

## Student experiences across multiple flipped courses in a single curriculum

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**CONTEXT** The flipped classroom approach has garnered significant attention in health professions education, which has resulted in calls for curriculum-wide implementations of the model. However, research to support the development of evidence-based guidelines for large-scale flipped classroom implementations is lacking.

**OBJECTIVES** This study was designed to examine how students experience the flipped classroom model of learning in multiple courses within a single curriculum, as well as to identify specific elements of flipped learning that students perceive as beneficial or challenging.

**METHODS** A qualitative analysis of students' comments ( $n = 6010$ ) from mid-course and end-of-course evaluations of 10 flipped courses (in 2012–2014) was conducted. Common and recurring themes were identified through systematic iterative coding and sorting using the constant comparison method. Multiple coders, agreement through consensus and member checking were utilised to ensure the trustworthiness of findings.

**RESULTS** Several themes emerged from the analysis: (i) the perceived advantages of flipped learning coupled with concerns about implementation; (ii) the benefits of pre-class learning and factors that negatively affect these benefits, such as quality and quantity of learning materials, as well as overall increase in workload, especially in the context of multiple concurrent flipped courses; (iii) the role of the instructor in the flipped learning environment, particularly in engaging students in active learning and ensuring instructional alignment, and (iv) the need for assessments that emphasise the application of knowledge and critical thinking skills.

**CONCLUSIONS** Analysis of data from 10 flipped courses provided insight into common patterns of student learning experiences specific to the flipped learning model within a single curriculum. The study points to the challenges associated with scaling the implementation of the flipped classroom across multiple courses. Several core elements critical to the effective design and implementation of the flipped classroom model are identified.

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 INTRODUCTION

Over the past two decades, higher education has experienced a pedagogical shift from traditional lecture-based instruction to instructional models that emphasise student engagement in the classroom.<sup>1–4</sup> Ongoing reform in higher education combined with dynamic changes in health care and advances in biomedical research have led to calls for the transforming of all aspects of health professions education, including classroom instruction.<sup>5–7</sup> The flipped classroom model is one of the pedagogical innovations that has garnered significant attention in medical, nursing, dental and pharmacy education.<sup>8–11</sup> The flipped classroom approach is characterised by the moving of direct instruction outside the classroom so that class time can be used for interactive applied learning with the purpose of enabling faculty staff to engage students through a wide variety of active learning strategies.<sup>12</sup>

Numerous approaches to operationalising the flipped classroom are described in the literature.<sup>12–16</sup>

Although the flipped classroom is sometimes described in simple terms as representing school work at home and homework at school, Yarbrow and colleagues emphasised the importance of active learning engagement as the defining characteristic of flipped learning.<sup>16</sup> Interpretations of the flipped classroom vary in terms of the main pedagogical framework, as well as specific in-class and out-of-class learning activities, but are characterised by the active engagement of students in applied learning and often rely on the use of instructional technologies.<sup>14,17</sup>

This pedagogical approach is underpinned by a combination of self-regulated and socio-constructivist learning theories.<sup>18,19</sup> The former views students as active constructive participants in the learning process, whereas the latter emphasises the role of learning interactions, such as classroom discussions, in developing higher-order cognitive skills like reasoning and problem solving.<sup>18,19</sup> The flipped classroom model relies, in part, on a student's capacity for self-regulation of pre-class learning and on the instructor's ability to design in-class interactions that facilitate higher-order thinking. This model is seen as advantageous for numerous reasons, chief of which are that it gives students greater ownership of the learning process, helps them develop critical thinking and domain expertise, and equips them with 'skills to address 21st century problems'.<sup>17</sup>

Although there is a growing body of literature discussing the benefits of the flipped classroom, evidence-based research specifically aimed at supporting the development of guidelines is just beginning to emerge.<sup>14,20</sup> In the area of health professions education, research on the flipped classroom tends to be limited to a single course or course sequence, and focuses on describing course design and implementation, examining relevant learning outcomes, and exploring student perceptions.<sup>10,11,21–24</sup> These studies are typically framed as comparisons between traditional and flipped versions of the course. Growing research evidence highlighting the pedagogical advantages of the flipped classroom has led to calls for the broader implementation of this model across multiple courses and over entire curricula.<sup>8,9</sup> However, there is a striking paucity of research examining such large-scale implementations.<sup>25</sup> Given the limited understanding of the implications of the large-scale adoption of the flipped classroom, it is timely to examine how multiple concurrent flipped courses can impact student learning. This work fills an important gap in the literature concerning design considerations for health professions schools employing the flipped model across multiple courses in the curriculum.

