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The effect of flipped instruction on student learning : perspectives from students and teachers

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The effect of flipped instruction on student learning : perspectives from students and teachers

Abstract

The purpose of this literature review is to examine the effects the flipped classroom has on student achievement, student attitudes and teacher perceptions. Thirty peer-reviewed journal articles were reviewed and analyzed. Three themes emerged from the review: student achievement, student attitudes and teacher perception. It was found that the flipped classroom was a positive experience within a majority of the studies. Since little research has been done in the K-8 level for content areas outside of math and science, it is recommended that further research to be done in a larger variety of content areas at the primary and secondary grade levels.

FLIPPED CLASSROOMS AND STUDENT LEARNING

**The Effect of Flipped Instruction on Student Learning:
Perspectives from Students and Teachers**

A Graduate Review

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Abstract

The purpose of this literature review is to examine the effects the flipped classroom has on student achievement, student attitudes and teacher perceptions. Thirty peer-reviewed journal articles were reviewed and analyzed. Three themes emerged from the review: student achievement, student attitudes and teacher perception. It was found that the flipped classroom was a positive experience within a majority of the studies. Since little research has been done in the K-8 level for content areas outside of math and science, it is recommended that further research to be done in a larger variety of content areas at the primary and secondary grade levels.

Keywords: flipped instruction, K-12, student achievement

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**The Effect of Flipped Instruction on Student Learning:
Perspectives from Students and Teachers**

Millennials (students born after the year 2000) hardly know a life without the use of technology. Not only do they see them as useful tools, but they use them as necessary functions in their everyday lives. According to research done by Phillips and Trainor (2014) millennials are described as “smart, ambitious, incredibly busy, multi-taskers, ethnically diverse, and digitally literate, [they] think it is cool to be smart, are always connected, expect immediate/instant access and responses, and have a preference for experiential and engaging learning environments” (p. 103). Today, teachers frequently complain about the lack of student work completion, motivation and engagement in class. Now we must ask ourselves, “are we teaching our students according to their needs?” According to Sahin, Cavlazoglu, and Zeytuneu (2015), a teacher should use his/her “knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments” (p. 142).

It is hoped that the flipped classroom instructional model guides student learning to a whole new direction with interaction, motivation, and a fresh desire to learn. Rossi (2015) describes the flipped classroom as a “learner-centered pedagogy, in which course content is delivered outside the classroom, [allowing] class time to be more productively used higher-level engaging activities, such as collaborative and problem-based learning through” (p. 1577). In this model, instructors are able to witness the levels of student understanding otherwise overlooked and plan lessons according to student progress. The purpose of this literature review is to investigate the effect flipped instruction has on student learning as

measured through student and teacher perceptions and the impact on student achievement. It is necessary to know the effect in order to understand the purpose for implementation.

According to Phillips and Trainor (2014), two high school chemistry teachers, Jonathan Bergmann and Aaron Sams, initiated flipped instruction as a way to catch-up absent students from missing class lectures (Madden & Martinez, 2015, p. 13). Ever since, the flipped classroom emerged and has become a new instructional model. Educators from across the world are implementing flipped instruction as a new type of instructional design. It's becoming a popular pedagogical movement due to its successes with student achievement (Millard, 2012). Essentially, in a flipped classroom, instructors "assign the class lecture or instructional content as homework. In preparation for class, students are required to view the lecture. Students utilize the time in class to work through tasks, advance concepts and engage in collaborative learning" (Roehl, Reddy & Shannon, 2013). Classwork can vary from assignments involving cooperative grouping, engaging activities, or peer discussions which all include the instructor's active participation and involvement. As an educator in a middle school building, teachers often complain about their challenge to engage millennial students and reach their technological interests due to their love.

According to Gilboy, Heinerichs, and Pazzaglia (2015), "the flipped classroom is an innovative pedagogical approach that focuses on learner-centered instruction" (p. 109). The review of this topic is important because if it is found that flipped classrooms do in fact lead to higher student achievement and motivation, others can be educated on this educational phenomenon. Flipped classrooms could change the way the educational field looks at instruction in the classroom. As Millard (2012) also stated, "this is an area where the

technology development is very rapid, and adoption is very much on the upswing” (p. 29). If flipped classrooms are found to improve student achievement and motivation, an educational shift could take place. Classroom and homework time would be utilized differently and teachers’ roles would look entirely different during the school day. The impact flipped classrooms have on student learning, achievement, and motivation will be reviewed in great detail from students’ and teachers’ perspectives respectively.

The results of the review should be applied to each and every classroom seeking improvement. This instructional practice is applicable for all content areas and grade-levels. This review addresses the following questions:

1. What effect do flipped classrooms have on student achievement?
2. What are students’ attitudes and perceptions toward the flipped instruction?
3. What are teachers’ attitudes and perceptions toward the flipped instruction?

The results of the review should provide teachers with the research evidence about the effect of flipped instruction so that teachers might want to apply it to each and every classroom seeking improvement. This instructional practice is applicable for all content areas and grade-levels; the ultimate goal is to improve student learning.

Methodology

A variety of reliable sources were found when conducting research on the effect flipped classrooms have on student achievement. The University of Northern Iowa’s OneSearch! (EBSCO) was used to identify general resources and to explore the amount of information available. The broad descriptor, *flipped classroom*, was used for the initial search. More than 20,000 articles were generated from the search. Realizing there was a

wealth of information on this particular topic, the second search was refined by using more specific descriptors. Grade-level related studies were searched for by using, *flipped classroom* and *middle-school*. Finally, to be the most specific to the research topics, the researcher used *flipped classroom AND middle school AND student achievement* as the final descriptors which uncovered the most relevant resources and research studies. Additionally, in order to retrieve a variety of articles, the descriptor *flipped instruction* was used as an alternative term. Google Scholar was used to gather citation. Over forty-one empirical studies were found using OneSearch! (EBSCO). The studies were critically reviewed and analyzed.

To narrow down the wealth of information found, the resources were evaluated based on the following established criteria: (a) how current is the source? Only studies written in the last five years were used. (b) who are the authors and what's their credibility? (c) does their information answer at least one of the provided research questions? (d) how was their information gathered (case study? literature review?)? (e) how was their information cited? It was essential that the most current sources were used and that information from case studies involving the topic were reviewed. Articles (approximately 8) that did not fit all of the criteria were thrown out. In the end, only empirical studies involving flipped classrooms in the instructional education setting were kept. A research gap was found. Even though the focus of my review is about flipped classroom in middle school, not enough research was found. Therefore, studies conducted at the elementary, secondary and collegiate level were used. The thirty most current (within the last six years), reliable and authentic sources (peer-reviewed journal articles) for the given topic were found: three graduate, 22 undergrad, four high school/secondary, and one library study was found.

While researching the thirty articles found, I organized the articles according to the three major themes by using a matrix. I started the research about student achievement, then I expanded this review about student and teacher attitudes toward flipped instruction. Determining the importance student and teacher perceptions had on the success of the instructional approach, I decided to include those as topics of my literature review.

Analysis and Discussion

As mentioned before, the purpose of this literature review is to see the effect flipped classrooms have on student achievement and to understand student attitudes and teacher perceptions toward the instructional approach. Thirty peer-reviewed journal articles were reviewed for the preparation of this paper: three graduate studies, 22 undergraduate studies, four high school/secondary studies, and one collegiate library study. Three major themes emerged from the 30 peer-reviewed articles: student achievement (13 studies); student attitudes (21 studies), and teacher perceptions (4 studies), with obvious overlap. These themes will be discussed respectively in the following sections.

