Evidence-Based Nursing Pedagogy: Show Me the Research!

Introduction

Although the flipped classroom is fairly new to education in general, there is a growing body of research available on its implementation. Unfortunately, not much of the research has been conducted within nursing education, because nursing is one of the more recent professions to dabble with the idea. What is available within the current literature adds valuable information to use of the method within the nursing profession, and will be the first set of studies to be reviewed. The second part of the chapter will review the studies on those professions that are not nursing, but medicine and allied health. Finally, some of the most helpful resources from the Kindergarten through 12 grade level (K-12) realm will be discussed. Because the K-12 educational community has been implementing the method for the longest duration, the suggestions and ideas will be reviewed as contributing to the overall discussion of flipping the classroom. There are also several earlier books from our K-12 pioneers using the method and websites that are full of blogging activity, suggestions, and advice on implementing the flipped classroom. Although much of the activity on these websites is focused on K-12 education, a fair amount is beginning to address higher education as well. Accessing these websites on a regular basis can introduce those interested in the flipped classroom to some new ideas and current technology available.

Table 2-1 Levels of Scientific Evidence

Level	Description of Studies
Level I:	Evidence from a systematic review of all relevant randomized controlled trials (RCTs), or evidence-based clinical practice guidelines based on systematic reviews of RCTs
Level II:	Evidence obtained from at least one well-designed RCT
Level III:	Evidence obtained from well-designed controlled trials without randomization, quasi-experimental
Level IV:	Evidence from well-designed case-control and cohort studies
Level V:	Evidence from systematic reviews of descriptive and qualitative studies
Level VI:	Evidence from a single descriptive or qualitative study
Level VII:	Evidence from the opinion of authorities and/or reports of expert committees

Puddy, R. W., & Wilkins, N. (2011). *Understanding evidence part 1: Best available research evidence. A guide to the continuum of evidence of effectiveness*. Atlanta, GA: Centers for Disease Control and Prevention.

Even though educational research is not typically as rigorous as what we are used to seeing in the health sciences literature, there is a call for ranking of each piece of evidence about the flipped classroom using the same levels of scientific evidence for quantitative research questions. Those in need of a refresher on what each level of research entails, please see **Table 2-1**.

Nursing Research and Articles on Flipped Learning

Although the concept of the flipped classroom is relatively new to nursing education, some nurse educators have applied the flipped classroom or a version of it and were able to publish not only their experiences, but also some preliminary research on the method. Each one of the existing nursing education studies will be reviewed individually and presented from highest to lowest in their scientific rigor.

Flipping the Classroom to Improve Student Performance and Satisfaction—Level III

The review of nursing education research begins with Missildine, Fountain, Summers, and Gosselin (2013), who studied the flipped classroom within two BSN adult health courses. The design of their study most aligns with Level III evidence, as they did randomly assigned their students into three separate groups, but did so within a quasi-experimental education environment. The control group, as you would expect, learned by the typical, traditional lecturing method ($n = 130$). A second group was provided the same lecture in class, but was also able to access a recording of the lecture to review at home at their own convenience ($n = 129$). The third group included students who were instructed with the flipped classroom ($n = 186$) as it was defined earlier in the text. The researchers had two main research hypotheses: (1) The flipped classroom method would result in higher course exam averages than those students who received lecture only and lecture augmented with online recordings and (2) the flipped classroom method would result in higher student satisfaction, and lower student satisfaction would be found in those receiving only lecture and lecture augmented with recordings (2013).

The results were very promising, as exam scores were found to be significantly higher for those students in the flipped classroom group ($M = 81.89$, $SD = 5.02$) than students in both the lecture only ($M = 79.00$, $SD = 4.51$, $p < 0.001$) and the lecture augmented with recordings groups ($M = 80.70$, $SD = 4.25$, $p = 0.003$) (Missildine et al., 2013, p. 598). It is worth mentioning that the scores increased as the student groups were given more control over their learning, although this was not touted as one of the findings of the study by the authors themselves. Students in the flipped classroom group also passed the course at significantly higher numbers than students in the other two groups. In fact, it was found that with use of the flipped classroom, an additional 47 students achieved passing grades in the course (2013).

The second hypothesis of the study was not, however, supported. There were 445 students who completed the researcher-developed satisfaction survey, a 75% response rate. (The fact that the survey lacked predetermined validity was listed as a limitation of the study.) Those students who were in the lecture only and augmented lecture groups had significantly higher satisfaction scores than those in the flipped classroom group. Missildine and colleagues did report that students in the flipped classroom group found this form of instruction to require more work of them as students. The researchers discussed the great potential for the flipped classroom within nursing education, but also believed that faculty may need to refine implementation techniques to "gain students' approval of these new approaches" (Missildine et al., 2013, p. 599).