The purpose of this study was to examine how students experience flipped classroom learning in multiple courses in a single curriculum. Specifically, we attempted to identify the elements of the model that were perceived by students as most helpful, as well as those considered to be most challenging in their learning process. Rather than comparing different versions of the same course, we focused on patterns of learning experiences that are common across multiple courses. The ultimate goal of the study was to contribute to the development of course and curriculum design guidelines by synthesising evidence across different courses.

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 METHODS

**Study design and setting**

The University of North Carolina (UNC) Eshelman School of Pharmacy is in the process of fundamentally transforming its doctor of pharmacy (PharmD) curriculum to be launched in the autumn of 2015. One of the core tenets of the new curriculum is the strategic re-engineering of instruction to maximise student learning and engagement using innovative pedagogical approaches, such as the flipped

classroom.<sup>26</sup> The flipped model's dual emphasis on self-directed (out-of-class) and interactive (in-class) learning is recognised by school faculty staff as being aligned with desired programme outcomes. Over recent academic years, many school faculty members have been actively redesigning their courses to adopt the flipped classroom format. Thus, current students in the programme have been exposed to variations of the flipped classroom model over their course of study and to several concurrent flipped courses in the 2013/2014 academic year. We saw this context as representing a unique opportunity to examine the patterns of student experiences across multiple flipped courses.

For the purpose of this study, we defined a flipped course according to two criteria: (i) it must require pre-class learning, and (ii) class sessions must be focused on application and problem solving through active learning. To identify courses that met these criteria, a panel of faculty members reviewed a list of all unique course–course director pairings for required courses in the PharmD degree programme for 2012–2014 ( $n = 35$ ). In cases in which consensus for inclusion was not reached by the panel ( $n = 3$ ), the course director was consulted, after which two investigators (JK and JEM) conducted an independent review of the syllabus and randomly selected class recordings.<sup>27,28</sup> Ultimately, 10 courses were identified as meeting the criteria for inclusion.

### Data collection and analysis

The study used inductive qualitative analysis of existing data, adopting an unfolding approach to the study design with two distinct phases.<sup>29,30</sup> The first phase was focused on the systematic identification of courses that had implemented the flipped classroom model, as described above. The second phase concentrated on the systematic analysis of student feedback data from courses identified in the first phase. Free-text entries from student feedback routinely solicited during mid-course and end-of-course (EoC) evaluations represented the primary source of data for this study and were provided to the research team in a de-identified and aggregate form. The analysis included all responses to questions about the course and excluded questions asking for evaluations of individual instructors. The study was reviewed by the UNC Institutional Review Board and was classified as exempt from requirements for ethical approval.

The process of elucidating experiences associated with a specific phenomenon lends itself to examination

through qualitative research methods situated within a constructivist, naturalistic research paradigm.<sup>29,31,32</sup> We took a grounded theory-based approach to analysis by constructing codes and categories from data using the constant comparison method for identifying categories and themes through multiple iterations of coding.<sup>29,33,34</sup> Consistent with the tradition of inductive qualitative content analysis, the labels for the categories were derived from the data in the process of analysis.<sup>35,36</sup> Given the large size of the dataset, coding was undertaken in several steps in which category refinement and aggregation were involved at each level.

As is common in inductive content analysis,<sup>37</sup> one investigator (JK) conducted a primary analysis of all 6010 comments in multiple passes. This process involved open descriptive coding of the data for each question on the evaluations, followed by the grouping of those codes into categories at the course level using constant comparison methods.<sup>29,38</sup> As themes began to emerge from those categories at the course level, the analysis was expanded across courses to identify and refine those themes that were salient across multiple flipped courses. Individual statements at the lowest level of data analysis often contained very specific comments about a particular assignment, class session experience, or test question. In our analysis we sought to move beyond this level of detail, focusing on categories of comments, relationships between them, and the themes that repeatedly occurred across courses.<sup>35</sup>

To ensure the dependability of findings, improve trustworthiness and to guard against investigator bias, three subsets of data collectively representing all 10 courses were independently analysed by three other investigators using the same iterative coding process (JEM, JER, MR: about 180 comments each). We then worked in pairs to compare open codes, categories, and emerging themes and sub-themes for each subset of the data. Consensus on overall themes and sub-themes was achieved through a series of discussions among all members of the research team, with the support of coding memos and notes made by each investigator in the process of analysis, a common approach in qualitative studies.<sup>31,35</sup> This process enabled us to move from manifest content (explicit statements) to latent content (underlying meaning) and to define, label and describe the themes for each course.<sup>35</sup>

