The Flipped Learning Approach in Nursing Education: A Literature Review

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ABSTRACT

Background: This integrative review examines the application of the pedagogical methodology—the flipped classroom—in nursing education. Method: A literature search of the CINAHL, ERIC, and the National Library of Medicine (PubMed and MEDLINE) databases was conducted, using the following key words: flipped classroom, inverted classroom, and nursing education. Results: Results of a literature search yielded 94 articles, with 13 meeting the criteria of the flipped classroom approach in nursing education. Themes identified include the theoretical underpinning, strategies for implementation of a flipped classroom, and student satisfaction with and outcomes of the flipped classroom approach. Conclusion: Syntheses of the findings indicate that the flipped classroom approach can yield positive outcomes, but further study of this methodology is needed to guide future implementation. [J Nurs Educ. 2016;55(5):252-257.]

Active learning has been defined as “any instructional method that engages students in the learning process” (Prince, 2004, p. 223). In an effort to increase the number of students who receive undergraduate science, technology, engineering, and mathematics degrees, the Executive Office of the President of the United States commissioned a report resulting in recommendations to educators to enlist classroom approaches that engage students in active learning (President’s Council of Advisors on Science and Technology, 2012). The President’s Council (2012) found that “substantial empirical literature demonstrates that alternative models of instruction can achieve many important learning outcomes more effectively than current practice” (p. 83). The flipped classroom approach is one such method to enhance active learning. Bishop and Verleger (2013) validated the President’s Council’s findings in their survey of flipped classroom approaches and efficacy in general education.

Bergmann and Sams (2014), who are recognized authorities on the flipped classroom methodology, approved of the definition of the flipped, or inverted, classroom as being:

a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter. (p. 1)

In the flipped classroom model, content that was traditionally presented in the classroom setting, such as face-to-face lecture, is assigned before class as homework, allowing class time for active learning, using case studies, laboratories, games, and simulation-based learning, or experiments, under the guidance of the instructor (Herreid & Schiller, 2013).

The Institute of Medicine’s landmark report, Crossing the Quality Chasm (2001), also emphasized the need for new health professions educational models as essential in preparing the health care workforce of the future to provide evidence-based care, to work collaboratively on multidisciplinary teams, and to manage complex patient–clinician relationships. The Institute of Medicine’s report The Future of Nursing: Leading Change, Advancing Health (2010)
also examined the nursing workforce’s ability to meet the demands of a reformed health care system, examining multiple components of the profession, including nursing education. A conclusion of the study indicated “the ways in which nurses were educated during the 20th century are no longer adequate for dealing with the realities of health care in the 21st century” and “nursing curricula needs to be reexamined, updated, and adaptive enough to change with the patients’ changing needs and improvements in science and technology” (Institute of Medicine, 2010, p. 2). The results of a multiyear study of nursing education, Educating Nurses: A Call for Radical Transformation, echoed those findings (Benner, Surphen, Leonard, & Day, 2010). Benner et al. (2010) called for shifts in nurse educators’ approaches to foster student learning, emphasizing teaching for a sense of salience, situated cognition, and action and the importance of clinical reasoning (students’ ability to reason as a clinical situation changes). Those aforementioned reports heralded the need for a change in the delivery of professional education from a solely traditional and passive approach to teaching and learning, to dynamic and multifaceted methodologies, with the goals of engaging students to be active learners and critical and creative thinkers. The flipped classroom methodology is one such approach to achieve those objectives.

The purpose of the current literature review is to discover what is known about the use of the flipped classroom approach in undergraduate, graduate, and postgraduate nursing education.

**METHOD**

Grove, Burns, and Gray (2013) described the process of writing a literature review as being similar to replicating a systems model, with the literature search reflecting the initial input stage, processing the literature as the secondary throughput stage, and writing the literature review as the final output stage, with the quality of the input and throughput determining the quality of the output. That methodology was used to structure and organize the review. Databases searched included CINAHL®, ERIC™, and the National Library of Medicine (PubMed® and MEDLINE®). Key words used to search the databases were flipped classroom, inverted classroom, and nursing education.