Using the Flipped Classroom in Graduate Nursing Education—Level IV

Critz and Knight (2013) researched use of the flipped classroom within their graduate Family Nurse Practitioner pediatrics course. The authors felt compelled to change their teaching style after finding in their student evaluations that students were feeling disengaged from and uninvolved in the course. These faculty had been using slide presentations consisting of a combination of student presentations for assignments and more expert faculty lectures. In addition, they had sporadic placement of case studies and group discussions throughout the semester. Using two main exams for learning outcome assessment, the authors found that even though students were passing the course, the grades were not at the level the faculty expected from students at the graduate level.

To redesign their classroom, Critz and Knight had their students complete what they described as a set of modules the week prior to coming to the scheduled face-to-face class time. Within the modules were short lectures that the faculty had recorded using screen capture software along with other videos on the content. The students also had their typical readings from the assigned textbook along with

several peer-reviewed, evidence-based journal articles on the content. When all of these steps were completed, the students were required to take a post-test on the content that was primarily application, case study–type questions rather than rote memorization. In total, these post-tests were worth 60% of the entire course grade. The remainder of their grades consisted of 2 examinations worth 20%, a student presentation worth 10%, and participation also worth 10%.

When the class time came, students were busy with faculty applying their content knowledge from the week to intensive case studies, group problem-solving exercises, role play, differential diagnoses, and pharmacologic management of selected disease states. Critz and Knight described the intensive case studies as being presented in an unfolding manner so that the students had a chance to ask questions at each stage until the diagnosis was reached. The in-class work was always related to the pre-class assignments. In some weeks, the researchers did go back to a more traditional lecture format and allowed time for student presentations, which were primarily in lecture format as well.

To determine the students' satisfaction with the flipped classroom, Critz and Knight (2013) polled their 20 students using an anonymous 10-item online survey using a 5-point Likert scale with additional space for students to make comments. Although admittedly not a large number of participants, 60% of the students felt the material covered was extremely worthwhile and 40% felt it was very worthwhile. Similar percentages were reported for the students' thoughts about the readings, student-led lectures, and prerecorded lectures provided by the faculty. Some of the reported student comments were a feeling of being overwhelmed with the amount of work required outside of the classroom due to working full time. I have heard similar comments from my students, and as a result, I tend to keep the offload content the least labor intensive as possible.

These authors felt that their experience with flipping the classroom was an overwhelming success. They saw their students take charge

of their own learning and be more engaged within the classroom than when they used straight lecture as their teaching method. Similar to others who have flipped the classroom, they reported an ability to correct student errors in thinking in real time in order to better assess student strengths and weaknesses (Critz & Knight, 2013). I could not agree with this more, and believe it to be one of the most helpful aspects of flipping the classroom that can allow faculty to really help students learn the material. When I used primarily lecture as a teaching method, I never felt 100% comfortable that my attempt to "transfer" information about patient care to my students actually resulted in student learning. In my flipped classroom, the students who do not understand cannot "hide" as easily. Instead, I am able to bring them out of the hiding place of confusion and misunderstanding into a place of learning about patient care. In a very real sense, the flipped classroom has provided a way for me to evaluate student understanding in real time. For me, this is one of the biggest advantages to using the flipped classroom in nursing.

The Use of Flipped Classrooms in Higher Education: A Scoping Review—Level V

Two faculty from the University of South Australia teamed up to provide what is described as a scoping review of the use of flipped classrooms in higher education. Jacqueline O'Flaherty from the School of Pharmacy and Craig Phillips from the School of Nursing and Midwifery used a five-stage framework to analyze the current state of the science about flipping the classroom within the realm of higher education. In the review, 28 articles from 5 different countries were found: 23 within the United States, 2 in Australia, and 1 each from the United Kingdom, Taiwan, and Malaysia. I would highly recommend this article for a nice overview of the state of science regarding flipping the classroom. As you might imagine, the article is full of helpful information and tables of summarization of the available literature. In **Table 2-2** you will find a brief summary of their findings.

Table 2-2 Summary of O'Flaherty and Phillips (2015) Scoping Review

Flipped Classroom Topic of Interest	Summary of Findings from Available Research

Technology and strategies used in pre-class activities	• Prerecorded lectures
	  ○ Podcasts
	  ○ Vodcasts (a video podcast)
	  ○ Screencasts
	  ○ Annotated notes
	  ○ Captured videos
	• Assigned readings to be done prior to class
	• Automated tutoring systems
	• Study guides
	• Interactive videos from online repository (such as Kahn Academy)
	• Case-based presentations
	• Simulations

Activities utilized during face-to-face class time	• Case-based presentations
	• Team-based discussions
	• Panel discussions
	• Debates
	• Smart phone apps and tablets
	• Think pair-and-share activities
	• Clicker questions
	  ○ Individual—quizzes or test of knowledge
	  ○ Team-based quizzes
	• Micro-lectures to address gaps in knowledge