Student Achievement

The first theme about student achievement emerged from the 13 articles reviewed. Teachers are always looking for ways to increase student engagement and achievement. Whenever a new instructional approach is implemented, it's anticipated that the approach reaches students at a whole new level and encourages them to learn more than they did before. Thirteen studies measured the effect of flipped instruction on student achievement through quantitative means (Cilli-Turner, 2016; Flumerfelt & Green, 2013; Harvey, 2014; Ojennus, 2016; Petersen, 2016; Rossi, 2015; Ryan & Reid, 2016; Sahin, Cavlazoglu &

Zeytuneu, 2015; Schultz, Duffield, Rassmussen & Wageman, 2014; Tune & Basile, 2013; Wilson, 2013; Yong, Levy & Lape, 2015; Ziegelmeier & Topaz, 2016).

Increased Achievement. For example, Cilli-Turner (2016) conducted a quantitative action research study about flipping an undergraduate statistics course. Two sequential semesters were taught: the first semester included two traditional classes and second semester included three flipped classes. The flipped class was required to watch videos created by the textbook publisher prior to attending class and took an open-note quiz during each class to ensure students were participating. After the quiz, students were given a variety of small group activities to do in class which required them to solve equations, deepen their understanding through discussions, and sample data and claims to test in class (similar to the homework assignments given to the traditional students). After comparing the final exam for the two semesters, Cilli-Turner found that “overall grades improved significantly” in the flipped section (p. 839). The researcher concluded that “the flipped classroom group performed better on almost all of the questions and performed significantly better on [specific math tasks]” (p. 839). Interestingly though, student surveys revealed that perception of the course didn’t relate to achievement. Even though students were high achieving in this particular course, they did not necessarily prefer this type of instruction. Cilli-Turner explained that this may be due to the fact that most students didn’t know what to expect throughout this course because it was considerably different from other ways their classes have be taught (p. 838).

Similarly, Wilson (2013) found success when he flipped two of his undergraduate statistics course. He decided to flip the courses in order to motivate his 52 students and help

encourage them to read the assigned reading material. He used two similar courses taught in the traditional format from the previous semester to compare results. In his quantitative study, he implemented a “loose” flipped classroom where students were required to read the assigned material and take an online quiz via Blackboard prior to the next week’s class. The quizzes were open book and students were encouraged to use the Khan Academy (or other Internet resources) for clarification. Class time during the flipped sections was spent working on statistical procedures independently or in small groups. With this implementation, Wilson found “overall course grades [to be] 9.99 points higher in the first two sections taught using the new method than [those enrolled] in the two previous sections” (p 197). Also, posttest grades in the two flipped classes were significantly higher as well. Rossi believes this success is due to the fact that her students have been able to “do” statistics with her guidance and she has been able to give immediate feedback.

Rossi (2015) found similar success when he conducted quantitative research on a two-semester college chemistry class. Here, students were required to watch 20-30-minute video lectures prior to class via Khan Academy. In class, students received face-to-face time with the instructor and worked in groups of 3-4 using white boards to solve problems (p. 1578). Rossi averaged exam scores and found three exam scores throughout the semester to increase “15, 17, and 19% respectively” compared to the three previous traditionally taught semesters (p.1578). “Also, there was a marked improvement in student total semester point average for the classes that were inverted (9%) relative to the previous semesters traditionally taught” (p. 1578). Rossi concluded the study by saying that more semesters of the flipped format would need to be implemented before firm conclusions could be made.

Additional studies found students to show increased levels of achievement in the flipped classroom (Peterson, 2016; Sahin, Cavlazoglu & Zeytuneu, 2015; Tune & Basile, 2013). Peterson (2016), for example, in a quantitative experimental study of about forty-four college students, found achievement success when he flipped his undergraduate statistics course. In this study, Peterson simultaneously taught two statistics courses: one flipped and one traditional lecture. In the traditional section, students watched lectures for the first half of class and were given problems to work on during the second half with guidance from the instructor. The flipped classroom students were assigned to watch videos of lecture PowerPoints with instructor voice-over prior to class. There was no formal penalty for not watching the videos, but many students chose to do so (p. 43). After a 10-minute question and answer session, in-class time was spent working on the same homework problems as the traditional course but with assigned partners. Performance on Peterson's final exam "were, on average, more than a full letter grade higher [in the flipped section] than the lecture section" (Peterson 2016, p. 13). Peterson concluded the results of his study matched other studies he examined (p. 13).

Sahin, Cavlazoglu and Zeytuneu (2015) wanted to understand student views toward the flipped classroom and how it affects student achievement by adopting mixed-method methods. They flipped three out of ten undergraduate calculus courses. Ninety-six participants were involved in the study. Students in the flipped sections were required to watch three ten minute YouTube videos at various parts throughout the semester and were given pop quizzes to check for participation. Surveys were also given to understand student perceptions toward the study and will be explained later under "student attitudes". Sahin, et

al., found “students’ average quiz scores from flipped classroom sections were significantly higher ($t(94) = 3.502, p = .001$) than students’ quiz scores from non-flipped sections” (p. 146). Further, “students’ quiz results in flipped classroom sections indicated that flipped classroom experiences with video preparation resulted in better achievement in calculus compared to traditionally taught sections” (p. 148). The researchers concluded the increase in quiz scores may be due to the fact that students in flipped classroom were able to better prepare for class and had more opportunities to converse with peers and instructors (p. 148).

Tune and Basile (2013) also found academic achievement when they researched 24 graduate students in a flipped cardiovascular, respiratory and renal physiology course. In this quantitative study, researchers wanted to assess the effectiveness of a flipped classroom compared to a traditional lecture class, when given the same instructor, classroom materials and exams. Students in the flipped classes were assigned to watch videos or complete homework prior to class. In class, they received a quiz covering the material. Conversely, it was optional for the traditional students to attend class and no quizzes were given. Identical summative assessments were given to the two sections, and Tune and Basile found, “students in the flipped course scored significantly higher ($P < .05$) on the [cumulative sections] by an average of <12 percentage points” (p. 317). They, too, found a strong correlation between in-class quiz scores and final exam scores. The researchers concluded that requiring students to watch video material and take corresponding quizzes in the flipped class had assisted in the increased assessment scores. They believe the quizzes were effective and encouraged students to study and learn material before class (p. 319). Researchers concluded that archived videos, in-class activities and preclass preparation contributed to

student success.

Studies of students with various demographics were considered and investigated (Flumerfelt and Green, 2013; Harvey, 2014; Schultz, Duffield, Rassmussen & Wageman, 2014). Harvey's study (2014) of a flipped undergraduate Latin class compared two courses (traditional and flipped) taught two years apart. When conducting her quantitative study, she compared final semester exam scores between the two courses and found increases in A's and B's, with decreases in the lower grades. "The percentage of A grades was much higher in 2013 (53%, as opposed to 22% in 2012)" (p. 123). She concluded that student engagement in the flipped classroom contributed to the success of students' academic learning, for instance, ten percent of fewer students received a C or lower (p. 124).

In order to have an in-depth understanding about flipped instruction over time, Schultz, Duffield, Rassmussen and Wageman (2014) conducted a two-year, mixed-method study involving sixty-one AP (advanced placement) high school chemistry students about the flipped classroom. First, a traditional class was held and direct lecture was presented with daily homework assignments to follow. The flipped class students were required to watch assigned PowerPoint videos, take corresponding notes, and complete a video reflection on a Google Doc for accountability. Like many of the above studies, class time was spent working on academic problems in class or participating in class discussions. When analyzing the data, Schultz, et al., found that the flipped classroom students outperformed those in the traditional class in all eight assessments. "A statistically significant difference was found on all assessments with the flipped class students performing higher on average" (p. 1334).

• Interestingly though, male students in the flipped class performed significantly better than

males in the traditional classes on all assessments; but the same cannot be said for females (p. 1337). Schultz, et al., concluded that the increase in student achievement happened in the flipped classroom because students had control of their own learning, students felt like they learned twice (via video and in class), and students were offered more help during the class time (p. 1338).