Articles published from January 2010 to September 2015 were sought to glean the most recent literature. Criteria for inclusion encompassed articles describing the use of the flipped classroom approach in undergraduate, graduate, and postgraduate academic nursing education. Articles that did not meet the inclusion criteria described the use of the flipped classroom approach outside of the field of nursing or described the use of the flipped classroom approach for teaching continuing education for licensed practitioners. Studies related to medical education were considered to be outside the field of the nursing specialty because of the known obstacle of profession-specific education and socialization (Langendyk, Hegazi, Cowin, Johnson, & Wilson, 2015), with the subsequent lack of data regarding the similarities and differences of the disciplines and thus the legitimacy of applying findings from one field to another.

**RESULTS**

Initial key word searches resulted in the identification of 94 articles. Of these, 13 articles met the inclusion and exclusion criteria. Two articles discussed the theoretical framework underpinning this teaching strategy, and 11 articles described the implementation of the flipped classroom approach in undergraduate, graduate, and postgraduate nursing education.

**Themes**

In 1997, Harvard professor Eric Mazur developed a teaching strategy called peer instruction, which involved having students in his physics classes prepare for class by completing preclass assignments so they were able to engage with the instructor and peers during class time (Crouch & Mazur, 2001). This strategy is credited as the initial iteration of the flipped classroom approach. Subsequently, educators Jon Bergmann and Aaron Sams gained recognition for introducing the flipped learning approach in 2007 to their high school chemistry students (Springen, 2013). Although this teaching strategy has been used in other disciplines, national initiatives indicate that it is time for nurse educators to consider exploring the topic fully. Therefore, an important component of this novel teaching strategy includes a discussion of its theoretical underpinnings. Table A (available in the online version of this article) presents two articles that discuss such theoretical underpinnings. Challenges in enhancing both learner satisfaction and objective evaluation measures of using the flipped learning approach emerged as a main theme of the review. An additional group of articles described the process of introducing the new teaching model to nursing students and faculty, coupled with practical strategies for the implementation of the flipped classroom approach (Table B; available in the online version of this article).

**Theoretical Frameworks**

Hawks (2014) proposed that the flipped classroom methodology incorporates both behavioral and constructivist learning theories, with the behavioral learning theory akin to traditional classroom instruction (lectures, tutorials, and teacher-centered instruction). Conversely, the constructivist learning theory “is based on the primary tenet that individuals use personal experience to construct and understand knowledge and reflection to create meaning” via collaboration with students and teachers who are “actively engaged rather than passive recipients of lecture content” (Hawks, 2014, p. 265).

Alternatively, Bhoryrub, Hurley, Neilson, Ramsay, and Smith (2010) presented heutagogy, which is “a self-determined approach to learning” that is surmised to strengthen undergraduate nursing students’ practice-based learning (p. 323). Bhoryrub et al. described heutagogy as an evolutionary leap from andragogy—the adult-based learning construct—because it seeks to promote learning through personal experience, with the “learner being central to the process” (p. 323). Although those authors do not discuss specific teaching strategies that would apply the theory of heutagogy, the flipped classroom methodology engages students to be self-directed, which is the type of learning extolled by heutagogy. Heutagogy also promotes active learning in a dynamic, nonlinear format, more realistically mirroring the
challenges faced by nursing students in the health care setting. The flipped learning approach caters to this type of nontraditional approach to learning.

**Guides for Implementation of the Flipped Classroom Approach in Nursing Education**

Five of the articles reviewed described strategies for flipping a nursing classroom. Schlairet, Green, and Benton (2014) described the process for converting a traditional face-to-face undergraduate nursing Fundamental Concepts of Nursing course into a flipped approach. Students were expected to view voiceover PowerPoint® lectures and complete assigned textbook readings independently. Classroom activities included peer instruction, small-group work, quizzes with faculty debriefing of answers and rationales, and simulation-based learning scenarios. Administrative and curriculum challenges faced by faculty during the pilot attempt and its subsequent iteration were described thoroughly. The article by Schlairet et al. (2014) is a guide for faculty, and its reflections may support the creation of future flipped courses, although a lack of student feedback, a pretest–posttest, or comparison of previous traditional course iterations with the flipped approach is significantly absent.