Time, cost, and staffing required	• Lead time for faculty described as intense • Funding for lecture capture to develop "library" of videos • Some institutions have support staff to help faculty flip • Technology team support (usually provided by institution) • Some had little lead time due to use of online video resources rather than creating videos on their own
Who is flipping?	• Nursing • Medicine • Pharmacy • Nutrition • STEM—Science, Technology, Engineering, Mathematics • Humanities • Graduate studies—research methods—statistics • Law and economics

Table 2-2 Summary of O'Flaherty and Phillips (2015) Scoping Review (Continued)

Flipped Classroom Topic of Interest	Summary of Findings from Available Research
Pedagogical acceptance of flipped classroom	• Clear expectations for students to decrease frustration • Some students critical of fact they had to take responsibility for their own learning outside of scheduled class time • Number of studies suggest students adapted easily to the flipped classroom • Efficient student adaptation with flipped classroom (as time went on) • Suggestion of introducing flipped learning early on in student studies to build an expectation and culture of self-directed learning • Faculty tend to have positive perception of flipped classroom • Both students and faculty tend to be dependent on lecture method because it is familiar, comfortable, instructor centered, and requires little student engagement • Flipped classroom has potential to increase the frequency and intensity of assignments

Evaluation of indirect and direct educational outcomes	• Very few studies with scientific rigor to show definite improvements in higher order thinking and cognition, problem solving, and critical thinking
	• Many studies reported an increase in student satisfaction with flipped classroom and active learning during class time
	• Evidence of increase in academic performance in 5 studies, as measured by improved exam results and course grades when compared to control
	• Evidence to support an increase in student attendance when flipped classroom is used
	• Qualitative feedback from student course evaluations suggested improved opportunity for teacher contact time, ability to develop communication skills, preferences for working in teams, active student engagement in the classroom—same students negative about flipped classroom due to increase in their time commitment outside of class
	• Qualitatively speaking:
	  ○ Flipped model enhanced learning experience, students felt empowered, students felt engaged
	  ○ Promotes more independent learners
	  ○ Increased group collaboration—team work
	  ○ Results in students who are better communicators, with better interpersonal and problem-solving skills
	• Little to no evidence showing any long-term improvement in educational outcomes—most studies focused at course level rather than curricular perspective

Table 2-2 Summary of O'Flaherty and Phillips (2015) Scoping Review (Continued)

Flipped Classroom Topic of Interest	Summary of Findings from Available Research
Remaining gaps in the literature	• Under-utilization of conceptual frameworks that enable a united approach to flipped classroom • Need for stronger evidence in evaluating student learning outcomes over time • Future research should consider other indicators of student engagement and success in the flipped classroom other than test scores and unvalidated satisfaction surveys

Data from O'Flaherty, J., & Phillips, C. (2015). The use of flipped classrooms in higher education: A scoping review. *Internet and Higher Education, 25,* 85–95.

Using Lecture Capture: A Qualitative Student of Nursing Faculty's Experience—Level VI

Although not focused directly on the flipped classroom, a qualitative study from Reed, Bertram, and McLaughlin (2014) present an interesting perspective from nursing faculty about recording videos and making them available to students outside of the classroom. The authors' university had purchased a fully automated lecture capture program, and as a result, the nursing program decided to have all classroom lectures recorded and provided for students after the class was over. The 14 nursing faculty participants had an average age of 55, considered themselves technology proficient, and had taught on average 17 years in nursing programs. Four focus groups were conducted and questions posed about use of the lecture capture software and remaining concerns. Two themes concerning faculty role and identity and two themes concerned with student learning emerged.

The first of the faculty role themes identified by the authors was *Unsettling/Anxious Beginnings.* Faculty reported feeling unsettled and anxious when using the lecture capture software, and didn't feel that they were given a choice to do so. Instead of being something extra for the students, it was more of an expectation of faculty. Faculty felt the training to use the lecture capture and the actual use of the lecture capture was a lot of work for them. They also voiced a concern about being judged by their more technology-savvy

students in the classroom, one stating that she did not want to look dumb in front of her students when she didn't know how to use the technology. However, the focus group participants also reported getting used to the new system after the initial big learning curve, one stating that she didn't even notice it anymore.