Flipped instruction not only benefits students in the regular classroom, but also the at-risk students. Flumerfelt and Green (2013) examined the flipped high school government classroom of 23 at-risk students. In this small quantitative study, control and experimental groups were used during one semester. Though not mentioned, it is assumed the control group received direct instruction during their traditional class. The flipped class received screencast videos prior to class in order to gain information. Flumerfelt and Green found that due to the flip, student homework rates increased in the experimental group from 75% to 100% and all class failures were eliminated (p. 364). Since this study, they examined the continual effects of the flip and found discipline events rates have decreased significantly and failure rates in all content areas have declined in significant amounts (p. 364).

No Significant Difference. In contrast, recent studies found little to no difference in student achievement in a flipped classroom (Ojennus, 2016; Ryan & Reid, 2016; Yong, Levy & Lape, 2015; Ziegelmeier & Topaz, 2016). For instance, Ojennus (2016) conducted a quantitative study in a biochemistry undergraduate course to examine the learning gains in a flipped classroom compared to a traditional one. Identical in content, the two classes were taught back-to-back with the same instructor, assignments, daily in-class quizzes and assigned reading material. The difference was in the delivery of the instruction: the

traditional class attended a 55-minute class lecture whereas, the flipped class was assigned to watch voice-over PowerPoint videos made by the instructor prior to class. Even though the students were assigned similar work, the flipped class worked on the assignments in class with peer and instructor guidance and the traditional students worked independently at home. This study concluded there was no significant difference in student achievement between two identical flipped and traditional courses (p. 22). Based on results from the three exams and a cumulative final, “classrooms performed nearly identically on these exams” (p. 22). Ojennus indicated that “the flipped classroom [may be] more supportive of weaker students than the traditional lecture...the students that exhibited the highest normalized learning gains were not the students receiving the highest grade in the flipped class” (p. 23). But overall, the conclusion was drawn that no evidence proved the flipped class outperformed the traditional class.

Similarly, Ryan and Reid (2016) conducted a quantitative study about flipping an undergraduate chemistry course in a year-long (back-to-back semester) parallel controlled study. Interestingly, in this particular study, students selected which section, controlled or flipped, they wanted to enroll for the semester. Courses were taught in parallel by the same instructor and 323 students were involved. The traditional class received participation for attending a large class lecture three times a week and were graded on their online assignments and discussion boards. The flipped class had their content delivered to them in PowerPoint based videos, assigned three times a week, and were assigned similar homework. The flipped class had opportunities to attend discussion sessions once a week to receive participations points and receive face-time assistance regarding homework. After analyzing

the results from five common exams and a final exam for both courses, the researchers found the flipped course exam scores to have no statistical significance compared to their traditionally taught chemistry course (p. 16). They concluded, “our first result is there was no *overall* difference ($p < 0.05$) in exam performance between the flipped and control sections” (p. 16). However, when they compared different data, they found the bottom demographic of students in the flipped class to have higher cumulative test scores (5-15%) (p. 16).

“Following this trend, a significant (56%) decrease in DFW’s (Ds, Fs, withdrawals) in the flipped course was found as compared with the control” (p. 21). Ryan and Reid concluded a few factors that may have contributed to the success of the bottom demographic in the flipped class: students had more student-instructor interaction, had self-paced lectures and were engaged in the lecture material (p. 21). Also, the researchers believe there was little difference between two section’s scores because the researchers themselves could not control the cross talk between classes; students could have shared “flipped” videos.

In order to get a better idea about the effects of flipped instruction from the practitioner’s point of view, Yong, Levy and Lape’s (2015) conducted an action research study by adopting the mixed method about two math course sections involving 176 undergraduate students (86 in treatment section, 90 in control section) to determine the effect flipped classrooms have on student achievement and perception (p. 915). Students were unable to choose which section to join, but they were informed once classes began; the majority of the students consented (p. 912). Both classes met three times a week for seven weeks. Instructors made PowerPoint voice-over videos based on lectures from previous years and those videos were made *available* for both sections. Both sections received the same

homework assignments and weekly quizzes. The traditional class completed work at home and quizzes in class. The flipped class students were assigned to watch 1-2 corresponding videos before class and complete a survey at the end of each to check for accountability before class. During class time, the flipped method allowed students to work on homework problems in small groups and ask questions from instructors. Yong, Levy & Lape analyzed assessment data and attitudinal surveys to determine the success of the flipped classroom. They received both positive and negative feedback. Students reported enjoying the videos and their pace, which will be discussed later. “Data revealed that student achievement was nearly indistinguishable between the control and treatment groups.... pre-test and post-test assessments showed no differences between the [sections]” (p. 915). There were also no differences found between homework and quiz scores between to the two groups. Researchers concluded two ideas that would help explain these results: because the videos were made available to both groups, the control group could have used them and therefore helped result in similar tests scores (even though they believe this is unlikely due to survey results) (p. 918). Also, just because students in the flipped class were given opportunities to work with partners on homework assignments in class, doesn't mean those in the control group didn't work with partners outside of class (p. 918). The study is limited for its subjectivity for their personal bias.

Beyond the action research, Ziegelmeier and Topaz (2016) conducted a mixed method study about flipping an undergraduate calculus course. They compared two similar courses using two different methods: traditional and flipped. In the flipped classroom, students were required to watch a 15-minute screencast of the instructors' lecture prior to

attending class. These videos covered lecture notes, included slideshow presentations, and even included a writeable tablet software so students could see the instructor as they “wrote” mathematical processes. Students in both sections were required to take the same checkpoint quizzes; the traditional students took it at the beginning of class (lecture) and the flipped model students took it after class (which consisted of extension activities and discussions). When comparing tests scores from both courses, researchers found results to be quite similar. When comparing checkpoint quizzes, unit quizzes and final exams, “there was little difference in performance between the two sections (p -value of 0.11)” (p. 856). It was suggested that a future study be conducted for longer than one year to see substantial differences.

Students’ Perspectives Toward Flipped Instruction

The second theme is about student perceptions and attitudes toward the flipped classroom format. “The way a student perceives his/her ability impacts the decisions he/she makes regarding tasks that he/she will attempt” (Ogden 2015, p. 782). It is important to have student buy-in at any grade level when it comes to instructional approaches and classroom models. If students do not like the way a class is being taught, they will not learn. Out of the 30 research studies reviewed, 21 reported on student attitudes toward flipped instruction, both positive and negative.

Participation. Participation in the flipped classroom may include watching instructional videos prior to attending class, taking notes and/or quizzes, and participating in in-class activities involving discussions, small group work or problem practice depending on the course design. As mentioned above, Cilli-Turner (2016) conducted a study on a flipped

collegiate math course examining student achievement and student perceptions. In order to analyze student perceptions, Cilli-Turner provided the students a five-point Likert-scale attitudinal survey at the end of the course. Specific to participation in class, Cilli-Turner found the results showed “a high level of participation in the activities of the flipped classroom...on average, students reported watching 86% of the videos assigned and taking notes on 94% of the videos watched” (p. 838). She believed this high number was due to the fact that daily quizzes were given over the videos, but 76% of students reported they learned a lot from simply watching the videos (p. 838).

Also mentioned above, Sahin, Cavlazoglu and Zeytuneu (2015) found that students enjoyed participating in their flipped college calculus course. In their study, they provided a survey to their students to figure out how the flipped classroom affected them. After providing descriptive statistics to reveal student perceptions, they discovered their “participants preferred watching flipped classroom videos (53%) over reading the sections of the textbook (13%) for preparation” (p.146). The researchers also concluded “that students in the flipped classroom have higher motivation to prepare for class...[and] the flipped class prepared them better for the class and helped them learn better” (p. 148). Therefore, they believe, students who had higher motivation to prepare for class resulted in higher scores (p. 148).

