Flipping around the classroom: Accelerated Bachelor of Science in Nursing students’ satisfaction and achievement

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ABSTRACT

Background: The flipped classroom approach is based on shared responsibility for learning by students and teachers, and empowers students to take an active role in the learning process. While utilization of this approach has resulted in higher exam scores compared to traditional approaches in prior studies, the flipped classroom has not included learners in Accelerated Bachelor of Science in Nursing (ABSN) programs.

Objective: To examine differences on exam scores and satisfaction of teaching between a 3-week flipped and traditional classroom approach.

Design: Mixed methods, crossover repeated measures design.

Settings: Private school of nursing located in the eastern United States.

Participants: 76 ABSN students.

Methods: Two separate sections of a Pharmacology course received either 3-weeks of flipped or traditional classroom during Period 1, then switched approaches during Period 2. Two exam scores measuring knowledge and a questionnaire assessing satisfaction of teaching were collected. Focus groups were conducted to learn about students’ experience in the flipped classroom. Descriptive statistics, Wilcoxon rank sum test, and stepwise linear mixed model were used to analyze quantitative data. Focus group data were transcribed, coded, and categorized in themes.

Results: Students in the flipped classroom achieved significantly higher scores on the first Pharmacology exam than students in the traditional classroom, but there was no significant difference on the second exam. Three themes emerged from focus groups on student perception of integrating the flipped approach: don’t fix what isn’t broken; treat me as an adult; and remember the work is overwhelming.

Conclusions: Both traditional and flipped classroom approaches successfully prepared students for the Pharmacology exams. While results support the use of the flipped approach, judicious use of this instructional pedagogy with dense or difficult content, particularly in accelerated programs, is recommended. Instructors should also provide students with enough information and rationale for using the flipped classroom approach.

1. Introduction

Alton (Alton, 2016) recognized that nursing students experience challenges when applying pharmacology concepts to clinical practice. According to Honey and Lim (2008), nursing students experience a decline in pharmacology knowledge, and the need for more understanding of medication management remains an area of concern. Manias and Bullock (2002) also proposed that nursing students are not well prepared to apply and manage medications outside of the classroom setting. Additionally, current pharmacological and parenteral therapies entail 12–18% of United States National Council Licensure Exam (NCLEX) test questions assigned to each client needs category and linked to nursing practice analysis (National Council of State Board of Nursing). This substantial pharmacology content on the NCLEX has driven the need for improving learning within nursing programs.

The Institute of Medicine (IOM) (2001) addressed the need for the creation of new health profession education models to prepare the future healthcare workforce, and the two-year Carnegie study of nursing education recommended transforming nursing education by shifting from passive teaching strategies to active strategies that provide opportunities for students to immerse in content and use clinical reasoning skills (Hawks, 2014). Historically, the lecture-based classroom was the traditional method of content delivery in higher education, yet, this passive modality has been challenged by recent studies reporting
the need for more dynamic methods to engage students and improve learning (Missildine et al., 2013a). One frequently used approach is the flipped classroom, which empowers students to take an active role in the learning process (Tune et al., 2013; McLaughlin et al., 2014). The flipped classroom has been shown to increase students' attention, engagement, and interaction time with their teacher and peers, and provides opportunities for receiving real-time feedback (McLaughlin et al., 2013; McGowan et al., 2014).

Innovative strategies to deliver pharmacology content could enhance nursing students' understanding of how medications are applied to specific case scenarios and better prepare students to transition from the classroom to the clinical arena as students and later as practitioners. In academia, for students to learn and remain engaged, the use of active-oriented learning strategies could assist with difficult content (Brame, 2016). The flipped classroom approach is one such strategy that may address retention of pharmacology concepts by changing the classroom format from a lectured-focused delivery to a student-centered delivery where students are responsible in active learning of course information (Mehta et al., 2013). Shared responsibility by the student and instructor, mutual accountability, and reflection of how information is delivered and learned can be used to increase student understanding of content and satisfaction of their learning experience (Ruh, 2003; Chickering and Gamson, 1989).