The themes common across all 10 courses were identified and are presented below. Preliminary reports were presented to a group of faculty staff

and students for member-checking, which helped to further refine theme labels and verify face validity.<sup>37,39</sup> These themes are distinct, but not necessarily mutually exclusive as they represent interpretations and related concepts, a phenomenon that is not uncommon in qualitative research.<sup>35</sup>

## RESULTS

The 10 courses included in this study represented six from the first year in the curriculum and four from the second year (Table 1). Of note, half of these courses used video lectures as the primary format for pre-class learning, and the other half utilised various text-based materials (e.g. textbooks, online modules, scholarly articles) for pre-class study. A total of 6010 student comments from EoC and mid-course evaluations were analysed. It is worth noting that there was marked redundancy in themes emerging from different evaluations for the same course. Therefore, we believe that the variations in the numbers of individual comments among the courses had minimal impact on the analysis and synthesis of findings.

The following presentation of results is organised according to four main themes identified by the research team: (i) overall course format; (ii) pre-class learning; (iii) in-class learning, and (iv) new pedagogy calls for changes in assessments.

### Overall course format

As described earlier, the flipped classroom approach used in the 10 courses analysed for this study differed from the instructional methods used in the remaining courses of the curriculum. It is thus not surprising that all of the courses in the sample generated multiple comments focusing on the overall course format, its advantages and associated challenges.

#### *Advantages of the flipped classroom model over the traditional lecture*

The main advantages noted included greater emphasis on understanding and application of material, a higher level of engagement during class time and continuous learning throughout the semester. Many students commented on how flipping 'really made understanding and application of the material the goal of the class' (course 4), and expressed a preference for the active learning format 'because it is more engaging and applicable'

Table 1 Characteristics of 10 courses included in the study

Course	Curriculum		In-class learning activities*
	year	Pre-class learning format	
1	Year 1 Science	Textbook, online summary notes	Small-group case-based learning, micro-lectures
2	Year 1 Science	Video lectures	Student-led discussion, micro-lectures, structured problem solving
3	Year 1 Science	Video lectures	ARS, micro-lectures, instructor-led case analysis, peer discussion
4	Year 1 Science	Video lectures, scholarly articles	ARS, micro-lectures, instructor-led case analysis, peer discussion
5	Year 1 Science	Video lectures, scholarly articles	ARS, micro-lectures, instructor-led case analysis, peer discussion
6	Year 1 Science	Video lectures	ARS, micro-lectures
7	Year 2 Science	Online interactive modules, e-textbook	Small-group case-based learning, micro-lectures
8 <sup>†</sup>	Year 2 Pharmacotherapy	Textbook-based homework	ARS, micro-lectures, instructor-led case analysis
9 <sup>†</sup>	Year 2 Pharmacotherapy	Online interactive modules	ARS, instructor-led case analysis, micro-lectures
10	Year 2 Pharmacotherapy	Textbook-based homework	ARS, small-group case-based learning, micro-lectures

\* Peer discussion typically in the Think–Pair–Share format.  
<sup>†</sup> Courses 8 and 9 were 8 weeks in length. All others were 16 weeks in length.  
 ARS = audience response system (commonly referred to as 'clickers').

(course 3) and 'emphasises doing over sitting and listening' (course 7). The following statements capture the perceived change in the learning process:

...this model has made me stay focused... keeps me up to speed and prevents me from falling behind...(Course 3)

It helped me think about subject matter WHILE [sic] I was learning, not cramming at the end. (Course 5)

### *Implementation issues*

Although students expressed recognition of the benefits of flipped learning, they also drew a distinction between their liking of the pedagogical concept and their appreciation of the reality of their learning experience, giving many comments phrased along the lines of 'I like the concept of the flipped class format, but I think the in-class 'active' portion could be more involved' (course 3), '...the idea is great, but [it] could have been implemented better' (course 9), as well as critiques of specific course elements and suggestions for how they 'should be adjusted to optimise the learning experience' (course 2). The general message indicated agreement that 'the flipped classroom model is a great idea, in theory' (course 4), but students had concerns about the ways it was implemented and executed. Interestingly, this thread was present even when the overall tone of comments about the course was positive, indicating the need for continuous refinement of course design.

### **Pre-class learning**

#### *Benefits*

Preparing for class by independently learning foundational knowledge is a core element of the flipped classroom model. Overall, students perceived this approach to learning as beneficial because it: (i) afforded 'more time to process new information' (course 8), and allowed students to 'pause and go back while learning the material initially' (course 5); (ii) 'helped [students] understand the concepts and actively participate in class' (course 4), and provided 'insight into what would be discussed during the next class' (course 6), and (iii) required one 'to stay on top of the material' (course 1) and 'prevents me from falling behind' (course 3).