Gilboy, Heinerichs and Pazzaglia (2014) participated in a university-wide initiative which required them to redesign one course into a blended learning course (50% online and 50% face-to-face) using the flipped classroom. The faculty members attended monthly meetings to meet with others and better understand the pedagogical approach. Gilboy,

Heinerichs and Pazzaglia conducted a quantitative action research study on four sections of their nutrition/dietetics classes, involving 148 students. Prior to attending each class, students were assigned to watch mini-lecture videos from YouTube, Ted Talks, etc. and complete worksheets and/or additional reading material related to the week's topic. Before class, students completed a low-stakes assessment to check for participation. During class, students worked on active learning projects related to the before-class videos and worked together in small groups to gain better understanding on various topics. Throughout the semester, students took a variety of assessments (essay, presentations, papers, peer-made assessments, and group tests) to demonstrate learning. At the end of the semester, the researchers provided students with a quantitative 5-point Likert scale volunteer survey to assess student's perception of the course. Out of the 72% of students who completed the survey, 76% of them reported that they preferred watching the class videos over listening to lectures and a majority of them (64%) would rather participate in the class activities than the lecture (p. 112). In order to successfully engage in the in-class activities, students understood the importance of being prepared for class. Additionally, 62% of the students felt they learned more effectively through the videos rather than through lectures (p. 112).

Pierce and Fox (2012) found that students believed participation was important when they conducted a quantitative study on their renal pharmacotherapy graduate students. They flipped the classroom to assess students' performance and attitudes. The 71 students enrolled in the course met twice weekly for two hours during an eight-week course. A pretest was administered at the beginning of class to help assess learning acquisition at the end of the semester. During the flip, students were asked view videos of lectures before attending class.

During class, students examined patient cases with those suffering from renal disease. Student performance was assessed by the pre-/post-tests and student perceptions were assessed by an end of term 5-point Likert survey. The survey results revealed “the majority (96%) agreed or strongly agreed that viewing the prerecorded lectures prior to class were important” (p. 3). Out of the 73% of the students who responded, 76% of them “agreed that viewing prerecorded lectures was essential to successfully participating in the [in-class] activity” (p. 3). By participating in watching the videos, 80% of the completed student surveys said they agreed that the flipped model “improved their self-efficacy to address the topics on the final examination” (p. 3). Pierce and Fox concluded, “this project supports the notion that quality, not necessarily the quantity, of student-teacher interaction is a compelling force in improving student performance” (p. 4).

Content Acquisition. Students from four studies felt that the flipped classroom helped them learn content-area concepts more concretely (Madden & Martinez, 2015; Ogden, 2015; Rossi, 2015; Sahin, Cavlazoglu and Zeytuneu, 2015). Madden and Martinez (2015) flipped the library classroom at Georgia State University as a way to provide tutorials and instructional material for students due to increasing demands and lack of availability of faculty. In this mixed-method study, the librarians wanted to teach students basic database researching skills via instructional videos, yet also schedule face-to-face workshops and informative sessions for deeper learning. In this particular study, the library pared up with the psychology department, whose courses require students to learn “PyschINFO database search strategies” as a part of the course curriculum (p. 16). In this course, students were asked to view the seven library research videos (20 minutes in length) outside of class. Then, during a

particular class session, students were required to apply what they learned by completing assignments, searches, and answer questions about how to conduct searches effectively. A standardized quiz was given to the students regarding the search process and the results were shared with the library and psychology department. In a span of three years, average quiz scores increased from 76%-88% due to the improvement of videos made over the years (p. 17). In this particular study, Madden and Martinez found students had less of a need for the library's research consultants when writing papers after the instructional writing videos were made accessible to students (p. 17). The researchers believe this pedagogical approach also lead to an improvement in the writing of student research papers according to their instructors (p. 17). Madden and Martinez found this "flipped" library approach to be desirable among the library classroom and have since increased the number of video tutorials and decreased the number of face-to-face informational sessions (p. 17).

The studies of Ogden (2015) and Rossi (2015) stated students' perception of their academic abilities increased after being enrolled in a flipped instruction course. In Ogden's qualitative research study, she flipped four sections of her college algebra courses within three semesters. Each class met for approximately 50 minutes, five times a week and instruction was flipped for two out of the five classes each week. During the flipped classes, students were assigned to watch videos made by the instructor as homework and complete a 3-4 question online quiz for accountability. Class time was spent working on cooperative learning projects, homework problems and more interaction with the instructor. To assess the 117 student perceptions of the course, Ogden used qualitative measures. "Data sources included student interviews, student self-evaluation surveys, and university course

evaluations” (p. 784). In relation to learning content, “63.2% [of the students] indicated that their feelings regarding their ability to learn mathematics had changed for the better” (p.788). Students were quoted saying “this class made me understand a lot more than I did in high school” and “it showed me that I’m capable to learn [math]” (p. 789). Students who reported not liking math even concluded they feel more capable, no longer fear math, and believe they can be successful in math in the future (p. 790). Ogden concluded by saying that this method of instruction helps students feel in control of their learning and ask questions.

As mentioned prior, Rossi (2015) flipped his college chemistry class to improve student engagement. He similarly found his student surveys to report “54% of the students perceived that their level of understanding organic chemistry was greater or much greater” after being enrolled in a flipped course (p. 1578). In addition, “94% of the students reported that the inverted classroom format either somewhat or significantly helped them with the study of organic chemistry” (p. 1578).

Similar results were found in Sahin, Cavlazoglu and Zeytuneu’s (2015) study (as mentioned above), where “the majority of the participating students (83%) stated that flipped classroom sections prepared them better for their classes throughout the semester” (p. 146). Additionally, “85% of students stated that the video lessons of the flipped classroom helped them perform better during the class” (p. 147). Only 15% of students said they were unsure whether or not the flipped classroom helped them and no students reported negative feelings regarding the flipped instruction (p. 147).

Harvey (2014), as mentioned above, flipped her Latin classroom and compared the year-end grades to her previous traditionally taught class. In her flipped classroom, she

observed the students “having a better understanding of the concepts at the point when [they] began to review them in class” (p. 119). She later stated that with the flipped method, “that students are spending more time considering each concept through detailed application [and] they develop a stronger foundation (p. 119).

Pace. While comparing the studies of McCallum, Schultz, Sellke, and Spartz (2014), Ogden (2015) and Yong, Levy and Lape (2016), all conclude that students found the flipped classroom to offer a self-paced learning environment. Ogden (2015), as mentioned previously, explained that in her college algebra class the students reported (in self-evaluation surveys and interviews) appreciating the ability to control the pace of assigned instructional videos by rewinding or pausing (p. 787). An example from her research surveys states, “online videos are extremely helpful. It’s nice to sit down and take it at my own pace” (p. 787).

While not all of Yong, Levy & Lape’s (2015) feedback was positive regarding the flipped classroom, as mentioned before, they uniquely found that the ELLs (English Language Learners) within their undergrad math courses found the flipped classroom to be especially useful. During this mixed-method approach, Yong, Levy & Lape analyzed assessment score data and attitudinal surveys to determine the success of the flipped classroom, they received both positive and negative feedback. In terms of self-pacing, ELL students reported pausing, rewinding and playing videos at their own pace allowed them to catch any English vocabulary they would have missed in a fast-paced class (p. 917). One student reported “in class, if we had practice problems, I would not even have a chance to try the problems and the class would have moved on, but the videos let me pause and take as

much time as needed” (p. 917). Almost all students reported this feature to be helpful. Another student responded, “the videos were awesome. Incredibly helpful when I was confused about an idea; I could re-watch that snippet again and again” (p. 917). Very few students reported either not liking the pace of the video or found it confusing to replay the video (p. 917).