Hawks (2014) summarized the background of the flipped classroom approach; discussed its theoretical underpinnings; reviewed the flipped approach used in nursing, medical, and pharmacy education; and provided guidelines on how to flip a classroom. Although Hawk’s stated aim was to guide the implementation of the flipped classroom approach in nurse anesthesia educational programs, the recommendations are general in nature and can be applied to any curriculum, favorably widening the article’s scope and applicability. Subsequently, this results in a deficiency of specific recommendations tailored to flipping a specialized nursing anesthesia educational program—an unmet implied goal of the article.

Harrington, Bosch, Schoofs, Beel-Bates, and Anderson (2015) examined the use of the flipped classroom approach, using a convenience sample of two groups of undergraduate nursing students (n = 82) in a medical–surgical course, with each group receiving two different teaching interventions. That study used a randomized, experimental design, which is generally considered the gold standard in inferring causal relationships (Polit & Beck, 2012), and was constructed meticulously. Students were randomly assigned to one of two cohorts—the traditional face-to-face or the flipped classroom—with identical content, examinations, and assignments. Although study designers controlled for variability by standardizing outcome measures, the faculty that was used to implement the teaching varied among groups, which could have skewed the effectiveness and outcomes. The article provides scant description of the activities used in the flipped classroom cohort, other than one mention of “experiential activities designed to guide students in the recognition of salient and relevant changes in client situations across time” (Harrington et al., 2015, p. 179). A multivariate analysis of covariance technique was applied to the results of examinations, quizzes, and specific knowledge and application questions. The examinations and quizzes yielded no significant difference between the two cohorts (p = .92). The specific knowledge and application questions had similar results (p = .57), and the difference between groups was not statistically significant. Mean course grades between groups were also analyzed with the analysis of covariance technique and comparable results were found, with no significant difference in grades between groups (p = .96). Harrington et al. (2015) interpreted the findings as evidence that the flipped classroom approach was successful in showing student mastery of course content, as both groups averaged 86.3% as a final grade. Although this may be a reasonable analysis of the outcomes, it is difficult to ascertain whether the difference in the two teaching strategies was substantial enough to cause a change in student behavior because the flipped teaching strategy intervention was not thoroughly described. Also, variability among the faculty used to implement the strategy limits the standardization of the study and its impact.

Burden, Carlton, Siktberg, and Pavlechko (2015) detailed the 2-year process of transitioning a traditional face-to-face psychiatric–mental health course to a flipped classroom, with a total of 359 students going through the course. Those authors did not indicate whether the course was at an undergraduate, a graduate, or a postgraduate level. Preclass work included worksheets, assigned readings, YouTube videos, and concept mapping. In-class activities involved small-group work, role-play, and concept map creation. A novel integration of the clinical component and learning objectives of the course included the use of virtual simulation and volunteer patients, which provided students with the time and setting to practice interview techniques and apply learned concepts in a simulated setting. In assigned reflective journal entries, students stated that they felt better prepared for class because of the preclass work activities. However, due to the lack of objective measurement of the impact of the intervention, such as comparison with previous iterations of the course or the anonymous survey of students’ perception of the flipped approach, the significance of the students’ comments is impossible to validate. With the considerable sample size and the longitudinal design of the study by Burden et al. (2015), it is unfortunate that data were not gathered to validate the effectiveness of the interventions. Nonetheless, that study thoroughly described the step-by-step process of implementing a flipped approach and is an effective guide for transitioning courses that encompass both the clinical and classroom components due to the detailed description of the assigned preclass work, the in-class activities, and the inclusion of clinically based activities.