#### *Increased workload*

Comments from multiple courses described the amount of time required for class preparation as 'unrealistic and very frustrating' (course 4) with '[pre-lectures] way too long most of the time'

(course 6) and overall 'too much time required outside of class' (course 9). Students observed that this 'becomes overwhelming' (course 5) in the context of the demands imposed by concurrent coursework, noting that 'if this was the only class I had, it would have been fine, but obviously, I have other courses to deal with' (course 9). This theme becomes more pronounced in comments about concurrent flipped courses: '...if only [this course] was flipped, I would be OK with it' (course 5). However, in the context of 'multiple classes with pre-class lectures' (course 5), students find they have to 'literally spend hours watching videos some days' (course 6), noting that 'there is no way this will be sustainable when all classes [...] are flipped' (course 5).

Students also commented on the optimal length of video- and text-based pre-class materials and the apparent disconnect between some instructor estimates and student experiences regarding pre-class preparation time. Student feedback on video lectures was consistent with reference to issues of length, with many comments such as '20–30-minute videos are reasonable, but 35–40-minute videos are not' (course 3) and 'videos in the 20-minute range are a lot more palatable' (course 4). For courses using text-based materials, comments on time were less specific, but were clear that class preparation 'should not take many, many hours to complete' (course 9). Additionally, across multiple courses, there were comments on the discrepancy between instructor estimates and the actual time required for thorough class preparation that might involve note-taking and several passes through difficult sections so that 'a 40-minute video could take about 2 hours to watch' (course 6). This 'unmanageable workload' (course 5) was cited by some as one reason for not completing pre-class learning.

#### *Quality of pre-class learning materials*

The quality of videos and online modules emerged as another important factor in student perceptions of the value of pre-class learning. Materials described as 'edited, concise, simple and engaging' (course 6) and 'containing VERY [sic] good information' (course 2) were noted as beneficial to learning. Conversely, students found it difficult to learn from materials that they described as 'monotonous and boring' (course 3) or 'full of errors and confusing wording' (course 9). Not surprisingly, critiques of production quality tended to overlap with comments on the length of the videos and online modules as student tolerance of poorly organised and presented information sharply decreased as



time commitments exceeded the desired 20–30 minutes. Overall, students articulated an expectation that pre-class learning materials should be ‘carefully crafted’ (course 5) and ‘made specifically for the flipped classroom’ (course 6).

### **In-class learning**

#### *Alignment with pre-class learning*

Alignment between pre-class and in-class learning activities emerged as a key factor in student perceptions of the flipped learning experience. Students expressed appreciation for instructional alignment:

The activities in this class required me to apply concepts that I had read about and gained an initial understanding of in ways that reinforced key points... (Course 7)

I love how the in-class lectures and clinical cases really reinforce the pre-class lectures. (Course 3)

Specifically, review questions and quizzes were noted as aiding understanding and providing incentives to prepare for class. Analysis of clinical cases was the most valued learning activity because it allowed for the application of knowledge and development of professional competency: comments on every course included multiple statements along the lines of ‘I really liked in-class cases’ (course 5), with elaborations such as ‘they really helped me understand material and apply it’ (course 10), ‘cases helped to solidify ideas’ (course 7), or ‘[cases] showed good logical approaches to issues’ (course 8).

However, three distinct patterns of misalignment were noted across multiple courses.

The first concerned excessive redundancy in the material presented for pre-class and in-class learning:

...[the pre-lecture was] pretty redundant to what was presented in class... zoning out in class because the material had already been presented to us... (Course 3)

Assigned lecture recordings covered the exact same material that we were then lectured on in class. (Course 6)

The second cited the ‘double lecture’ (courses 3, 5, 6) and referred to the introduction of completely new material during class, primarily in lecture format:

We had new information introduced in the pre-class lecture, and then more new information introduced during the in-class lecture – essentially just a double lecture... (Course 3)

It felt like we were having twice the amount of lecture. (Course 5)

The third concerned a lack of learning activities to bridge the gap between the acquisition of foundational knowledge before class and active learning during class:

The information goes from basic > simple quiz > full PharmD’s knowledge and expecting me to solve cases and know everything about them. There needs to be a better stepping-stone... (Course 1)

I would’ve liked for the beginning of class to be a review of the module’s key points before jumping into cases. (Course 9)

Although they were critical of redundant or excessive lecturing, students clearly saw the need to have some element of lecture to help bridge pre-class and in-class learning, to ‘reiterate/reteach/go through in detail (SLOWLY!) the most important or the most challenging concepts’ (course 7) and provide ‘at least recaps of pearls needed for cases before diving into cases’ (course 9). Comments similar to ‘I would have appreciated a bit more lecture in class about the topic before moving into cases’ (course 10) were very common.