McCallum, Schultz, Sellke, and Spartz (2015) conducted a qualitative exploratory study to examine the correlation between of student academic success and success in the flipped classroom. Here, researchers used focus groups as a way to gather feedback from students about their satisfaction and engagement in a flipped course in which they were enrolled. For their six focus groups, they used 60 undergraduate students from three flipped mathematic courses offered at the university. All three courses had similar flipped designs: assigned instructional videos as homework and provided collaborative, problem-solving activities in class with instructor guidance. The focus group interviews consisted of recorded questions and a small survey. Overall, researchers found the approach to be viewed by students as positive and led to academic success (p. 46). When it comes to the pacing of the course, students responded positively. One student noted “on [the videos] you can pause it and take a note. In the classroom sometimes when she’s lecturing, you miss some things...this time you can stop it and go at your own pace” (p. 45). Students believe this pace led to easy studying techniques. Another student stated, “when it comes to exams...I could go back to the [video] session and just watch the good 20-minute session and be completely refreshed on what I’m about to study for” (p. 47). Finally, this pace allows students to stay organized and take detailed notes (p. 48).

Learning Styles. Three studies found that flipped instruction benefits students with a variety of learning styles (McCallum, Schultz, Sellke, & Spartz, 2015; Ogden, 2015; Ziegelmeier & Topaz, 2016). In Ziegelmeier and Topaz's (2016) mixed-method college calculus study, as mentioned above, they found that the "flipped model certainly allows more time for different modes of active student learning...the body of evidence is growing that such endeavors support students in their learning" (p. 856). They also stated that the variety of activities "can appeal to many types of student learners and add dimension to any course" (p. 855).

In Ogden's (2015) study, as mentioned prior, students reported how the flipped classroom helped them learn on their self-evaluation surveys. One student reported "I love watching the online lectures then going to class and getting a small review on it then doing problems. I really feel like it significantly helps me learn...I love it" (p. 787). They later went on to state "you learn it online then in class it's reinforced and you can ask questions that are more informed" (p. 787). The flipped classroom allowed students to ask questions in class they would not have during the typical lecture. Students felt this instructional approach supported their multiple individual needs (p. 790).

McCallum, Schultz, Sellke, and Spartz (2015), as mentioned above, found the flipped classroom approach to meet a variety of students, according to their responses in their provided focus groups. One math student was quoted saying "I tend to zone out in class sometimes, so it's just nice to have it at home and you're just paying attention to your course and doing something" (p. 47). Another student reported "I feel like the activities help a lot more...we are doing activities every class period, so it does help reinforce the concepts that

were learned in the chapter (p. 48). Finally, students feel like design is easier than the traditional method. “I feel like it’s just easier to understand what is being taught in class, instead of it all being done in class, and you come with background knowledge and stuff” (p. 48).

In contrast, Khanova, McLaughlin, Rhoney, Roth, and Harris (2015) conducted a mixed method study researching a flipped psychiatry/neurology pharmacotherapy course in hopes of understanding student perceptions about the course. The students enrolled in the course revealed that the flipped classroom was, indeed, a preferred way of instruction, but that the approach may not be the best form of instruction for some learners. During the mixed method study, instructors created online modules for students to view, each explaining a particular disease. During the videos, instructors embedded “quick check” assessments asking students questions about what was being viewed. There were no assigned class times for this course, but students were given the option to meet for review sessions before exams. Here, students were able to meet with instructors and ask questions to clarify concepts. Khanova, McLaughlin, Rhoney, Roth, and Harris used pre-course and post-course surveys (with a 4-point Likert scale) to qualitatively evaluate the 171 students’ perceptions. Two open-ended questions were included on the post-course survey. Pre-course survey results found positive results, that “72% of participants indicated that they preferred the traditional lecture course format over the flipped classroom model” (p. 3). Once they examined the post-course survey, they found “83% indicated they preferred the [flipped classroom], a significant increase from the [pre-course survey]” (p. 4). But, not all reviews were positive. Even though students who attended the review sessions reported the sessions enhanced their

learning, some students felt “‘most everything was self-taught,’ and there was lack of guidance from professors” (p. 5). Students also reported experiencing challenges with the design. Researchers believe these challenges “can be attributed to known differences in cognitive strategies people use in learning from screen vs paper-based materials, including poorer time management and distractibility when learning from screen” (p. 6). Not all students learn best through visual and auditory means. Finally, a student quoted, “I would much rather come to class and be lectured” (p. 5). Despite the contradicting survey results, researchers believe the information received is important for the teaching practice (p. 7).

Format. Four studies specifically mentioned the design of the flipped course was seen as a beneficial to students (Love, Hodge, Grandgenett, and Swift, 2014; McGivney-Burelle and Xue, 2013; Roach, 2014; Vazquez & Chiang, 2015). For instance, Vazquez and Chiang (2015) conducted a large mixed-method case study on a microeconomics undergraduate course and student experiences within it. Nearly 18,000 students were enrolled in two flipped courses taught by the same instructor during one semester. In this flipped design, students had to complete three weekly assignments before attending class: two pre-lecture assignments and a weekly quiz. The pre-lecture assignments involved multimedia slideshow presentations with instructor audio. Inside the videos, instructors embedded formative assessments to check for understanding and accountability. The assessment questions had to be answered correctly before students could move forward on their assignment (p. 384). Additional quizzes were given online weekly over video and in-class material. Students met in large-group with the instructor twice a week where the first 20% of class was lecture and the remainder was dedicated to active learning activities (p. 384).

Students were also given the chance to meet with a TA and a small group (30-35) to ask questions and seek clarification in a small group setting. After analyzing assessment scores, surveys and other empirical data (observations, small group session discussions, etc.), researchers found students typically enjoyed the format of the flipped classroom. “A compelling conclusion from this case study is that students generally do not like using a textbook to approach concepts seen for the first time” (p. 385). Students reported hardly ever reading the textbook before coming to class. But in this flipped setting, “students overwhelmingly (92%) prefer this medium by a significant margin. This finding is also supported empirically by the number of students who chose to watch the pre-lecture videos, even when it was not required” (p. 386).

Love, Hodge, Grandgenett, and Swift (2014) conducted a linear mixed-method study on three sections of an undergraduate algebra course and found their students had a positive attitude toward the flipped instructional format as well. Fifty-five students were involved and divided among one flipped and one traditionally taught course section. Both sections received the same information and completed the same assigned coursework. The flipped section was encouraged to review course materials before class (videos, readings, etc.) but it was not a requirement. Class time was used for interactive, hands on activities and to solve assigned problems in pairs (p. 320). These students had to complete an assessment before class as well, checking for understanding. The lecture class time was divided into halves: the first half was for student-instructor questions and problem solving help and the second half was dedicated to lecturing for the upcoming week. Both sections were quizzed weekly. At the end of the semester, the assessment scores and surveys (flipped class only) were analyzed

to check for student perception. The 4-point Likert scale survey results showed that “74% of students in the flipped section had a positive attitude about the flipped classroom approach...and 74% agreed that working problems on the board helped them remember the course material better and was more fun than a traditional lecture course” (p. 322). At first, not all students were comfortable with publicly displaying their problem solving on the board, but eventually, 81% were confident in doing so (p. 322).

