than a traditional model in the future, students commented in the focus group interviews that their preference for a flipped course would depend on the instructor, the course content, and the class size.

Nearly all students agreed or strongly agreed that the in-class learning activities and vodcasts contributed to their learning (97% and 83% respectively). Importantly, the large majority of students agreed or strongly agreed with the following statement: "In-class learning activities were an opportunity to apply the content learned from the vodcasts". However, half of the students (51%) disagreed with the statement "I enjoyed watching vodcast lectures prior to in-class sessions as opposed to live in-class lectures" suggesting that the vodcasts did not contribute to positive learning experiences to the same degree as the in-class learning activities. Finally, nearly all students (89%) agreed with the statement that "The flipped classroom model was a different learning experience than other MPH courses" revealing that course was novel and innovative in this setting.

Table 2

Descriptive statistics of post-course survey items focusing on learning experience and perceptions of the flipped classroom model

Survey Items	Disagree %(n)	Neutral %(n)	Agree %(n)
The vodcast lectures contributed to my learning.	3(1)	14(5)	83(29)
I watched the assigned vodcast lectures before attending in-class sessions.	14(5)	3(1)	83(29)
I enjoyed watching vodcast lectures prior to in-class sessions as opposed to live in –class lectures.	51(18)	20(7)	29(10)
The recording quality of vodcast lectures was adequate.	29(10)	20(7)	51(18)

Survey Items	Disagree %(n)	Neutral %(n)	Agree %(n)
It was useful to have access to the vodcasts while studying for the final exam.	9(3)	3(1)	89(31)
In-class learning activities contributed to my learning.	3(1)	6(2)	94(33)
In-class learning activities were an opportunity to apply the content learned from the vodcasts.	6(2)	20(7)	74(26)
Viewing the vodcasts before class prepared me for the in class learning activity.	0(0)	31(11)	69(24)
The instructor made meaningful connections between content of the vodcasts and the in class learning activities.	6(2)	14(5)	80(28)
The flipped classroom design (online content delivery plus in-person classroom interaction and problem-solving) enabled more interaction with my classmates than did other MPH courses.	26(9)	26(9)	49(17)
The instructor facilitated in-class engagement and participation.	9(3)	17(6)	74(26)
Overall, I enjoyed taking a course using the flipped classroom design (online content delivery plus in-person classroom interaction and problem-solving).	20(7)	20(7)	60(21)
Other instructors in the Faculty of Health Sciences should consider using a flipped classroom model.	23(8)	31(11)	46(16)
The flipped classroom model was a different learning experience than other MPH courses.	0(0)	11(4)	89(31)
I would like more diversity in terms of course design in the MPH program.	0(0)	37(13)	63(22)
In the future, I would rather take a course using a flipped classroom model than a traditional lecture –based model.	31(11)	34(12)	37(13)

[1] Students were asked to react to the statements on a 5-point Likert scale where 1 =Strongly disagree; 5 =Strongly agree

Qualitative thematic analysis of the focus group data identified four major themes in relation to perceptions of the flipped classroom model and learning experiences: knowledge application, content delivery, innovation, and connecting the online and in-class components. Each of these themes is briefly discussed below along with excerpts from participants' responses.

Knowledge application. Overall, students responded very favourably to the opportunity to apply what they had learned online through interactive in-class learning activities. Specifically, students reported that the opportunity to actively engage with course content and the peer and instructor interaction that occurred through the activities facilitated learning, content recall, and knowledge synthesize. One student enthusiastically stated "I feel like this (the flipped classroom model) did it for me! Because of the group activities, we were always interacting, and it was something new".

For several of the focus group participants, the value of the in-class learning activities became particularly clear as they prepared for the final exam. "[W]hen I did actually come back to studying for the exam, I was surprised how much I remembered from the activities and how they helped". Another stated, "the material really stuck with me I noticed for the final". Students had particularly positive views towards the diversity of activities across the course as a whole, and those specific activities that gave them the opportunity to practice skills potentially relevant to the workplace. "I liked the activities that were the most hands on and putting you in a position of OK 'if this were my job what would I do' kind of thing."

Content delivery. There were mixed reviews about the vodcasts. The students found it very useful at exam time given that they could re-watch the vodcasts while studying for the final exam. For example, one student stated, "as I was studying for the exam I really saw the utility of the vodcast. So you could go back, re-watch the vodcast and re-examine your notes … So I really liked the flexibility of that, being able to re-watch the vodcast and re-visit the material." However, some students reported that the vodcasts were not engaging and many wanted more opportunities to ask specific questions about the content.