2. Background

In the flipped classroom, students are exposed to content prior to classroom attendance through media, such as text or other written materials and audio and/or video recorded materials (Sierra, 2010). Pedagogically, adopting a teaching method based on a shared responsibility for learning by students and teachers should facilitate academic excellence and better prepare students for their future career as they transition to clinical practice (Sierra, 2010). The benefits of pre-work allows students to engage with the material as needed based on their pace of learning. In class, students participate in interactive activities, such as small group discussions and case scenarios, to apply the concepts learned. In this way, the instructor spends classroom time on higher level application of knowledge and problem solving - an essential component for decisions in clinical practice (Young et al., 2014). Flipped classroom strategies are built on the well-established principles of active learning, including students learning from and supporting one another in collaborative assignments and projects (Hamdan et al., 2013), and receiving immediate feedback from peers as well as teachers (Hacker and Tenent, 2002; McCollough and Gremler, 1999). It was posited that Pharmacology is one course that would benefit from interaction and the use of higher-order thinking to build the skills to recognize medication side effects and tailor medications to their patients' needs.

The flipped classroom model is not a new approach to the delivery of course material; however, there is scant evidence about its use in nursing compared to other health disciplines (Sharma et al., 2015a), or for what specific content the approach best facilitates learning. Only two studies found demonstrated that nursing students had better achievement on exams in pharmacy courses using the flipped classroom approach compared to students in a traditional classroom (Munson and Pierce, 2015; Sisk, 2011). A systematic review, including five studies and 934 participants, evaluated the approach and reported that some students were satisfied with the flipped classroom; however, it was not known if it improved academic performance (Bethivhas et al., 2016). Other studies demonstrated that students lacked enthusiasm for the approach despite higher final exam scores (Simpson and Richards, 2015) and that increased student tension was potentially related to increased workload outside of the classroom (Critz and Knight, 2013).

Although extant literature supports the effectiveness of the flipped classroom (McGowan et al., 2014; Missildine et al., 2013a; Munson and Pierce, 2015) and similar instructional interventions such as team-based learning (Sisk, 2011), there is limited evidence supporting the use with ABSN students. Accelerated baccalaureate programs are for adults who previously completed a bachelor's or graduate degree in a non-nursing discipline. These fast-track programs typically take between 11 and 18 months to complete, and prepare students for licensure as a registered nurse (RN). In past studies, students enrolled in these programs had significantly higher GPAs, academic performance, and standardized test scores than students in traditional BSN programs (Payne and Mullen, 2014), and, thus, may respond differently to flipped classroom methods. Therefore, the purpose of this study was to evaluate the flipped classroom approach in a Pharmacology course of an ABSN program. More specifically, the study sought to answer the following questions:

1. Are there differences on student exam scores between the flipped and traditional sections?
2. Is there a relationship among demographic variables and exam scores for each section and classroom approach (flipped or traditional)?
3. Is there a relationship between satisfaction and classroom approach (flipped or traditional)?
4. What are student perceptions of learning in a flipped classroom?

3. Methods

3.1. Setting

The study was conducted at a private school of nursing located in the eastern United States. Data were collected February through April 2016 from a convenience sample of ABSN students (N = 76) as they completed their first semester Pharmacology course.

3.2. Design

Evidence suggests gradual integration of the flipped approach (1–3 weekly class sessions in the semester rather than weekly throughout the whole course) (Beuten et al., 2013; Sharma et al., 2015b) is the best strategy for facilitating a smooth transition for both instructors and student. It allows for the opportunity to learn from the experience by either building on successes or planning to overcome problems during future classes. Prior to integrating the flipped classroom in the course, the instructor was trained, supervised, and mentored by experts in this pedagogical approach. To increase control, one instructor taught both sections so that the procedures used for the flipped classroom were similar and consistent. This study implemented a crossover repeated measure design and its strength was to allow the participants to serve as their own control, which will decrease the influence of confounding covariates and require fewer subjects than other repeated measures designs. In this crossover repeated measures design, 76 ABSN students enrolled in two separate sections of the Pharmacology course received three weeks of flipped classroom during the semester. Students in both sections started the first 6 weeks of the semester with traditional classroom instruction that was predominantly lecture-based using PowerPoint presentations, and by the end of this period students completed an exam (called the baseline exam). After six weeks of traditional classroom, students in Section 1 (n = 36) were taught using the flipped classroom approach for three weeks (period 1) while Section 2 (n = 40) continued with the traditional instruction and by the end of this 3 week period, students completed exam 1. Then, during the next 3 weeks (period 2), the instruction in Section 1 returned to the traditional classroom while flipped classroom was used in Section 2, and by the end of this 3 week period students completed exam 2. Additionally, focus groups were conducted with students after completion of their flipped classroom experience to explore their perceptions of the approach and how it did or did not facilitate their learning.
3.3. Procedures