#### *Role of the instructor*

Providing a stepping stone from pre-class to in-class learning emerged as one of the key roles of instructors in the flipped classroom. Students generally viewed instructors as ‘experts in the field’ (e.g. courses 1, 4, 8) who should help them make better sense of the material and guide in-class learning by ‘elaborating on material to clear up any possible questions’ (course 2) and providing ‘rigorous checks that the students understand the material’ (course 1). However, our analysis also revealed a tension between the need for some lecturing to recap key points and ‘clarify questions that students may have while being exposed to material for the first time’ (course 2) and frustration with the ‘mini-lecture that is not so mini’ (course 3). Overall, students expressed a desire for increased interaction with instructors in active and engaging discussion and ample opportunities to ask questions, struc-

tured so that the quantity of time reflects ‘students talking = professors talking’ (course 6).

All the courses included in the study used multiple instructors, which added complexities associated with pedagogical consistency. Student comments highlighted the need for instructors in team-taught flipped courses to align their approaches with one another and to function effectively as team members. Although the use of multiple instructors was generally seen by students as facilitating a ‘welcome change of pace’ (course 3) and an opportunity to ‘hear different people’s views’ (course 5), there was also notable frustration with ‘too many teachers with varying expectations’ (course 9), sometimes ‘with no smooth transitions’ (course 8), to which students expressed difficulty adjusting. The message implied in the comment ‘if you are going to teach in a flipped format, there needs to be more consistency across the professors’ (course 1) was present across multiple course evaluations, followed by suggestions that the course director should ‘work with the guest instructors’ (course 4) and assist ‘other professors with figuring out how to be effective in this type of learning environment’ (course 5).

### **New pedagogy calls for changes in assessments**

Survey responses often focused on assessments regardless of the question or prompt. Some students noted that the flipped classroom format with its ‘multiple resources to study from’ (course 6) facilitated learning and ‘made it so I felt very prepared when exams came around’ (course 4). However, others felt overwhelmed by ‘soooo [sic] much information covered’ (course 5) through different learning materials and activities, noting that it was not clear ‘what’s important to know’ (course 9). In particular, students tended to perceive test questions as unfair if they were based on material covered in out-of-class learning that was not given special attention in class.

Furthermore, comments across multiple courses pointed to a perceived incongruence between the in-class emphasis on the application of knowledge and problem solving, and assessments conducted using multiple-choice question examinations. Students ‘wanted to be able to show thinking’ (course 10) and resented having to ‘pick the right answer’ to questions that ‘test how many small details you could memorise instead of concepts, which does not seem to fit with the goal of the class’ (course 4). Along the same lines, open-ended or essay questions were perceived as aligned

with the course learning objectives because they provided an ‘opportunity to show [one’s] understanding’ and ‘to do critical thinking and apply everything we learned’ (course 5), as well as the chance to provide nuanced answers instead of the ‘all-or-nothingness of [a] multiple choice exam’ (course 7). Some observed that graded projects, research papers and presentations offered ‘better assessment of understanding of the material’ (course 6) compared with multiple-choice tests. The overall theme was that assessments in a flipped classroom should be better aligned with active learning pedagogy, varied in form, and designed to assess not only the student’s knowledge and understanding, but also the student’s ability to apply course concepts and solve problems.

### **Overlapping themes**

It is worth noting that although these themes emerged during the qualitative analysis as distinct from one another, they were not always mutually exclusive. Perceptions of the overall course format, for example, can depend on the format and content of pre-class and in-class learning. Similarly, perceptions of in-class learning activities may be influenced by associated pre-class learning. The theme of assessments can connect to all learning activities, depending on the course design. Instructor role, although most prominent among comments about the in-class portion of the course, spans the entire learning process and course design. As such, these themes should be considered both individually and as a whole.