**Enhanced Student Satisfaction With the Flipped Classroom Approach in Nursing Education**

Critz and Knight (2013) reported on a graduate-level nurse practitioner program in which students in an existing pediatric course indicated that they felt uninvolved. The course was consequently converted into a flipped classroom, and they described the faculty preparation, assignments, in-class activities, technological demands, and subjective student feedback. Students were polled at the end of the course (n = 20) in regard to several components of the flipped classroom strategies used. An anonymous 10-item survey was used, with students being able to rate each component on a 5-point Likert scale, ranging from extremely worthwhile to not at all worthwhile. The majority of
students reported that the content, assignments, activities, and quizzes were worthwhile and many wrote positive comments regarding the course. Thus, the goal to increase student satisfaction in the course was met. The Critz and Knight article did not include the statistical significance of the change in attitude toward the course or the increase in mastery of course content, compared with previous course iterations.

Similarly, Schwartz (2014) reformatted a statistics course for nursing students (n = 12) in a postgraduate Doctor of Philosophy program from a traditional model to the flipped classroom model. The article described the assignments, activities, hardware and software challenges faced, and the staff that was needed to support the conversion of a statistics course. Students were asked to complete two anonymous questionnaires rating the impact that the flipped approach had on learning; one questionnaire was completed during the third week and the second was completed during the last month of the course. Students agreed that the flipped approach helped to increase their understanding of the course, and the students had favorable views of the activities and assignments, preferring the flipped format to the traditional format. An unannounced pretest was administered on the first day of class, and an identical posttest was given on the last day of class. Although scores increased from 28% to 75%, statistical significance was not reported, and the study lacks comparison of course proficiency between the traditional face-to-face course and the converted flipped classroom approach.

The study by Simpson and Richards (2015) described the transformation of an undergraduate population health course from a traditional model to a flipped modality as part of a curriculum revision. Two cohorts of students were involved—juniors (n = 64) and sophomores (n = 93). The juniors were enrolled in the traditional course, which was converted to a flipped design. The sophomores participated in an updated and transformed version of the course, which was newly presented in the sophomore year as a flipped format. Preclass work, such as voiceover PowerPoint lectures, teaching videos, online modules, and text readings were required. In-class activities encompassed case studies, Web quests, videos with response time, and group-developed presentations. The term Web quests was not defined by the authors. To evaluate the effectiveness of the intervention, the authors used two surveys—end-of-semester course evaluations, which are provided at the university level to gauge general student comments regarding the effectiveness of the course and instructor, and a faculty-created survey targeting student appraisal of the flipped course design. Paired t tests were used to measure the results of the course evaluations, and no statistical difference was found between the traditional and flipped design scores. The student survey indicated that students perceived greater flexibility to control the pace of instruction, the flipped design enhanced active learning and student engagement, and the course design had an appropriate balance of online work and in-class activities. Although the students claimed increased satisfaction with the flipped course, Simpson and Richards (2015) did not state whether the flipped classroom survey was anonymous, which is an important caveat when addressing survey results. Also, the courses underwent a shift not only from a traditional content delivery to a flipped classroom, but also from a face-to-face format to a hybrid format. The impact of this shift and the difference in students’ progression through the curriculum (sophomores versus juniors) may or may not have affected the students’ perceptions of the flipped approach and was not addressed by the authors.