Institutional Review Board (IRB) approval for this exempt study was obtained prior to the implementation. Students were informed that completion of the satisfaction questionnaire indicated agreement to participate. Names of students who participated in the focus groups were not released to the course instructor. Demographic and evaluation data were collected using researcher developed tools. Scores on course exams, part of course requirements, were used as measures of achievement. Demographic and satisfaction measures were collected at the conclusion of the third week of each period of the study. Finally, a sample of students from each section (n = 7 and 10, respectively), participated in focus groups about their perceptions of the flipped approach.

3.4. Measures

Achievement was measured using scores from 2 course exams completed during the study to assess knowledge retention, problem solving, and application of pharmacology content. Additionally, scores from an exam completed prior to the start of the study was used as a baseline measure to compare the groups. All the exams in this study were developed by the course instructor, were validated by another faculty, and each exam covered new content on several human body systems. The baseline exam covered fundamentals of pharmacology, dermatology, bone/joint and endocrine systems. The first exam included respiratory, cardiology and gastrointestinal systems, while the second exam included antibiotics, infection, neoplastic and neurological system. The possible range of scores on each exam was 0 to 100.

Students’ satisfaction with traditional and flipped classroom formats was measured at the end of each period of the study using 10 questions adopted from the standard university course evaluation. Students rated their satisfaction on a 5-point Likert-scale from 1 (never) to 5 (always).

Finally, student perceptions about the flipped classroom were collected during two separate focus groups. Students were asked to voluntarily participate after their experience in the flipped classroom period. An interview guide was used to facilitate discussion on their general perceptions of the approach in the context of the Pharmacology course, and in what ways the approach facilitated or hindered their learning. A faculty member skilled in focus group techniques, and who was not involved in the course or ABSN program, conducted this aspect of the study.

Demographic data were collected at the end of the first period of the study. Demographic variables included gender, age, ethnicity, and educational background (prior degree and GPA, and number of years since degree completion).

3.5. Data Analysis

Data were analyzed using the Statistical Analysis System (SAS version 9.4, SAS Institute Inc., North Carolina, USA) and Statistical Software Package R (R, The R Foundation for Statistical Computing). Descriptive statistics (means, standard deviation, percentages, and ranges) were used for demographic and educational background variables and Wilcoxon rank sum test was used to examine the differences on exam scores and satisfaction between teaching approaches and sections. Multivariate analysis using crossover repeated measure design (stepwise linear mixed model) was used to examine the relationship between demographic variables and exam scores for each section, and between exam and individual satisfaction scores.

To assess student perceptions of learning in the flipped classroom, audio recorded from the focus groups were first transcribed by an experienced transcriptionist and one of the investigators verified the transcription by comparing the text with the audio recording. All personal identifiers were removed to protect student confidentiality. Initially, the three investigators independently read and analyzed the transcripts, wrote summaries and coded the data. Investigators then compared summaries and code assignments until consensus was reached on themes and meanings (Sandelowski, 2000).

4. Results

4.1. Demographics

Of the 76 ABSN students, only 61 (80%) completed the demographic data questionnaire. Any analyses that used demographic data included only the subsample of 61. The majority of the sample were female (88.5%), white (59.3%), single (67.8%), did not have children (90%), spoke English as their first language (87.9%), and had a previous GPA of 3.69 or less (81.8%). The students were relatively young (M = 27.17), ranging from 22 to 46 years, and there was no significant difference in age between the two sections. More than half of the students (53.7%) completed a science degree before their enrollment in the ABSN program, 22.2% with an art and humanities major, and 24.1% in social sciences.