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## **DISCUSSION**

Our study is one of the first to broadly examine a large-scale implementation of the flipped classroom model in a single curriculum. The findings of this study align with previous research demonstrating that students generally find the flipped classroom format preferable to that of the traditional lecture.<sup>10,15,21,40,41</sup> However, our analysis also demonstrates that this preference is conditional upon the effective implementation of this model and alignment within the core instructional elements. Challenges associated with ineffective course delivery can potentially erode the goals and perceived benefits of the flipped learning model. Moreover, when multiple courses are flipped, the impact of each individual course design or pedagogical strategy on the overall student learning experience is amplified. In

other words, minor problems become major obstacles to learning as the model is scaled across the curriculum. In our review of the literature, we found only one recent study of a large-scale curriculum transformation using elements of classroom flipping, which, similarly to our findings, also identified a number of challenges for both instructors and students.<sup>25</sup>

The issues of increased workload for students associated with self-directed pre-class learning and specifically the length of video lectures have been noted in a number of studies.<sup>15,21,25,42</sup> Our study suggests that the cumulative workload of multiple concurrent flipped courses quickly becomes overwhelming and stressful. Additionally, an unmanageable volume of pre-class learning may lead to students coming to class unprepared, which prevents them from properly engaging in classroom learning and ultimately undermines the pedagogical model. Curriculum-wide adoption of the flipped classroom should be accompanied by a thorough analysis of the total time and effort required of students in and out of the classroom for all concurrent courses. Like Remington *et al.*,<sup>25</sup> we found that instructors tend to underestimate student workload and therefore the use of actual time and workload data is recommended.

The importance of instructional alignment among all learning activities to the achievement of better outcomes is well established.<sup>43</sup> Previous reports noted that it may be particularly challenging for students to connect pre-learning and in-class learning in a flipped classroom.<sup>44</sup> Our study corroborated this challenge, documenting several patterns of instructional misalignment. Additionally, our analysis demonstrated that students were sensitive to discrepancies between classroom learning aimed at higher levels of Bloom's taxonomy and assessments designed for lower levels.<sup>45</sup> Taken together, these findings offer compelling evidence of the need for thoughtful design and sequencing of learning activities, as well as the re-design of assessments to more effectively achieve instructional alignment in a flipped classroom. This echoes observations of a recent review of flipped classroom literature regarding the importance of *how* pre-class and in-class activities are integrated into the overall approach.<sup>17</sup>

The provision of opportunities for instructor–student interaction is one of the strengths of the flipped approach.<sup>44</sup> Our study provided strong evidence that students desire an increase in such

interaction and feel strongly that an instructor reliance on the lecture during class is incompatible with the flipped model. The study provides explicit and implicit arguments for the need for additional faculty development as part of the broader implementation of flipped learning. When implementing this model, faculty staff may need help with understanding the learning theories and pedagogical principles that underpin the flipped approach, as well as practical guidelines for the development of instructional materials, the identifying of appropriate active learning exercises, the more accurate estimation of pre-class preparation time, and the transformation of the classroom from a content-focused to a learner-centred environment.<sup>17,20</sup>

Redesigning learning environments is a complex undertaking that often requires multiple iterations of implementation and refinement to achieve the outcomes desired.<sup>46</sup> As others undergo curricular change or experience multiple course redesigns, systematic and rigorous assessment should be used to identify opportunities for improving course design. The data and results described here have advanced our own school's quality improvement process, enabling us to identify key steps to improving flipped courses, activities, technologies and strategies. This work has informed practices at the course and curriculum levels and includes reducing pre-class workloads, improving the quality of learning materials, and implementing a faculty development workshop series focused on pedagogy and course design.

The flipped learning model is flexible and can incorporate a wide variety of learning activities and teaching strategies, as evidenced by a growing body of practical guidelines and examples.<sup>12,16,20</sup> However, in the context of multiple courses and multiple instructors, this variability can have negative effects on student learning, especially for students who struggle to develop effective learning habits while adjusting to constant change. Our findings support other research observations that students value predictable structure in learning activities and that some level of consistency within and across courses is necessary.<sup>25,44</sup> Further, this study demonstrates the need for institutions to consider and examine multiple course redesigns at the curricular level. Ensuring that students have sufficient time to prepare for class, for example, is critical for promoting self-regulated learning and for optimising student engagement during class. Although course-level studies provide valuable insight into



teaching and learning, these studies render student experiences across the curriculum incompletely understood. Our findings have raised awareness at our own school about the importance of curriculum coherence and of fully understanding how changes across multiple courses impact students.

### Limitations

Although this study provides one of the first examinations of student experiences across multiple courses, it was limited to a single institution. This affects the transferability of the findings to other educational settings. Nevertheless, we believe that the context of the study is sufficiently similar to other health profession education contexts to make the findings relevant and applicable in other settings. Another limitation of the study is that it examined flipped classroom implementations and associated learning experiences without addressing learning outcomes. Finally, the study is limited in its focus on the student perspective and does not consider the perspectives of instructors and other stakeholders in the educational process. Researchers have noted the value of student comments on course evaluations for understanding student experiences.<sup>47</sup> Moreover, we believe that student perceptions of the learning experience are important factors in their motivation and engagement in learning, and that better understanding of those experiences can inform and improve teaching practice.