Roach (2014) found high levels of student satisfaction after “partially flipping” his college economics course of almost two hundred students. He conducted qualitative research to assess student attitudes. This particular course design was unique. Students were informed at the beginning of class that they were involved in a flipped classroom and were asked to watch one video per week. They were also told information from the videos would be found on assessments. Content-related videos (via Khan Academy, TED talks, etc.) were posted on a blog and left there for students to refer to whenever necessary. The economics students attended “normal” lecture classes twice a week and attended an engaged “partially flipped” class once a week. During this “Friday Flip”, students would split into small groups and work on activities and problems that related to the videos and lectures (p. 78). Students were surveyed twice to collect qualitative data; once at midterm and once at the final exam. Researchers found the flipped format was well-received by students with “76% of students responding that flipped learning helped them learn...[and] 94% of students responded that this class was more interactive than other courses they had taken before” (p. 83). Students responded to the layout of the course. One student said they “think a lot of learning types could really ‘get it’” (p. 79). Roach concluded that:

“by engaging students with media-type that they can appreciate more than the standard textbook is entirely possible that course material is covered more quickly because the students have a better understanding of the material before coming to class, and thus deeper learning can occur in a short period of time” (p. 83).

McGivney-Burelle and Xue (2013) found similar results when they asked their students about their flipped calculus class experience. The goal of their mixed-method study was to examine the benefits and challenges of the flipped classroom. They did so by looking at student achievement through assessment data and student perceptions through focus groups and surveys. Two almost identical classes were compared (section A and B); the only difference was chapter 6 was made flipped in section B. During the instruction for this chapter specifically, students were asked to watch videos of instructional content before class and were expected to complete an entrance slip containing two questions about the homework. Class time was spent entirely on homework, group work, and peer discussions. When examining achievement during the flipped chapter, not only did assessment scores in section B prove to be four points higher than section A, but survey answers revealed positive responses to the flipped environment. “Specifically, [students] said they liked being able to do more challenging examples in class rather than listen to a lecture...and they enjoyed having the instructor available in class to help them while they worked on problems” (p. 483). Focus group attendees also had a strong preference for the instructional model. One specifically said,

“When you’re in class...you can shake your head and you know every

step...and then when you go back by yourself it is always a different story because there you have no guide to help you. Watching the videos and doing the examples with it...it like boosts your confidence...it's like, 'oh yeah, I understand this concept' ...To do problems your own pace...was a lot more effective" (p. 483).

Overall, McGivney-Burelle and Xue felt students preferred this type of pedagogy (p. 485).

Overall Student Satisfaction. Eight out of nine studies reported students having a high level of overall satisfaction toward the flipped classroom (Butzler, 2015; Gecer & Gag, 2012; Gross, Marinari, Hoffman, DeSimone, & Burke, 2015; Jamaldin & Osman, 2014; Kong, 2015; McCallum, Schultz, Sellke, & Spartz, 2015; Phillips & Trainor, 2014; Sahin, Cavlazoglu & Zeytuneu, 2015). Butzler (2015) conducted a unique quantitative study on a flipped chemistry course at an open-enrollment college. The purpose of the study was to provide insight to student perceptions in the course and determine how class rank and high school academic success relates to success in the flipped classroom. Three sections of 122 students were involved in the study: one traditional, one flipped and one Stealth Flipped. All three sections taught the same content and identical assessments were used. The traditional course received class lecture with assigned homework, the flipped class students were assigned to watch those lectures online before class and complete homework in class, and the Stealth flipped section listened to vodcasts of the teacher and/or reading material and assessed their learning through formative assessments via Google Forms (p. 1574). "The differences in mean course grades are not significant when comparing overall course grades

in Lecture, Flipped and Stealth Flip classes” (p. 1574). However, they did find a correlation between high school class rank and overall course grades. “The higher a student’s high school class rank, the higher the overall course grade” (p. 1575). Researchers also concluded that success in high school math and chemistry may have made students better prepared for this course. Overall, Butzler concluded “most students with all academic backgrounds are more satisfied in a flipped classroom” (p. 1575).

Gross, Marinari, Hoffman, DeSimone, & Burke (2015) conducted a quasi-experimental study on six courses at the collegiate level: three flipped and three traditional (course title or subject unknown). All courses received the same materials and covered the same topics. After analyzing course exams, researchers could not conclude that the traditional course did worse than the flipped one. But, the quantitative survey given to only flipped course students revealed the students preferred the pedagogy and reported high levels of satisfaction. Results revealed four themes: students believed that the use of technology made learning easier, class activities made for effective ways to learn, they felt the course was engaging, and they’d be likely to recommend a similar course design to a friend (p. 43). Instructors also noted numerous occasions where students asked whether other flipped courses would be offered at the university (p. 42).

Kong (2015) conducted a three-year quantitative study at the secondary level to investigate the critical thinking impact flipped classrooms have on students in core-subject classes. Four whole-class Humanities cohorts were arranged to go through this three-year trial and 124 students participated in the study. The entire pedagogical approach was supported technologically and most materials were provided electronically to students.

Course lessons were three part: (part 1) lesson prep where students pre-read material online and brainstormed on upcoming topics, (part 2) in-class knowledge learning via teacher and worksheets, (part 3) post-lesson learning with class discussions and activities (p. 20). To assess the development of critical thinking throughout the three-year study, Kong developed multiple choice critical thinking test papers. After analyzing the results from these assessments, he found students “demonstrated a progressive growth of overall competency in critical thinking skills across three years, with the test mean marks increased from 12.13 to 16.88” (p. 21). Semi-structured interviews found that “the teachers and students valued the pedagogical way of providing guidance for students’ group sharing for fostering critical thinking skills development” (p. 16). It was noted in the study that teachers observed a change in critical thinking abilities among students. And although Kong’s (2015) three-year study of critical thinking skills reported not experiencing any issues with technology, they did mention issues with slow and unstable Internet connection over the course of the study (p. 27).

As mentioned above, McCallum, Schultz, Sellke, and Spartz (2015) examined student perception on their flipped undergraduate mathematics course and found the majority of students to find the experience positive. During their qualitative study, they surveyed 60 of their students and “51 (85%) agreed (30% somewhat agreed, 30% agreed, 25% strongly agreed) that the flipped approach helped their learning” (p. 52). Further, 60% said they would choose a flipped classroom over the traditional setting (p. 52). During the conducted focus groups, researchers found some students liked the in-class experience in particular. One student stated, “I think this learning in-class just engages you more; I don’t sit there and

space out. Being interactive and doing activities kind of makes you more active during the class time” (p. 48).

Sahin, Cavlazoglu and Zeytuneu (2015) found several student benefits to implementing the flipped classroom in their mixed method college calculus course, as detailed above. Due to implementation, they found positive “changes in [student] preparation habits before attending class, improved levels of understanding and higher levels of self-efficacy during the lectures” (p. 148). Researchers also found students had less anxiety of missing something in class because they could re-watch the videos and also had opportunities to ask questions in class (p. 148). Researchers also believe students have the ability to watch videos whenever they want, which means they aren’t pressed for time.

Jamaldin and Osman (2014) examined a flipped TESOL (Teachers of English to Speakers of Other Languages) statistics course and found various levels of engagement (behavioral, emotional, cognitive, and agentic). The quantitative study was conducted involving 24 undergraduate TESOL students enrolled in a Malaysian Instructional Design course. The students were provided with a structured questionnaire (with a 7-point Likert scale) to gauge their engagement and perceptions about the course. Most of the students involved found themselves to “feel good” in class and felt emotionally engaged in class (p. 129). Due to participation in the flipped class, Jamaldin and Osman concluded that the study “has shown that using the flipped classroom to enhance student engagement promoted active learning during activities both inside and outside of class” (p. 129).