Improved Examination Scores and Diminished Student Satisfaction With the Flipped Classroom Approach in Nursing Education

Team-based learning was concomitantly introduced to students (n = 80) with a flipped classroom approach in two sequential undergraduate fundamental nursing courses (Ratta, 2015). Team-based activities, assignments, the use of lecture-capture software, and outcome measures are described in the article. Lecture capture is a technology that allows the previously recorded classroom audio and video to be downloaded digitally by students in a variety of formats (Educause Learning Initiative, 2008). Initial subjective feedback from most students was negative, and Ratta (2015) did not detail the aspects of the course that students found undesirable, which bears the question: Were students unhappy with the flipped approach or team-based learning? In contrast, students’ scores on standardized examinations were higher than those from previous classes (Ratta, 2015). This underscores Benner’s et al. (2010) well-known caveat that “student satisfaction may not be a good indicator of learning” (Ratta, 2015, p. 3). A limitation of Ratta’s study is a lack of statistical data and significance of the increase in examination scores, compared with previous classes. Also, because two interventions were introduced (flipping the classroom and team-based learning), it is impossible to distinguish which of the two, or a combination of the two methods, positively affected test scores.

Missildine, Fountain, Summers, and Gosselin (2013) used a quasi-experimental design study of students (n = 589) in two undergraduate adult health courses over a period of three semesters to compare three approaches to teaching—lecture only, lecture plus lecture capture, and lecture capture using the flipped classroom approach. Flipped classroom activities included simulation case studies, games, and other exercises, which were not described. A faculty-developed, 16-item questionnaire, with good internal consistency (Cronbach’s alpha .98), was used to assess student satisfaction on a 4-point Likert scale, with higher scores indicating greater satisfaction. Data analysis revealed that students in the lecture capture with flipped classroom approach cohort were significantly less satisfied (p < .001) with the course than students in the lecture only and lecture plus lecture-capture groups. The second prong of the evaluation of the teaching methods was to compare the differences in mean examination scores. This was conducted appropriately, with a one-way analysis of variance, which demonstrated a significant difference in scores related to teaching methods (p < .001). The flipped approach with lecture-capture group had higher average examination scores, compared with the lecture only (p < .001) and lecture plus lecture-capture groups (p < .003). The findings of Missildine et al. (2013) echo the aforementioned conclusions by Benner et al. (2010) and Ratta (2015) regarding student satisfaction—that is, it may not correlate with learning.
DISCUSSION

The current literature review demonstrates the state of the science of the flipped learning approach in nursing education. Although learning theories that buttress the pedagogy are evolving, further exploration of these theories are needed to strengthen the framework of the teaching strategy. The literature presented shows that the flipped classroom strategy may be effective in promoting active learning by increasing student engagement and self-efficacy in the academic setting. It also demonstrates that student satisfaction may be inversely related to improved performance, but although student examination scores improved, students may not approve of the new methods of teaching and may be wary of changes to curriculum delivery.

Few studies exist on the flipped classroom approach in nursing education, and only one study statistically validates its value in improving examination scores. The current literature review serves to make the following recommendations:

- Further development of the theoretical underpinnings of the flipped classroom approach in nursing education is merited.
- One study found that the flipped classroom teaching strategy has been shown to improve student self-efficacy, increased student engagement, and improved examination scores in non-nursing general education and college-level courses (Herreid & Schiller, 2013). Thus, in designing and implementing a flipped classroom strategy for nursing education, the examination of the methods used successfully by other disciplines should be considered.
- Sams and Bergmann (2013) clarified that not all content lends itself to flipping, such as courses that convey large amounts of factual content. With this caveat in mind, nursing faculty should be selective in identifying content that is best suited for the flipped approach.
- Lack of quantifiable, significant changes in nursing students’ knowledge, skills, and attitudes with the flipped learning approach is evident in this review. Consequently, the flipped learning approach in nursing education needs further validation and study before it can be recommended as an effective teaching strategy.

LIMITATIONS

The current literature review has several limitations. The articles selected in this review excluded those from medical education, which possibly could have further elucidated this topic. Also excluded were studies from general K-12 education and academic education outside of nursing, where a plethora of flipped classroom articles have been written and examples of its efficacy have been expounded (Bishop & Verleger, 2013). Due to the scarcity of articles that met the inclusion criteria for the current review, the articles selected are based on students from various levels of nursing education, which may hinder appropriate comparison of findings.