The second faculty theme was *An Unwelcome Presence*. The new lecture capture was described as unwanted by the faculty in the focus groups. This unwelcome presence was seen as having the potential to interfere with their connections to students within the classroom setting. It was a theme that the faculty felt threatened by the technology in several ways. One participant wondered where their lectures were going. Where was this historical recording of her "going" on the Internet? Would she be laughed at on popular video streaming websites? Activities and conversations that happened in a classroom lecture were seen as having the potential to be taken out of context if in a video format as well. Faculty reported feeling guarded in the classroom and a sense that privacy was breached and possibly security threatened as well. Things that they might have said in a class not recorded they were hesitant to say. The faculty also had concerns that once their lecture had been "captured" on video, what did they need the faculty for (Alexandre & Wright, 2013)? One might argue that in the flipped model, the expert nurse educator is more necessary than ever. Expert faculty are needed in order to come alongside each student in the classroom and explain difficult concepts with direct connections to patient care. Their ability to answer complex questions from students and help correct errors in thinking are keys to the success of the flipped classroom. When done correctly, the flipping classroom cannot be done without expert faculty to guide the students into a deeper learning experience.

The student learning themes included *Student Learning* and *Promise and Potential*. First of all, some of the faculty in this study were concerned that providing their lectures outside of the class time would result in students missing their classes altogether. In fact, several of the faculty participants reported seeing a dropoff in student

attendance with recording of lecture and providing it after class was over. Some participants argued that students needed to be in class for discussions, which did not record well on the screen capture. Others, however, were less adamant about students being in class, stating that at some point faculty need to let go of trying to control student attendance in class. The idea of students as consumers, knowing what they are doing as adult learners, was expressed.

In this theme, one participant asked why students would ever come to class if they could just watch the lecture video and pass the test. This idea does make a point that faculty need to be more than a talking head within the classroom during a lecture. Students are highly intelligent and can at times learn despite the instructional design within the classroom. Why would students need to come to class to watch a faculty member read a slide presentation to them that came directly from their assigned readings? Students can complete readings prior to coming to class where that information can be applied. In class, students should be encouraged to deepen their understanding of the readings. Faculty are charged with helping students unpack more complex ideas and applications of readings and make complicated issues more meaningful. The in class time should be used to engage the brain rather than review the readings on a series of presentation slides.

The second of the student learning themes was *Promise and Potential*. Faculty in the focus groups stated that students found great value in having the lecture material recordings and received student feedback thanking them for doing so on their evaluations. Some of the potential benefits of providing lectures after class included the need for an excused absence (to help students catch up), student preparation for testing, and for the ability to review material at an individual pace. Faculty did want to have more information about how students were using the recordings. One of the participants mentioned that having the recorded lectures available to students decreased the amount of time spent on individual tutoring outside of the classroom. Interestingly, these faculty participants were very positive about having some additional class time to work interactively with students.

*Flipping the Statistics Classroom in Nursing
Education—Level VI*

A smaller study by Todd Schwartz (2014) at the University of North Carolina at Chapel Hill focused on implementation of the flipped classroom for a PhD in a nursing statistics course. The math content lends itself well to the flipped format of lecture at home and the faculty there to help students work through difficult mathematical equations and problem sets. Using his 12 doctoral students, he implemented the flipped model for 2 courses each meeting for 3 hours of face time. The courses involved sequential and cumulative learning and mastery of each topic was considered critical prior to moving on to new content (similar to other content in nursing programs in general).

Although only a small sample was used, the findings included student feedback and outcomes. Students did not score the flipped classroom high after the third week, but this changed when asked again at the end of the semester. The author reminds that at first the students may be against the idea of the flipped classroom, but change this opinion over the time they are exposed to the method. Part of their change in heart may be due to the understanding of how much more they understand and learn the content, despite the additional work and requirement for them to be more engaged in learning.

*Flipping the Classroom: A Data-Driven Model for Nursing
Education—Level VI*

McGowan, Balmer, and Chappell (2014) published a short article about their use of the flipped classroom for continuing education for nurses during the ANCC Annual Symposium on Continuing Nursing Education. The project goals were focused on maximizing learning opportunities within a short period of time (1 day), exposing nurse educators to the flipped model of learning by having them be in the role of learner, and expanding the number of contact hours that could be obtained by combining classroom time with pre-work assignments. The program involved a series of videos that the

nurse educators would watch prior to the symposium. These videos were provided in what was called an e-learning environment and were available 1 month prior to the symposium. Reminders were sent each week during the month prior to the symposium as well, in order to encourage participation.

The design of the study used technology that allowed the researchers to build an e-learning environment complete with videos, searchable library related resources, the ability to take notes, set reminders, and ask questions of faculty. The technology also allowed the researchers to keep track of participant activities in the e-learning environment electronically. In the month prior to the symposium, it was found that 102 nurse educators accessed the system and took 178 notes, set 408 reminders, and searched almost 100 resources. Using the activity on the online system, the researchers were able to tailor the live classroom experiences to complement the online pre-work that was completed. During live sessions, the researchers used case studies and audience response systems to apply material learned during the month prior to the conference.