Innovation. The flipped EOHC was innovative and offered a learning experience and environment that was distinct from the other core courses available in the MPH program. The students appreciated that the course did not rely on the conventional lecture-based approach, and acknowledged the additional effort put towards designing and implementing an innovative course. For example, "I really thoroughly enjoyed this class because it was always changing, it was different from my lecture courses". Another student expressed their appreciation for a new learning environment and experience in the following manner, "…we appreciate the fact that you tried something new and it was very evident that you were working hard to try and improve our learning and interest in environmental health. We really appreciated that."

At the same time, because the flipped class room was an innovative course design and implementation, and quite different from the lecture-based model the students were accustomed to, the idea that "[I]t was a little bit difficult to adjust to" emerged from the focus group data. "At first it was very hard for me to get used to the format of the flipped classroom." another student agreed with this comment and added "I definitely started out feeling more negative (about the flipped course). "

Connecting online and in-class components. The final theme that emerged from the focus group data was the lack of "bridges" connecting the online and the in-class components of the course. The need to make explicit connections between the in-class learning activity and vodcast content emerged from the focus group discussions. The idea to have a question and answer session and a brief summary from the instructor before starting the learning activity

during in –class sessions was put forward as a strategy to "reinforce the main concepts, pick up some of the challenging things and have time for questions that would be very helpful."

Discussion and Conclusions

Our results suggest that the flipped classroom instructional model fostered largely positive learning experiences and perceptions among a group of MPH students. Informed by our findings and our experiences using a flipped classroom approach, we highlight insights and lessons learned that are relevant to other instructors considering applying the flipped classroom model in their courses as well as blended learning within higher education more broadly. Synthesizing and sharing experiences and insights is key to ensure that we collectively capitalize on lessons learned while taking advantage of emerging educational technologies and tools.

The Importance of an Engaged and Supportive Instructor

A highly engaged and supportive instructor is important to inspire and promote learning during in-class sessions. A supportive instructor is also important to ensure that students are not left behind and that there are ample opportunities for clarification on important concepts and material that may be difficult to acquire through self-directed means e.g., watching vodcasts and/or reading. It is important to emphasize that the flipped classroom requires a different manner of engagement and support than instructors may be accustomed to with traditional lecture-based teaching. For the flipped classroom model to be successful, the role of the instructor should shift from the so-called 'sage on the stage' to a role of 'guide on the side'. This new role may be a challenge for instructors initially, but will likely be rewarding for instructors as well as the students. To facilitate this shift, students must also be willing to take ownership of their own learning, as well as that of their peers (EDUCAUSE Learning Initiatiave, 2014).

Providing Adequate Scaffolding

In education, scaffolding refers to "a variety of instructional techniques used to move students progressively toward stronger understanding and, ultimately, greater independence in the learning process" (Abbott, 2014). We found that using a variety scaffolding techniques is necessary to support students as they adjust to a new and different instructional model and to ensure that students have the necessary support to complete the preparatory components (i.e., out of class online components) to meaningfully engage with the in-class learning activities. Specific techniques instructors can use include: establishing clear expectations for preparatory work (vodcasts and reading); using knowledge and comprehension quizzes to ensure accurate reading is taking place; providing clearly defined learning objectives and well-structured in-class learning activities, and explicitly describing how a new module builds on the knowledge and skills that the students gained in a previous module. Creating an opportunity for the instructor to answer questions and correct misconceptions is also highly valued and important in laying the foundation for application activities. In future iterations of the course, we will expand the use of the learning management system (Canvas) to better support the scaffolding activities and to provide the structure for students to support each other in the form of peer-to-peer discussions and resource sharing.

Ideally, the instructional support fades as the semester progresses fostering greater student leadership, independence, and ownership of the learning process. Providing appropriate scaffolding that sufficiently connects the preparatory phase and the in class applications throughout the semester should enrich the integrity of the flipped classroom design and yield improved learning outcomes among peer learners.

Creative, Diverse and Clearly Outlined Learning Activities

It was clear that students benefitted from, and enjoyed, a diversity of creative in-class learning activities. Our activities ranged from a debate to a structured toxicology problem set. Also, given that every in-class activity was different from the last, we found it was important to clearly present the learning objectives and process for each activity.

Instructional Team and Institutional Support for Re-design and Implementation

As Bronwell writes, "[c]hange is difficult in any setting, but changing academic teaching appears to be especially tricky" (Brownell & Tanner, 2012, p. 339). Shifting from a lecture-based model to a flipped classroom can be a daunting task for instructors. The re-design and implementation of a course using the flipped classroom model is time and resource-heavy. An instructional team, which in our case consisted of a TA, an evaluator, and an educational support consultant in addition to the instructor, is an effective means to support the course re-design process. Weekly debrief meetings were also an important component of our approach and we highly recommended that others engaging in substantial course re-design use a similar process. Access to technical support for the vodcasts production may be needed; the extent of technological support will depend on the skill set of other instructional team members.