CONCLUSION

Although the literature may describe the implementation of the flipped classroom approach, most of the articles included in the current review do not examine the outcome measures to validate the use of the teaching strategy. Further studies are warranted to substantiate the flipped classroom approach in nursing education as an effective teaching methodology.

REFERENCES


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<thead>
<tr>
<th>Study, Year</th>
<th>Purpose</th>
<th>Type of Study</th>
<th>Sample</th>
<th>Measurement</th>
<th>Treatment</th>
<th>Results</th>
<th>Findings</th>
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<tbody>
<tr>
<td>Bhoyrub, Hurley, Neilson, Ramsay, &amp; Smith, 2010</td>
<td>Introduced the educational framework of heutagogy for possible application to nurse education</td>
<td>Theoretical concept</td>
<td>None</td>
<td>None</td>
<td>Conceptual underpinnings of heutagogy and comparison with current approaches, challenges, and applications</td>
<td>None</td>
<td>Heutagogy is potentially an effective framework to incorporate into nursing education</td>
</tr>
<tr>
<td>Hawks, 2014</td>
<td>Introduced the flipped classroom approach and possible implementation in nurse anesthesia education</td>
<td>Literature review</td>
<td>None</td>
<td>None</td>
<td>Overview of the flipped classroom model; constructivist and behavioral theories; brief review of evidence in nursing, medical, and pharmacy education; guidelines for implementing the flipped classroom approach</td>
<td>None</td>
<td>Nurse anesthesia education may benefit from the application of the flipped classroom approach</td>
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<td>Study, Year</td>
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<tr>
<td>Burden, Carlton, Siktberg, &amp; Pavlechko, 2015</td>
<td>Strategies to flip the classroom to promote a variety of learning outcomes</td>
<td>Descriptive</td>
<td>Convenience sample of nursing students ($n = 359$) enrolled in a psychiatric-mental health course from 2012-2014; sample does not specify whether undergraduate or graduate</td>
<td>Journal entries, student comments</td>
<td>Textbook-assigned readings, YouTube videos, concept mapping, Web sites as preclass work; classroom activities: concept mapping, small-group activities, role-play, virtual simulation, telepsychiatry management visits</td>
<td>Journal entries reflect consistent themes regarding the flipped approach, with students feeling better prepared for class and more involved in class</td>
<td>Active involvement and better preparation for class reported in reflective journals</td>
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<tr>
<td>Critz &amp; Knight, 2013</td>
<td>Used the flipped classroom model to engage students in new and meaningful ways</td>
<td>Descriptive</td>
<td>Convenience sample of graduate students ($n = 20$) enrolled in two pediatric courses in a family nurse practitioner program</td>
<td>10-item online survey measuring satisfaction with the flipped classroom, using a Likert scale</td>
<td>Voiceover PowerPoint® presentations, videos, reading assignments, and online quizzes as preclass work; classroom activities: case studies, role-play, group problem solving, student presentations</td>
<td>Majority of students state case scenarios, student lectures, out-of-class readings, and content were worthwhile</td>
<td>Students were positive about the flipped classroom approach</td>
</tr>
<tr>
<td>Patterson, Geist, Larimore, Rawiszer, &amp; Al Sager, 2015</td>
<td>Comparison of content knowledge in a traditional lecture course versus a flipped classroom course</td>
<td>Quasi-experimental quantitative</td>
<td>Convenience sample of two cohorts of undergraduate nursing students enrolled in a pharmacology course using a control group ($n = 40$) and treatment group ($n = 46$)</td>
<td>Identical unit tests (three) in both cohorts and a standardized Health Education Services, Inc. (HESI™) final examination, informal questionnaire</td>
<td>Not described</td>
<td>All three unit tests showed significantly higher test scores in the flipped cohort ($p &lt; .00$), final HESI examination showed no statistical difference between groups; questionnaire results not stated</td>
<td>Flipped methodology showed knowledge gains in three of four examinations</td>
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### Table B