4.2. Exams

Wilcoxon Rank Sum (Mann–Whitney U) test was used to compare the differences between the 2 sections on exam scores (baseline, exam 1 and exam 2). As a proxy measure of equivalency of students in each section, scores on the baseline exam prior to intervention were examined. No significant difference was found between the two sections, with means of 89.06 and 89.13, respectively, U = 698, P = 0.82. During period 1, students in the flipped classroom scored significantly higher on exam 1 (M = 92.3) than students in the traditional classroom (M = 89.7), U = 534, P = 0.05. No significant difference on exam 2 scores was found between the sections (flipped M = 90.5 and traditional M = 91.1, U = 633, P = 0.48).

The main disadvantage of a repeated crossover design is that carryover effects (bias from the previous teaching approach) may confound the effects (Liang and Carriere, 2010). To address this limitation, linear mixed method analysis was used. Results showed no significant effects of the teaching approach (flipped, traditional), period (Alton, 2016; Honey and Lim, 2008), or carryover effect of the approach used in the preceding period (Table 1: Type 3 Tests of Fixed Effects). When data from the 2 periods of the study were combined, students’ exams scores in the flipped classroom weeks were less than one point higher than students in the traditional classroom.

4.3. Association Between Exams Score and Demographics

Linear stepwise regression was used to examine the relationship between exam scores and demographic data. In the regression model, only demographic variables that were correlated with exam scores in each period were included. On the baseline exam for students in Section 1, there was no correlation with any demographic variables. However, for those in Section 2, both African American and married students had significantly lower scores and older students had higher scores, than all other students in the section. On exam 1, students taught in the flipped

Table 1

The mixed procedure type 3 tests of fixed effect.

<table>
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<th>Effect</th>
<th>Num DF</th>
<th>Den DF</th>
<th>F (Num DF, Den DF)</th>
<th>F Value</th>
<th>Pr &gt; F (P value)</th>
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<tr>
<td>Period</td>
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<td>3.97</td>
<td>0.09</td>
<td>0.76</td>
</tr>
<tr>
<td>Carryover effect</td>
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<td>74.3</td>
<td>3.97</td>
<td>2.37</td>
<td>0.13</td>
</tr>
</tbody>
</table>

Num DF: the numerator degrees of freedom.
Den DF: the denominator degrees of freedom.
classroom who were male, spoke English as a second language or were from a multiracial background had significantly lower scores than all other students, whereas African American students taught in the traditional classroom had significantly lower scores than all other students. On exam 2, African American students in the flipped classrooms scored significantly lower and white students in traditional classroom scored significantly higher than students from other racial backgrounds (Table 2: Linear Stepwise Regression: Correlation Test between Test Score and Demographic Data).

4.4. Satisfaction and Correlation With Exam Scores

Table 3 shows students were significantly more satisfied with traditional teaching than with the flipped approach. A linear regression model was used to examine the correlation between each satisfaction item in the flipped and traditional classrooms and exam scores. Regardless of classroom type (flipped or traditional), students scored higher on exams when they were satisfied with course content organized in a manner that facilitated learning.

4.5. Focus Groups

Although the focus groups occurred with two separate groups of students and at two different times (for Section 1, it occurred immediately following the final flipped classroom session and for Section 2 it occurred one week after the final flipped classroom session), investigators noted no overall differences in experiences or perceptions of the educational approach. Analysis of data resulted in three dominant themes: 1) Don’t fix what isn’t broken; 2) Treat me as an adult; and 3) Remember the work is overwhelming. The qualitative findings complemented the quantitative data to provide a better understanding of using the flipped classroom.

4.5.1. Don’t Fix What Isn’t Broken

Students overwhelmingly wanted to begin both focus group sessions by stating that they liked the traditional lecture with PowerPoint slides and were successful obtaining previous degrees learning in that format. As one student shared, “To be honest, I adore our teacher and I think she makes a really dry subject interesting in the traditional method.... Don’t fix it if it isn’t broke. I think she’s great.” Comments also centered on the idea that the first few weeks of the semester employed traditional teaching modalities and how “switching gears” (from traditional to flipped) in the middle was very “disruptive.” As one student stated:

Presenting this change part way through the semester was kind of hard because I had already developed this style of learning and studying and it was working for me. And then now for this exam, I kind of don’t quite know where to start. I feel like I have to start all over again developing a new method. That was kind of tricky just doing it part way through.