The researchers found that out of the 124 participants that attended the live sessions, 82% had participated in the e-learning environment. Of those who accessed the online learning prior to the live sessions, 74% reported watching more than 10 videos of the 11 part series. By participating in the online learning environment, 76% reported that they felt better prepared to engage with symposium faculty and to be more active learners. Although an exact percentage was not provided, the researchers stated that the majority of participants felt that the flipped classroom model was an effective educational strategy. Some conclusions of the researchers were that it can be expected that although not all will participate in pre-work, 80% would be very possible. In addition, the researchers felt that planning the in-class work to fit the performance on the e-learning provides an ideal learning environment that can be tailored to the individual learners in any given classroom.

Flipping the Classroom With Team-Based Learning in Undergraduate Nursing Education—Level VI

Della Ratta (2015) used a flipped classroom approach with team-based learning as the primary in-class activity for undergraduate nursing students. The study focused more so on the teaching strategy of team-based learning than it did the flipped classroom. The flipped model was not implemented until the second semester of these students' study, and was only introduced briefly. The author looked primarily at course evaluations, which were more positive in the second semester of learning when the flipped model was introduced. This researcher did not use video within the flipped classroom in favor of a narrated PowerPoint. When used, these narrations were reported as highly valued by the students due to their ability to control the pace, go backwards, and repeat as individually necessary. It was also reported that when team-based learning was used with flipped classroom sprinkled in the mix, the students' scores were significantly higher than with traditional methods of teaching (mostly lecture). It is important to remind the reader that the statement about significantly higher scores was not substantiated by any statistics or evidence within the article.

Della Ratta provided some lessons learned when implementing the team-based learning and flipped classroom, starting with the reminder that new teaching/learning strategies take considerable preparation time for the faculty. Creating the narrated PowerPoints was reported as time consuming and challenging. Writing team application activities also took quite a bit of thought and ingenuity. However, once these were in place, they only required minor revisions and/or updating for the future classes.

Narrating a lecture is much more time consuming than creating a video. In addition, students prefer the video format, because they do not have to take the time to manually click through each slide. The other advantage to the screen capture is in the ease of delivery of the video versus the capability to deliver a narrated lecture. If

a video using lecture-capture software is supplied to students, they can download and watch it on any device they choose, which is not possible with narrated lectures using the voice-over feature. Many students use mobile devices and find the video files convenient. The ability to watch the videos at any time without having to click through a set of slides and voice-over files is an advantage of the lecture capture video.

Flipping the Classroom for Student Engagement—Level VII

Alexandre and Wright (2013) both from nursing education programs in New York, implemented the flipped classroom as a result of a super storm in their area. Educational institutions were closed and there were power outages and lack of transportation in the area. In the aftermath of the storm, their school was used to shelter more than 800 people who were displaced by the storm. As a result, the nursing instructors began to reach out to their students using Blackboard, providing recorded lectures and pre-class assignments with the goal of applying that material when the courses resumed at the school. Later when they used the flipped classroom purposefully with their RN-BSN students, they found their students to be well prepared for class and very engaged in the in-class presentations and discussions. In this cohort, students were very happy with the flipped classroom and they had a 100% pass rate in the course.

Although this is not a research-based article, Alexandre and Wright (2013) did provide a basic definition of the flipped classroom as well as advice on how other faculty might implement the method. It is their advice to have a clear understanding of the learning objectives, take time to learn what students do not know and respond to those gaps in knowledge, and maintain flexibility in the classroom setting. Another suggestion was that flipping works best with content or topics that can be explained in 15 minutes or less within video content. Their suggestion was to keep the videos the students will watch at home short and to the point. Alexandre and Wright also recommended using existing technology, communicating clearly

with the students about how the flipped classroom will be used. This communication should include clear faculty expectations of students both prior to and within the face-to-face classroom settings. The use of group work was another suggestion, stating that it allowed their students to learn from one another, collaborate, partner, and focus on group problem solving.

In addition to the research above are some resources available in the literature that provide advice on how to flip the classroom in nursing and other health professions. McDonald and Smith (2013a, 2013b) have provided professional development to nurses using the flipped model with great success. Their two-part series in *The Journal of Continuing Education in Nursing* provides their discussion of benefits and strategies as well as some guidance on how to develop podcasts and videos. Similarly, Burns (2012) discussed the use of flipped learning and asynchronous online learning for continuing education in *Critical Care Medicine*. Burns states that the barrier of shift work to the traditional type of learning that has been provided for continuing education (CE) to large groups of employees makes flipped learning and online options for CE a real benefit in delivery of important educational offerings.