**Literature Review of the Flipped Classroom Approach in Nursing Education**

<table>
<thead>
<tr>
<th>Study, Year</th>
<th>Purpose</th>
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<th>Limitations</th>
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<tr>
<td>Hanson, 2016</td>
<td>Evaluate the impact of the flipped approach on the application of lecture content to clinical practice</td>
<td>Descriptive</td>
<td>Purposive sample of undergraduate nursing students recruited from a pharmacology course in 2013 ($n = 187$) and 2014 ($n = 220$)</td>
<td>Online, 10-item Questionnaire, with verbal response and open ended items</td>
<td>Voiceover lectures (eLectures), lecture format, quizzes, peer discussion, teacher discussion, and case studies</td>
<td>Students reported increased understanding (29%), wider and deeper thinking (14%), and a preference for eLecture due to the ability to replay it digitally (11%); conflicting commitments were reported as reasons why some students did not attend workshops and activities (16%); comments indicated a preference for instructional learning (13%)</td>
<td>Students did not verbalize significant benefits in the flipped classroom approach</td>
<td>The poor response rate (13%) may not have yielded an accurate evaluation of the intervention; participant bias cannot be excluded; lacks analysis of whether the approach affects mastery of material, comparison of method versus traditional content delivery</td>
</tr>
<tr>
<td>Harrington, Bosch, Schools, Beef-Bates, &amp; Anderson, 2015</td>
<td>Compared learning outcomes of flipped versus traditional pedagogy</td>
<td>Experimental</td>
<td>Convenience sample of undergraduate students ($n = 82$) enrolled in a medical–surgical nursing course</td>
<td>Examination questions, quiz scores, and semester overall grades were analyzed using multivariate analysis of covariance and analysis of covariance techniques</td>
<td>Group with traditional face-to-face lectures, compared with the flipped approach group, which received experiential activities</td>
<td>No statistical significance found in scores between groups</td>
<td>Mastery of content the same with the traditional versus flipped classroom approach</td>
<td>Sparse description of activities used during flipped intervention</td>
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<td>Study, Year</td>
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<td>Mattis, 2014</td>
<td>Compared learning outcomes and mental effort of flipped versus traditional pedagogy within the context of three levels of content complexity</td>
<td>Quasi-experimental</td>
<td>Convenience sample of volunteer undergraduate nursing students (n = 46) instructed on basic algebra concepts</td>
<td>Pretest-posttest, including the Perceived Mental Effort Rating Scale with each problem, results analyzed using analysis of variance and Bonferroni corrections</td>
<td>Control group: visual-only instruction, textbook work; experimental group: instructional video</td>
<td>Significant increase in accuracy found at moderate levels of complexity, no significant effects of treatment on mental effort; significant decrease in use of mental effort on levels of high complexity between pre- and posttest</td>
<td>Flipped approach increased math accuracy at moderate levels of complexity and decreased mental effort at higher levels of complexity</td>
<td>Students in the experimental group did not have ability to review instructional videos, whereas the control group had the ability to reread materials; intervention based solely on one 13-minute video may limit applicability</td>
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<tr>
<td>Missildine, Fountain, Summers &amp; Gosselin, 2013</td>
<td>Determined the effects of the flipped classroom approach on examination averages and satisfaction</td>
<td>Quasi-experimental</td>
<td>Convenience sample of undergraduate baccalaureate nursing students (n = 589) enrolled in two courses—Adult Health I and Adult Health II—over three semesters</td>
<td>Comparable examination items and a 16-item survey, using a Likert satisfaction scale, with internal reliability assessed via Cronbach’s alpha .98</td>
<td>Three approaches were evaluated: lecture only, lecture plus lecture-capture backup, lecture capture plus flipped classroom approach using simulation case studies, games</td>
<td>Significant differences according to the method of teaching, average examination scores significantly higher in the flipped classroom approach, significant differences in satisfaction across three methods (p &lt; .001)</td>
<td>Higher examination scores among the flipped classroom cohort, although students were significantly less satisfied with the flipped classroom approach</td>