Higher learning institutions also have a key role to play and should support and facilitate a shift toward innovative teaching and learning models and the application of emerging technologies in higher education. Universities should, for example, provide technical and pedagogical support to facilitate the re-design, implementation, and support the evaluation of courses experimenting with innovative approaches and tools (Vogel, 2012). Research has shown that the most common barriers for changing teaching models in the context of higher learning included a lack of training and incentives (Anderson et al., 2011; Brownell & Tanner, 2012; Henderson, Beach, & Finkelstein, 2011). Universities therefore can promote change by providing capacity-building opportunities as well as incentives for faculty members. Instructional team and institutional support is necessary to achieve the maximum positive impacts of the flipped classroom instructional model.

Recognizing the Time Investment

Recognizing that the initial design (or re-design) of a course using the flipped classroom instructional requires a substantial investment of time and energy on the part of the instructor is important. For example, McLaughlin et al. (2014) report that the faculty needed 127% more time to prepare a flipped classroom compared to a lecture-based course. This may be particularly true for those instructors who are most familiar and comfortable with the conventional lecture-based approach and have little experience with alternative teaching and learning approaches. Specifically, it is easy for instructors to overlook the time required to generate appropriate,

effective, and creative in-class learning activities. This provides further support and rationale for a team-approach, particularly when transitioning from a lecture-based to a flipped classroom model.

Continual Reflection and a 'Learning-by-doing' Approach

In our case, weekly debrief meetings and continual reflection and learning throughout the course delivery enabled a 'learning-by-doing' approach. We encourage other instructors to take a 'learning-by-doing' approach and acknowledge that ultimately, the re-design and implementation of a course using the flipped classroom model is an iterative process that is best supported by continual reflection with regards to those aspects that are working and those that are not. In our case, continual reflection was guided by Rolfe et al.'s (2001) framework for reflective practice (Rolfe et al., 2001). We found this to be a simple, practical, and effective framework.

Building Bridges Between In-class Activities and Online Learning

The importance of bridging the online and in-class components of a flipped class became clear as the semester progressed and also from students in the focus group data. To ensure continuity in the course and to encourage synthesis and higher-order learning, the instructor should be purposeful about making connections between the in-class and online aspects of a flipped classroom course. In our implementation of the flipped classroom, limited bridges were explicitly built between the in-class and online components of the course. It became clear throughout the semester that students needed more intentional guidance to make important connections between the content acquired online and the objectives of the in-class learning activities. One way to achieve this in practice could be to start the in-class session with an introduction or a 'microlecture' to make connections between online and in-class learning explicit (McLaughlin et al., 2014).

There are several limitations that should be noted when interpreting these results. First, we cannot exclude the possibility that students answered questions in the post-course survey or the focus group session in a socially desirable way. Additionally, while participation in the survey was high, this study only examined a single course over one semester in a milieu that included very few alternative instructional models. It is possible that both positive and negative perceptions of this instructional model were attributable to it simply being a different experience than other courses offered to the students. Evaluation of the flipped classroom in other academic settings is needed to corroborate the findings here. Finally, given that participation in the focus group was voluntary, minority views may not have been adequately captured.

The lecture-based teaching model continues to dominate teaching and learning in the context of higher education despite advances in online access and technology (Eapen, Vavalle, & Harrington, 2012; Pierce & Fox, 2012). Despite growing interest among instructors, institutions, and society at large (Topp, 2011; Tucker, 2012), research remains limited regarding the extent to which the flipped classroom model improves learning outcomes and experiences in the context of higher education and in public health education in particular. Based on survey and focus group data, and classroom observation, we report generally positive views and perceptions of the flipped classroom model among a group of graduate level public health students. Although we agree with others who suggest that the flipped classroom model has the potential to influence the

landscape of higher education (Bergmann & Sams, 2012; Houston & Lin, 2012; Szafir & Mutlu, 2013), we also note that more research is needed to fully determine the impacts of this model on teaching and learning experiences and to better understand the conditions and specific features of the flipped classroom that can lead to positive learning outcomes and experiences in different content areas. In an era of rapidly changing and advancing educational and online technology, we must continue to experiment with, and rigorously evaluate, innovative instructional models while sharing our experiences to collectively capitalize on lessons learned in our classrooms.

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