### CONCLUSIONS

The present analysis of data from 10 flipped courses provides insight into common patterns of student learning experiences specific to the flipped learning model across a single curriculum. Importantly, this study points to the challenges of scaling the implementation of the flipped classroom across multiple courses. We have identified several core elements critical to the effective design and implementation of the flipped classroom model: careful selection and design of foundational content material and in-class active learning strategies; thoughtful alignment of pre-class and in-class learning activities; purposeful redesign of assessments to align with learning objectives and course learning outcomes, and a systemic approach to curriculum with attention to overall workload and the consistency of student learning experiences.

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*Contributors:* JK took the lead on this research; she made substantial contributions to the concept and design of the work, coordinated and participated in all data collection and analyses, facilitated and participated in all data interpretation, and drafted the manuscript. MTR and JER contributed to the conception of this work and the analysis of data and drafted a portion of the manuscript. JEM oversaw the design and implementation of this work and contributed to data collection, analysis and interpretation, and to the drafting of the paper. All authors contributed to the critical revision of the paper and approved the final manuscript for publication. All authors have agreed to be accountable for all aspects of the work.

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### REFERENCES

- 1 Barr RB, Tagg J. From teaching to learning – a new paradigm for undergraduate education. *Change* 1995;**27**:13–25.
- 2 Handelsman J, Ebert-May D, Beichner R *et al*. Scientific teaching. *Science* 2004;**304**:521–2.
- 3 Schneider CG, Shoenberg R. Habits hard to break: how persistent features of campus life frustrate curricular reform. *Change* 1999;**31**:30–5.
- 4 Freeman S, Eddy SL, McDonough M, Smith MK, Okoroafor N, Jordt H, Wenderoth MP. Active learning increases student performance in science, engineering, and mathematics. *Proc Natl Acad Sci U S A* 2014;**111**:8410–5.
- 5 Cooke M, Irby DM, O'Brien BC. *Educating Physicians: A Call for Reform of Medical School and Residency*. San Francisco, CA: Jossey-Bass 2010.
- 6 Frenk J, Chen L, Bhutta A *et al*. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. *Lancet* 2010;**376**:1923–58.
- 7 Osborne ML, Fields SA. Training physicians for the future US health care system. *Future Hosp J* 2014;**1**:56–61.
- 8 Prober CG, Khan S. Medical education reimaged: a call to action. *Acad Med* 2013;**88**:1407–10.