4.5.2. Treat Me as an Adult

Participants talked about the desire for teachers to provide the rationale for a new teaching strategy and guidance on how to prepare themselves as learners. As a student lamented:

I think .... [there was] a real lack of communication telling us why we...
were doing things. I noticed it when we were filling out the review at the end. It said, “Have you been doing the readings and the PowerPoints ahead of time?” I think if they had told us, “This is super important to do ahead of time,” ……, we all know it’s an expectation for us to show up to class having watched those videos, having done the readings, things like that.”

Moreover, they wanted teachers to select in-class activities that respected them as adults and facilitated their learning, such as “quizzes that give immediate feedback and the case studies.” One student noted, “Remember we are all second degree students and so we’re adult learners. I think if we’re going to be having an interactive active class, it’s maybe more discussion-based versus blowing a whistle, running around. It seems a little childish.”

4.5.3. Remember the Work Is Overwhelming

The final theme focused on the heavy credit load in the first semester of the ABSN program. When coupled with multiple courses that are also using the flipped approach, the workload was too much for students to manage. As one student commented, “Trying to do all that stuff before class along with all the other pre-classwork, it’s a bit heavy. It would take up so much time.” Students also said that Pharmacology content is “too hard, dry, and complex, and there is too much information, making it difficult to prioritize” what to focus on in preparation for class.

5. Discussion

It is important to note that both teaching approaches prepared students for success on exams. Although students in the flipped classroom performed statistically significantly higher on the first exam than students in the traditional classroom, there was no significant difference on the second exam. There was a letter grade difference between the two teaching modalities on the first exam (flipped mean was equal to an A − and the traditional mean was equal to a B + ). From an academic grade perspective, this difference is important and impacts a student’s grade point average, which has potential implications for scholarships and future graduate program admission.

On both the quantitative measures and in focus groups, students shared that they were more satisfied with traditional teaching than with the flipped approach. Moreover, focus group comments suggest that the flipped approach might best be used in courses or subjects where students already have some foundational knowledge. When students had to learn predominantly unfamiliar content (medical jargon) as well as a new way of learning, they perceived it to be overwhelming. Similar to past studies (Clark et al., 2008; Hunt et al., 2003), some students also reported that they preferred lectures to the flipped approach because they felt burdened by the pre-class studying. Consistent with past research, data from the focus groups highlighted the importance of providing rationale for using the flipped classroom approach to prepare students for this learning environment (Hawks, 2014; McLaughlin et al., 2014). Additionally, consideration should be given to using the flipped approach in the early part of the course so that students have the opportunity to develop a pattern and way of learning that is not disrupted when a different approach is employed.

Finally, educators should exercise judicious use of the flipped approach. Findings support that it may not be effective for every class meeting or for every course, as sometimes the content matter is too dense or difficult and students may learn better using a different teaching modality. It is particularly important to consider intentional and limited use in an ABSN program because the curricula are so condensed. Moreover, coordinating with other instructors teaching in the same semester is imperative so that the flipped approach is balanced with other teaching approaches in the same week and students are not overloaded.

6. Limitations

The study used a small sample size of students from one institution, which limits the generalizability of the results. The crossover design used in the study, although a strong methodological approach when a sample size is small, may have introduced contamination if students across sections shared information and discussed their learning environment and materials. Moreover, the differences in class and exam content over the course of the study makes direct comparison of the teaching modalities impossible as some content could be more difficult to understand.

The course design did not incentivize students to come prepared for the flipped classroom as pre-class content knowledge quizzes were not part of the final grade. Knowing that prior studies illustrate students feel an increased burden when learning in a flipped environment (Sandeflowski, 2000; Liang and Carriere, 2010), not constructing the course to expect students to do the readings before coming to class may have impacted learning and the study results.

7. Conclusion and Implementation for Practice

While both the traditional lecture and flipped classroom approaches successfully prepared students for the Pharmacology exams, results support that the flipped approach was a useful instructional pedagogy. The theoretical underpinnings of the flipped approach, including active learning strategies (Chickering and Gamson, 1989; Kuh, 2008), prepares students to be self-directed learners, and equips them with skills to be life-long learners. Further evaluation is needed to determine where in the curriculum the flipped classroom works best, as well as with what types of learners and content. Additionally, studies need to evaluate how the pedagogical approach prepares learners for the practice setting, particularly around medication knowledge and safety.

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References


Institute of Medicine, 2001. Crossing the Quality Chasm: A New Health System for the