Research and Articles on Flipped Learning from Other Professions

It's Not About Seat Time: Blending, Flipping, and Efficiency in Active Learning Classrooms—Level III

In the world of chemistry education, Baepler, Walker, and Driessen (2014) wondered if the seat time for their large chemistry course could be reduced with the use of a flipped classroom. These authors both blended and flipped their classroom, measuring post-test comparisons. One section of their chemistry course was split into three different parts that met only once a week instead of three times a week, while a larger portion of the course's learning activities were moved to the online environment. The main idea was to get more

concentrated face-to-face time between students and instructors, even if it occurred only once a week. The face-to-face session would be compared to the traditional lecture-based classroom with the instructor lecturing rather than working with students in small groups. The research hoped to prove that seat time within the classroom would not necessarily mean student learning time due to the quality of interactions rather than the quantity of time involved during face-to-face class time.

At the beginning of the study, student demographics and initial testing were all statistically similar. It was found that flipped, hybrid, active-learning classes that decrease student seat time by two thirds can yield student learning outcomes that are at least as good as, and in one study better than, the traditional full-lecture auditorium class. Importantly, it was also found that the move to the new format did not disadvantage students at any particular grade point average level. Student perceptions of their learning experience improved significantly with the flipped, hybrid format as well. These results beg the question of how much more learning could occur if students were offered the chance to interact and learn directly from instructors each class period rather than cutting class time down by a third. The potential is great, and most students would no doubt enjoy the ability to actively engage with faculty and get their questions answered directly when necessary.

The Flipped Classroom: A Course Redesign to Foster Learning and Engagement in a Health Professions School—Level III

McLaughlin et al. (2014) redesigned a first-year pharmacy course into the flipped classroom at the University of North Carolina Eshelman School of Pharmacy. Their students were required to do a self-paced interactive learning module (called an iLAM), assigned readings, and application exercises prior to coming to class. Each face-to-face class time had a similar structure with 15 minutes of clicker questions using an audience response system, a 15-minute pair-and-share time

or micro-lecture, 25 minutes of student presentations including discussions, and finally a 20-minute quiz (individual or paired) over the material of the day. Learning evaluation for the course included three exams, several quizzes, points for engagement, student projects, and a cumulative final exam.

Data were collected on voluntary pre- and post-surveys, which 62 of the 150 students completed. Correlations were also used to show connections between student engagement and their final examination scores. The majority of students reported completing the at-home materials, but correlations between online engagement measures and final exam performance were weak ($r = -0.04$ to $r = 0.20$). There was a higher correlation between the number of online extra credit points that were completed and the final course grade ($r = 0.34$). Students in the flipped classroom were statistically more likely to agree that active student engagement was consistently encouraged ($p = < .001$) and participation was necessary to be successful ($p = < .001$). Attendance was also statistically significantly higher in the flipped classroom ($p = .03$). Students in the flipped classroom also had significantly higher final grades than those in the traditional classroom ($p = < .001$). These researchers also found that students who stated they preferred lecture to active learning prior to the class changed their minds after being a part of the flipped classroom.

The authors also provided some insight from their experiences and feedback of their students about ways to enhance student learning. Believe it or not, they reported no longer considering the textbook as required reading because students found it to be redundant and outdated. They also replaced student presentations with 30-minute active learning exercises and added instructor-administered and graded 20-minute quizzes online outside of class time to insure preparation for class. Student grading of each other's work was added and an online portal of pharmacy information called the "Pharmacopedia" was developed to provide expanding concepts, new technologies, current clinical trials with medications, new drug products, and weblinks.

The Experience of Three Flipped Classrooms in an Urban University: An Exploration of Design Principles—Level IV

Kyu Kim, Mi Kim, Khera, and Getman (2014) from the University of Southern California used a mixed-methods approach to evaluate the flipped classroom within the three different professions of engineering, sociology, and humanities. The three instructors had specialty training and mentors to help them with the development and implementation of the flipped classroom, and had 115 students enrolled in their three courses. Out of these 115 students, 41 students provided responses (36%) to surveys. The researchers also used instructor reflections, interviews, and other documents such as course syllabi. Overall, the researchers reported that their student participants perceived the flipped classroom activities as more student oriented than their traditional classes. Combined data from the three courses were used to develop a design framework for flipped learning. Nine design principles emerged from the data and are provided for review in **Table 2-3**.