Phillips and Trainor (2014) examined millennial perceptions toward the flipped classroom during a qualitative study. The researchers emailed a survey to accounting majors

at a Northeastern university to examine student attitudes toward the flipped classroom and their experiences within them, specifically millennial. They received a response rate of 17%, leaving a sample of 125 student responses (p. 108). Students were asked to respond to questions about perception and familiarity with the course using a 5-point Likert-scale survey. They were also given the option to give open-ended feedback with suggestions for the pedagogical design. While only 18% had previous experience with the pedagogy, “68% of [those] participants found the flipped classroom to be either effective or very effective” (p. 109). Surprisingly, 71% of the participants have never heard of the flipped classroom.... [and] 74% responded that the flipped classroom sounded like a good idea and would be will to experience [it]” (p.109). Millennials do appreciate modern ways of instruction. This study proved that “students generally wanted either lectures and/or lecture materials provided online and not during class time. Students also asked for videos and other resources to supplement the materials covered in class” (p. 110).

Sixty-seven undergraduates were involved in Gecer and Gag’s (2012) qualitative study on a blended Computer II course. In this blended environment, students had face-to-face learning experiences along with e-learning methods (via Learning Management Systems). Data was collected through seven open-ended interview questions sent to students via the internet. Researchers coded the results and found themes among the answers of the students. They found student responses to most frequently sat that the course design made them actively participate in class and homework (p. 440). One student reported, “we grasped the need of coming to class prepared and doing assignments made our active participation to the course” (p. 440). When asked which factors affected motivation, “easy access to learning

materials in electronic environment (85%)’ was found to be the most effective factor” (p. 440). Other positive responses revealed “the computer made their learning more permanent” and “the students could control their own learning and arrangement of skills in [a] blended learning environment” (p. 441). All in all, students found the experience to be useful and positive.

In contrast, one study found the flipped classroom to have negative student perceptions toward the classroom. Cilli-Turner (2016), as mentioned above, found perplexing results in regard to overall student satisfaction of the flipped classroom in her quantitative study. In her flipped undergraduate statistics course, she measured student achievement and attitudes toward the flipped pedagogy. While her attitudinal survey found that some students liked the flipped classroom, “roughly the same percentage of students (40%) reported that they liked the flipped classroom method as reported that they did not like the method (37%)” (p. 838). Interestingly, Cilli-Turner discovered that some students who reported liking the flipped classroom also reported that they didn’t prefer this way of teaching. Cilli-Turner concluded “this may be due to the flipped classroom challenging students’ notions of what to expect in a statistics course...students may be unhappy when presented with a learning environment that is considerably different [than] what they are used to” (p. 838). Regardless of their feelings toward the pedagogy, students reported high levels of participation and significantly increased grades during the study. (p. 838-839).

Teacher Perceptions.

The majority of research centers on student achievement and attitudes, but teacher perceptions were considered in six studies (Cilli-Turner, 2016; Guerrero, Beal, Lamb,

Sonderegger, & Baumgartel, 2015; McGivney-Burelle & Xue, 2013; Phillips & Trainor, 2014; Sahin, Cavlazoglu and Zeytuneu, 2015; Ziegelmeier & Topaz, 201).

Positive Perceptions. When measuring the learning outcomes and attitudes in a flipped statistics course, Cilli-Turner (2016), as mentioned previously, reflected on her role as the instructor. She found that in-class monitoring of student learning gave her a better grasp of what students were finding challenging (p. 836). She went on to state that, “I preferred teaching in the flipped classroom much more. Students were more engaged with the material and with each other than in the traditional class” (p. 840).

Guerrero, Beal, Lamb, Sonderegger, & Baumgartel (2015) investigated the effects the flipped classroom had on student achievement and attitudes and interviewed teachers about their perceptions. This mixed-method study was conducted in two undergraduate math courses, involving 68 students. The method used in this study is very similar to the other formats presented: the traditional course students received a lecture approach during class and were assigned homework to complete outside of class. The flipped course students received instruction outside of class through electronic means. They were encouraged to take notes and spent class time working on hands-on activities and practice problems. Pre- and post- exams, mid terms, finals, attitudinal surveys were used to gather data. While the data revealed the flipped class didn't necessarily improve student achievement, it was reported an enjoyable experience for both students and teachers (p. 827). To gain insight from the instructors involved in the course, two-hour long interviews were conducted at the middle and end of the semester. These interviews were audio recorded and researchers took notes on the instructor responses (p. 821). “According to the instructor, students in the flipped section

seemed more aware of the content being covered each day and came to class prepared to engage with group members on explorations of content introduced overnight in the online videos” (p. 826). Instructors felt learning the content before attending class made them prepared. “These students were engaged with the content at a deeper level and demonstrated higher levels of perseverance in problem solving than students in the other section” (p. 826). The instructor did note that she felt students showed less enthusiasm and motivation as the course progressed. She noted that students seemed bored with watching the videos because note taking lacked as did the amount of times the videos were watched (p. 827). Overall, she felt it was an effective approach, but may not be necessary for all topics in an entire course (p. 827).

Sahin, Cavlazoglu and Zeytuneu (2015), as mentioned above, also reported on teacher perceptions in their mixed method calculus study. They found that teachers enjoyed monitoring students’ work in class. “Doing homework in class provides great opportunity for teacher’s to see students’ difficulties and learning styles” and teachers can adjust lessons to fit the students’ needs. (p. 143). They also found that teachers enjoy having students come prepared to class, in this particular setting.

Downfalls. However, the flipped instruction can have some minor downfalls for instructors. Four studies (McGivney-Burelle and Xue (2013); Phillips & Trainor, 2014; Sahin, Cavlazoglu & Zeytuneu, 2015; Ziegelmeier & Topaz, 2016) reported some negatives found in the flipped classroom. McGivney-Burelle and Xue (2013), as mentioned before, summarized some thoughts for instructors at the end of their mixed method undergraduate calculus study. They noted that it is possible to cover the same amount of material in a

flipped classroom as in a traditional classroom. They also made it known that creating the instructional flipped videos takes an extensive amount of time to create. “On average, for every class meeting, it took us about 1.5 hours to make one short video and an additional 45 minutes to prepare the quiz and in-class problem set” (p. 484). But, once technical issues are resolved and videos are made quicker, instructors feel the time pays off. “Once a polished set of videos and course materials are created the preparation time will be significantly reduced” (p. 484).

Sahin, Cavlazoglu and Zeytuneu found that “preparing a good quality video can be very time consuming for teachers and some teachers can be resistant because of their lack of experience with the necessary technology” (p. 144). Flipped instruction does require a large amount of preparation at the beginning of implementation.

Phillips and Trainor (2014) and Ziegelmeier and Topaz (2016) also found that the effort for designing material for the flipped instruction can be time consuming for teachers. They suggested starting out small by slowly moving away from lectures, implementing videos under 20 minutes, and not be repetitive between lecture videos and class discussions (p. 105) Developing check-point quizzes and online screencasts may take a lot of planning but Ziegelmeier and Topaz (2016) stated that screencasts are necessary for student learning and believe the majority of their students find those resources valuable. (p. 855).

Conclusions and Recommendations

Instructors are striving for ways to meet the needs of today’s learners through motivating and engaging means. Technology must be integrated in today’s classrooms in order for students to meet the demands of their future. It is clear that flipped instruction has

become an increasingly popular instructional approach in the collegiate areas of math and science. Research from this literature review has proven it to be a more positive and beneficial strategy than the opposite. Among the research reviewed, themes emerged in the areas of student achievement, student attitudes and teacher perspectives, and each had their own findings.

Student Achievement

Out of the thirteen articles reviewed regarding student achievement and the flipped classroom, nine studies found an increase and four studies did not. No studies were found to have a negative effect. The structure of the classes were similar; students were required to watch an instructional video prior to class, possibly get assessed over the new material, and class time was spent working on cooperative group activities and where application of the knowledge was put into place. When determining what made certain studies of increased achievement successful and others not a variety factors must be considered. An even number of quantitative and mixed method research studies were used and a variety of control/experimental groups were utilized.