- 9 Hawks SJ. The flipped classroom: now or never? *AANA J* 2014;**82**:264–9.
- 10 McLaughlin JE, Roth MT, Glatt DM, Gharkholonarehe N, Davidson CA, Griffin LM, Esserman DA, Mumper RJ. The flipped classroom: a course design to foster learning and engagement in health professions education. *Acad Med* 2014;**89**:1–8.
- 11 Park SE, Howell TH. Implementation of a flipped classroom educational model in a predoctoral dental course. *J Dent Educ* 2015;**79**:563–70.
- 12 Hamdan N, McKnight P, McKnight K, Arfstrom K. A review of flipped learning. 2013. <http://www.flippedlearning.org/review>. [Accessed 13 January 2015.]
- 13 Bishop JL, Verleger MA. The flipped classroom: a survey of the research. Proceedings of the ASEE Annual Conference, 23–26 June 2013, Atlanta, GA.
- 14 Kim MK, Kim SM, Khera O, Getman J. The experience of three flipped classrooms in an urban university: an exploration of design principles. *Internet High Educ* 2014;**22**:37–50.
- 15 Lage MJ, Platt GJ, Treglia M. Inverting the classroom: a gateway to creating an inclusive learning environment. *J Econ Educ* 2000;**31**:30–43.
- 16 Yarbrow J, Arfstrom KM, McKnight K, McKnight P. Extension of a review of flipped learning. 2014. <http://www.flippedlearning.org/Page/62>. [Accessed 13 January 2015.]
- 17 O’Flaherty J, Phillips C. The use of flipped classrooms in higher education: a scoping review. *Internet High Educ* 2015;**25**:85–95.
- 18 Wolters CA. Self-regulated learning and the 21st century competencies. 2010. [http://www.hewlett.org/uploads/Self\\_Regulated\\_Learning\\_21st\\_Century\\_Compencies.pdf](http://www.hewlett.org/uploads/Self_Regulated_Learning_21st_Century_Compencies.pdf). [Accessed 11 May 2015.]
- 19 Palinscar AS. Social constructivist perspectives on teaching and learning. *Annu Rev Psychol* 1998;**49**:345–75.
- 20 Moffett J. Twelve tips for ‘flipping’ the classroom. *Med Teach* 2015;**37**:331–6.
- 21 Tune JD, Sturek M, Basile DP. Flipped classroom model improves graduate student performance in cardiovascular, respiratory, and renal physiology. *Adv Physiol Educ* 2013;**37**:316–20.
- 22 Galway LP, Corbett KK, Takaro TK, Tairyan K, Frank E. A novel integration of online and flipped classroom instructional models in public health higher education. *BMC Med Educ* 2014;**14**:181.
- 23 Critz CM, Knight D. Using the flipped classroom in graduate nursing education. *Nurs Educ* 2013;**38**:210–3.
- 24 Sharma N, Lau CS, Doherty I, Harbutt D. How we flipped the medical classroom. *Med Teach* 2015;**37**:327–30.
- 25 Remington TL, Hershock C, Klein KC, Niemer RK, Bleske BE. Lessons from the trenches: implementing team-based learning across several courses. *Curr Pharm Teach Learn* 2015;**7**:121–30.
- 26 Roth MT, Mumper RJ, Singleton SF, Lee CR, Rodgers PT, Cox WC, McLaughlin JE, Joyner P, Blouin RA. A renaissance in pharmacy education at the University of North Carolina at Chapel Hill. *N C Med J* 2014;**75**:48–52.
- 27 Shelton AK. Strategies for ensuring trustworthiness in qualitative research projects. *Educ Inform* 2004;**22**:63–78.
- 28 Wildemuth BM. Existing documents and artifacts as data. In: Wildemuth BM, ed. *Applications of Social Research Methods to Questions in Information and Library Science*. Westport, CT: Libraries Unlimited 2009;158–165.
- 29 Lincoln IS, Guba EG. *Naturalistic Inquiry*. Beverly Hills, CA: Sage Publications 1985.
- 30 Guba EG. Criteria for assessing the trustworthiness of naturalistic inquiries. *ECTJ* 1981;**29**:75–91.
- 31 O’Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative research: a synthesis of recommendations. *Acad Med* 2014;**89**:1245–51.
- 32 Pope C, Mays N. Reaching the parts other methods cannot reach: an introduction to qualitative methods in health and health services research. *BMJ* 1995;**311**:42–5.
- 33 Harris I. What does ‘the discovery of grounded theory’ have to say to medical education? *Adv Health Sci Educ Theory Pract* 2003;**8**:49–61.
- 34 Charmaz K. *Constructing Grounded Theory*. Thousand Oaks, CA: Sage Publications 2014.
- 35 Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurs Educ Today* 2004;**24**:105–12.
- 36 Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. *Qual Health Res* 2005;**15**:1277–88.
- 37 Elo S, Kääriäinen M, Kanste O, Pölkki T, Utriainen K, Kyngäs H. Qualitative content analysis: a focus on trustworthiness. *SAGE Open* 2014;**4**:1–10.
- 38 Holton JA. The coding process and its challenges. In: Bryant A, Charmaz K, eds. *The Sage Handbook of Grounded Theory*. Thousand Oaks, CA: Sage Publications 2007;265–289.
- 39 Cavanagh S. Content analysis: concepts, methods and applications. *Nurse Res* 1997;**4**:5–13.
- 40 Butt A. Student views on the use of a flipped classroom approach: evidence from Australia. *BEA* 2014;**6**:33–44.
- 41 Graham K, Burke K. Students’ perceptions on a blended and flipped classroom. *Int J Proc Educ* 2014;**6**:21–6.
- 42 Moraros J, Islam A, Yu S, Banow R, Schindelka B. Flipping for success: evaluating the effectiveness of a novel teaching approach in a graduate level setting. *BMC Med Educ* 2015;**15**:27.
- 43 Cohen SA. Instructional alignment: searching for a magic bullet. *Educ Res* 1987;**16**:16–20.
- 44 Strayer JF. How learning in an inverted classroom influences cooperation, innovation and task orientation. *Learn Environ Res* 2012;**15**:171–93.
- 45 Anderson LW, Krathwohl DR. *A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom’s*

*Taxonomy of Educational Objectives*. New York, NY: Longman 2001.

- 46 Sawyer RK, ed. *The Cambridge Handbook of the Learning Sciences*. Cambridge: Cambridge University Press 2005.
- 47 Stark PB, Freishtat R. An evaluation of course evaluations. 2014. <https://www.stat.berkeley.edu/>

~stark/Preprints/eval14.pdf. [Accessed 13 January 2015.]

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