Table 2-3 Kyu Kim, Mi Kim, Khera, and Getman's Design Principles for the Flipped Classroom

Design Principles	Description
Provide opportunity for students to gain first exposure prior to class	• Students able to prepare for class ahead of time • Students can learn at their own pace
Provide an incentive for students to prepare for class	• Use low-stakes grading to insure students are prepared • Require students to submit questions/comments on YouTube and give points for doing so
Provide a mechanism to assess student understanding	• Low-stakes quizzes (3–5 questions on learning management system) • Formative assessments
Provide clear connections between in-class and out-of-class activities	• Make sure homework and in-class work focus on same or similar content
Provide clearly defined and well-structured guidance	• Be clear about flipped classroom expectations • Scaffold learning • Give students clear instructions and structure

(Continues)

Table 2-3 Kyu Kim, Mi Kim, Khera, and Getman's Design Principles for the Flipped Classroom (Continued)

Design Principles	Description
Provide enough time for students to carry out the assignments	• Provide adequate time for students to complete in-class activities and online activities • Help students learn self-regulation in their learning
Provide facilitation for building a learning community	• Create learning communities that connect students and help them to collaborate • Group dynamics are difficult and can hinder group work in class and out of class—provide excellent guidelines for groups
Provide prompt/adaptive feedback on individual or group works	• Students desire prompt and specific feedback
Provide technologies familiar and easy to access	• Spend more time on how to integrate technology with pedagogy rather than use of the technology itself

Data from Kyu Kim, M., Mi Kim, S., Khera, O., & Getman, J. (2014). The experience of three flipped classrooms in an urban university: An exploration of design principles. *Internet and Higher Education, 22*, 37–50.

Although many of these authors' design principles seem to be obvious, it is important to listen to the researchers' suggestions in order to avoid making some simple mistakes. These ideas can help faculty to structure their planning for the flipped classroom, and help them to develop a framework of ideas. It is interesting that most of these authors' suggestions focus on providing a clear and straightforward set of expectations for the students, communicating with them clearly about their learning, and using the flipped classroom as a pedagogy that integrates technology rather than being technology centered. It would be safe to argue that with most major changes in process, a clear set of expectations about the new process is a must. This article provides some valuable information about process change, but is not terribly helpful when it comes to implementation of the flipped classroom in real time.

Student Perceptions Toward Flipped Learning: New Methods to Increase Interaction and Active Learning in Economics—Level VI

Noticing the lack of higher education research on the flipped method, Roach (2014) designed a study to measure student perceptions about

his economics flipped classroom. Overall, he found on response to surveys, his students were positive about the flipped classroom. The students thought the flipped classroom helped them learn more effectively and that the class was much more interactive than other courses they had taken. Roach also proposed that the use of media (videos to deliver content) may be more efficient and less timely than having students read a standard textbook or listen to a live lecture. Allowing students to prepare for class with rote memorization and basic understanding prior to coming to class allowed Roach more time for interactive learning in the classroom and resulted in deeper learning in a shorter period of time. As have many other researchers, Roach has called for more research on the flipped classroom that spans disciplines and includes quantifiable evidence of its potential to increase student learning.

Enhancing Student Engagement Using the Flipped Classroom—Level VI

A group of nutrition educators have used the flipped classroom and published on how they implemented the model and their students' perception of the method. Gilboy, Heinerichs, and Pazzaglia (2015) from West Chester University of Pennsylvania used a five-item Likert scale plus two open-ended questions on an anonymous survey online to assess student perceptions of the flipped classroom learning environment. In their sample, 72% ($n = 142$) of students responded voluntarily. Out of these participants, 76% preferred the video lecture over the face-to-face lecture, and 64% indicated their preference to participate in-class activities rather than listen to faculty lecture. About the same number of students (62%) felt that they learned material more effectively by viewing the online recorded lectures than when they were in class during a lecture. Some faculty may fear that their students have the potential to feel less connected to them if the flipped classroom is used. These researchers found that 70% of their student respondents felt connected to their faculty when the flipped classroom was used.

The researchers also found that students liked the ability to learn at their own pace and the ability to apply what they were learning

with the teachers there to guide them. Curiously, these student participants had some of the same concerns as faculty about some of their peers not being prepared to engage fully in the face-to-face class time activities. With or without using the flipped classroom, insuring active participation by each and every student when using group work is a challenge. The authors provided some solutions to this problem, including an online discussion board prior to class to alert faculty to students who are not doing their part prior to class. They also suggested the faculty do a quick quality check with each group of students at the start of class and then move around to help from group to group as needed.

Also included in this article is a section about lessons learned. The authors discussed their experience with the flipped classroom as rewarding, but warn that the upfront time to make the lectures and develop learning activities requires extensive planning and time. Also suggested is an attempt to gain buy in from the students, use of instructional designers if available, and keeping video-recorded lectures to 15 minutes or less. In addition, they suggest that faculty use course-level analytics available in an online learning system to provide faculty knowledge of accountability and student engagement out of the classroom. They also suggested the use of video resources other than those made by faculty if possible, such as TED talks or Khan Academy videos. Here is where our opinions differ, because I have heard from my flipping colleagues as well as from my students that they much prefer their faculty delivering the video lecture themselves. Although we think that our less-professional video may be less desirable, our students seem to prefer the lectures that we provide and anecdotally prefer our videos.