<td>Sparse description of activities used during the flipped intervention</td>
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<tr>
<td>Ratta, 2015</td>
<td>Used team-based learning within a flipped classroom setting to facilitate active learning</td>
<td>Descriptive</td>
<td>Convenience sample of undergraduate baccalaureate nursing students ($n = 80$) enrolled in semester two of a fundamentals of nursing course</td>
<td>End-of-semester course evaluations, student scores on end-of-semester standardized course examination</td>
<td>Voiceover PowerPoint presentations and chapter readings as preclass work; classroom activities: readiness assurance tests individually and in groups with discussions, clinical scenarios, peer evaluations</td>
<td>No statistical data provided</td>
<td>Most students did not report positive feedback after the first semester, second semester evaluations were “more positive,” student examination scores were “significantly higher” than previous classes</td>
<td>Lack of statistical data and significance of intervention</td>
</tr>
<tr>
<td>Schlairet, Green, &amp; Benton, 2014</td>
<td>Foster autonomy and self-directedness in the undergraduate baccalaureate nursing student</td>
<td>Descriptive</td>
<td>Convenience sample of undergraduate baccalaureate nursing students ($n = 80$) enrolled in a Fundamental Concepts of Nursing course over two semesters</td>
<td>None stated</td>
<td>Voiceover PowerPoint presentations as preclass work, classroom activities: peer instruction, group work, class discussion, group presentations, audience response devices for NCLEX®-style questions, case studies</td>
<td>None stated</td>
<td>Faculty felt prep work was time intensive</td>
<td>Lacks analysis of whether the flipped approach affects mastery of material, comparison of method versus traditional content delivery</td>
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<td>Study, Year</td>
<td>Purpose</td>
<td>Type of Study</td>
<td>Sample</td>
<td>Measurement</td>
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<td>Results</td>
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<td>Schwartz, 2014</td>
<td>Implement the flipped teaching approach in a research-based Doctor of Philosophy program to enhance the student learning experience</td>
<td>Descriptive</td>
<td>Convenience sample of postgraduate nursing students enrolled in a statistics course</td>
<td>Two surveys using a Likert-scale to evaluate endorsement and favorability of the flipped classroom approach, end-of-semester course evaluations, pretest–posttest</td>
<td>Video recorded lectures as preclass work, classroom activity: Small-group activities</td>
<td>Average 3.9 to 5.0, with 5 = <em>strong agreement</em> of the flipped classroom approach; average 4.5 to 5, with 5 = <em>very favorable</em> of the flipped classroom approach; average 4.5 to 5, with 5 = <em>strongly agree</em>; course evaluation as <em>excellent</em>; pretest 28%; posttest 75%</td>
<td>Positive feedback regarding the flipped classroom approach</td>
<td>Lacks analysis of whether the flipped approach affects mastery of material; comparison of method versus traditional content delivery</td>
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<td>Simpson &amp; Richards, 2015</td>
<td>Revision of a population health course from a traditional delivery format to a flipped classroom format to enhance student engagement in the course</td>
<td>Descriptive, exploratory</td>
<td>Convenience sample of two cohorts of undergraduate nursing students: juniors (n = 64) enrolled in a public health science course and sophomores (n = 93) enrolled in a population health course</td>
<td>Two surveys: faculty created a Likert-type scale survey to evaluate students' perceptions regarding the flipped classroom format; end-of-semester course evaluations</td>
<td>Voiceover PowerPoint presentations, teaching videos, interactive online modules, assigned readings as preclass work; classroom activity: case studies, Web quests, videos with response time, group-developed presentations</td>
<td>No statistical difference between the previous traditional and current flipped classroom cohort on the course evaluation survey; favorable comments on survey focusing on the flipped format</td>
<td>Positive feedback regarding the flipped classroom approach</td>
<td>Lacks analysis of whether the flipped approach affects mastery of material; revision changed course from traditional face-to-face to hybrid format; authors did not discuss the effects of this major change in content delivery</td>
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