The Use of Flipped Classroom to Enhance Engagement and Promote Active Learning—Level VI

A study done in Malaysia with instruction technology students attempted to measure various levels of engagement in the flipped classroom with instructional technology students (Jamaludin & Osman, 2014). A study used a small sample of 24 students. The take-home

point from this study was that the flipped classroom may help students self-regulate their learning behaviors. This notion makes sense because the students with flipped learning are more able to learn at their own pace and be able to self-regulate rather than be moved methodically along with their cohort. Most educators would agree that in any given cohort or class of students, there exist several different levels of learners. In addition to the levels of learners, there are individual personality traits that affect how a student tends to absorb material. I think back to my own experience with lecturing in the classroom. I talked and delivered information at one pace, but my students could be listening, absorbing the lecture, and learning at a much different pace. When students have the ability to slow down or pause a lecture within the video, they automatically self-regulate their learning.

The Flipped Classroom Paradigm for Teaching Palliative Care Skills—Level VII

Periyakoil and Basaviah (2013) have used the flipped classroom model to teach palliative care skills to medical students at the Stanford University School of Medicine. The lack of experts to mentor medical students about how to deliver expert palliative care coupled with a need for more time in the classroom for discussion and clarification were listed as reasons for using the flipped classroom. The instructors had the students do what they called pre-work in the third quarter of their program including an online video module on theory of and evidence related to discussing bad news with patients and families. They also watched video vignettes of suboptimal examples. During face-to-face time, the students split into small groups and viewed a professionally filmed 5-minute vignette together, then brainstormed on how the interaction could have been improved. After a bit of role play and feedback from their peers, the students watched a professional, more optimal, version of how to discuss bad news with patients.

Although no data was collected during this use of the flipped classroom, the authors provided an example of how medical educators

are attempting the flipped model of learning. Much of what has been provided in this case example of the flipped classroom involves working to provide front material and using that within the face-to-face time with students to engage them and make them use and apply what they have learned.

The Changing Landscape of Anesthesia Education: Is a Flipped Classroom the Answer?—Level VII

Kurup and Hersey (2013) reported on their use of the flipped classroom to deliver educational material in anesthesia education. Recognizing the ever-growing time constraints on resident education, the authors discussed the flipped classroom as a way to increase attendance in their class, supplement intraoperative teaching (experiential learning), and limit lecture time in the classroom. They found with their use of the flipped classroom that online learning worked best when combined with face-to-face learning, but did not describe this as a hybrid class. Their students liked the additional time with their faculty in the classroom setting aside from lecture. It was one of their suggestions to use lower order cognitive skills with the online, pre-class learning and step up those cognitive skills when the faculty were there to assist the students. This advice is similar to this book's suggestion and several other resources about flipped learning.

Additional Resources Focused on Flipped Learning

A chapter reviewing the resources available for the flipped classroom would be remiss without the mention of Jonathan Bergmann and Aaron Sams (2012, 2014), the pioneers of flipped learning on the K-12 landscape. These innovative educators have published two books on flipping the classroom and are active in a number of blogs, on YouTube and Twitter. The first of their books was the most helpful to me in my flipping adventures: *Flip Your Classroom: Reach Every Student in Every Class Every Day* (2012). They have since published another book about their new ideas regarding flipped learning: *Flipped Learning: Gateway to Student Engagement* (2014).

Table 2-4 Web-Based Resources on the Flipped Classroom

Website	URL
Flipped Learning Network	http://flippedlearning.org
Edutopia	http://www.edutopia.org
Teacher tube	http://www.teachertube.com
Educational Technology and Mobile Learning	http://www.educatorstechnology.com
Flipped Classroom Workshop	http://www.flippedclassroomworkshop.com
Flipped Institute	http://flippedinstitute.org

Another text that quickly followed Bergmann and Sams first edition was one by Jason Bretzmann (2013) titled: *Flipping 2.0: Practical Strategies for Flipping Your Class.* The text provides a brief introduction by Bretzmann himself, then moves on to chapters by additional K-12 educators who provide examples of their flipped classrooms. It is a wonderful example of flipping for the K-12 classroom, and can provide some ideas to nursing educators about how to engage students in the classroom. There is one chapter focused on technology for students that is very helpful, and worth the read.

In addition to these pioneering texts, more resources have become available. **Table 2-4** lists several valuable Internet resources regarding the flipped classroom. Although some of these are not focused solely on higher education, they are helpful in terms of classroom management and use of technology.

Conclusion

Although we can learn quite a bit from reviewing the resources listed in this chapter, it leaves us with the notion that "to learn we must do." The research about use of the flipped classroom is certain to boom over the next decade. Nursing educators can be a part of the quantitative and qualitative state of educational science if we dare to engage in the scholarship of teaching and learning when implementing the flipped classroom.

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