Nine studies found students to increase achievement through quantitative means and a variety of achievement levels were represented among the studies. An increase in assessment scores, grade-level grades or homework completion were found in all studies (Cilli-Turner, 2016; Flumerfelt & Green, 2013; Harvey, 2014; Petersen, 2016; Rossi, 2015; Sahin, Cavlazoglu & Zeytuneu, 2015; Schultz, Duffield, Rassmussen & Wageman, 2014; Tune & Basile, 2013; Wilson, 2013). Most researchers concluded that the flipped classroom found success because the pedagogy is hands on. The “class time” sessions were seen as beneficial

to students because it was spent working on problems with the instructor's guidance and availability to answer questions or provide clarification. Group activities and partner problem solving were reported to reinforce concepts (Petersen, 2016; Sahin, Cavlazoglu & Zeytuneu, 2015; Wilson, 2013). In the flipped classroom, students were better prepared to come to class and were ready to learn. Finally, having archived videos at the students' disposal assisted in student success. Students were able to review material whenever necessary (Tune and Basile (2013).

Researchers who found "no significant difference" offer explanations for their results (Ojennus, 2016; Ryan & Reid, 2016; Yong, Levy & Lape, 2015; Ziegelmeier & Topaz, 2016). Some researchers believe the instructional design is only successful for a certain student demographics or learning styles. Ojennus' (2016) thinks the flipped classroom may be more supportive of weaker students (p. 23). Ryan and Reid (2016) believe the bottom demographic of students benefited most; they had the highest cumulative test scores, respectively, and decreased the numerous of Ds, Fs, and withdrawals because of the flip (p. 21). Students of other demographics did not experience similar results.

The format could have also contributed to the lack of success in some studies. Ryan and Reid (2016) and Young, Levy and Lape (2015) concluded that their study findings could have been affected by the sharing of videos within their mixed method study. In these cases, researchers could not control cross-talk or video sharing among the control and experimental groups, which could have affected the study results. Additionally, students within the flipped classroom could have shared ideas from their hands-on activities and group discussions with students in the control group (Yong, Levy & Lape, 2015). On a positive note, research within

the no achievement studies reported students found the experience to be positive. All in all, no researcher stated the instructional approach had negative effects or a reverse effect. Most plan to tweak parts of their methods, will continue to use the pedagogy, and hope determine its longitudinal effects in the future (Ojennus, 2016; Ziegelmeier & Topaz, 2016).

Student Attitudes

Student attitudes toward the flipped classroom were almost unanimously positive in the areas of participation, content acquisition, pace, learning styles, format, and overall satisfaction. Students found the instructional approach to be motivating, engaging and unique. Twenty-one research studies reported on student attitudes toward the flipped classroom.

Participation. Studies reported that the flipped classroom encouraged them to participate in the assignments, especially when quizzes were involved (Cilli-Turner, 2016; Gilboy, Heinerichs & Pazzaglia, 2014; Pierce & Fox, 2012; Sahin, Cavalazoglu & Zeytunue, 2015). Researchers also found that students liked watching videos over reading textbook material and listening to lectures (Sahin, Cavalazoglu & Zeytunue, 2015; Gilboy, Heinerichs & Pazzaglia, 2014). Participating in watching the assigned videos were important and essential. Students found the videos helped them learn and made them feel more successful on in-class activities and assessments (Gilboy, Heinerichs & Pazzaglia, 2014; Pierce & Fox, 2012; Sahin, Cavalazoglu & Zeytunue, 2015). Finally, students felt participation in in-class discussions were helpful. Those opportunities provided students the ability to seek clarification, practice problems with instructor supervision, and learn simultaneously with

others (Cilli-Turner, 2016; Gilboy, Heinerichs & Pazzaglia, 2014; Pierce & Fox, 2012; Sahin, Cavalazoglu & Zeytunue, 2015).

Content Acquisition. Most students felt like their learning was enriched through the flipped classroom and they felt more informed about the topics presented. Researchers reported students felt more confident in specific content areas because the videos reinforced material and the in-class discussions answered any questions they had (Harvey, 2014; Ogden, 2015; Rossi, 2015). With the help of the flipped classroom, some instructors reported that students became more independent and self-confident, especially in the area of writing (Madden & Martinez, 2015). Overall, students reported feeling more prepared and better informed for class because of this course design (Harvey, 2014; Ogden (2015), Sahin, Cavalazoglu & Zeytunue, 2015).

Pace. The pace of the classroom was found to be enjoyable for all types of students. The ability to pause, rewind, and replay scenes from the assigned videos was deemed helpful in the studies of McCallum, Schultz, Sellke, and Spartz (2014), Ogden (2015) and Yong, Levy and Lape (2016). Some students also reported that the pace of the self-controlled videos helped with note taking. Because the videos could be paused and replayed, students had enough time to write adequate notes or hear repeated information (McCallum, Schultz, Sellke, and Spartz (2014). Yong, Levy and Lape found these techniques especially helpful for their ELL students.

Learning Styles. Most studies agree that the flipped instruction reaches a variety of learning styles and can be beneficial to all students because of its active, hand-on learning component (McCallum, Schultz, Sellke, & Spartz, 2015; Ogden, 2015; Ziegelmeier & Topaz,

2016). Through attitudinal surveys, students reported that the format helps reinforce concepts and meets their individual needs (McCallum, Schultz, Sellke, & Spartz, 2015; Ogden, 2015).

In contrast, Khanova, McLaughlin, Rhoney, Roth, and Harris (2015) reported that their students believed that the flipped classroom may not be for all students. Students felt the class seemed self-taught and there was little guidance from the instructors (p. 5). Students also felt not everyone learns best from a screen and therefore, may have issues with distractions when watching the videos. Students with poor time management and those who wish to take paper-pencil notes may not enjoy this way of instruction (p. 5). All in all, researchers still believed the takeaways from their study can be used to improve the implementation of the design.

Format. Like mentioned above, students do not necessarily like reading the textbook material and therefore enjoy this instructional format. Because students don't typically like reading the textbook and often don't, it's been found more successful to have students watch the videos and it's seen as an easier task (Roach, 2014; Vazquez & Chiang, 2015). Students believe the flipped classroom format helps them learn and reinforces material in detail. Working through problems in-class, whether on the board or in small groups, helps students retain the information better (Love, Hodge, Grandgenett, and Swift, 2014; McGivney-Burelle and Xue, 2013; Roach, 2014). The whole format was reported as "more effective" when compared to the traditional lecture format (McGivney-Burelle and Xue, 2013).

Overall Satisfaction. Numerous studies reported students having had a positive and encouraging experience in overall satisfaction in a flipped classroom (Butzler, 2015; Cilli-Turner, 2016; Gecer & Gag, 2012; Gross, Marinari, Hoffman, DeSimone, & Burke, 2015;

Jamaldin & Osman, 2014; Kong, 2015; McCallum, Schultz, Sellke, & Spartz, 2015; Phillips & Trainor, 2014; Sahin, Cavlazoglu & Zeytuneu, 2015). Providing content through technology can be fun and exciting for some. Students felt engaged and motivated in this type of pedagogy and would likely to take another flipped course in the future (Gross, Marinari, Hoffman, DeSimone, & Burke, 2015; Jamaldin & Osman, 2014; McCallum, Schultz, Sellke, & Spartz, 2015). One study specifically stated that they believe the flipped classroom format improved students' self-efficacy and made them confident in their own learning (Sahin, Cavlazoglu & Zeytuneu, 2015). Kong believed this design improved the students' critical thinking skills (p. 16).

Two downfalls to the flipped classroom were mentioned. One study reported that some students may have culture shock to the new design, may not work best in cooperative learning environments and may be stressed with the amount of responsibility they would have to hold in this environment (Phillips & Trainor, 2014). Similarly, Cilli-Turner (2016), found the same amounts of students who liked the pedagogy were the same amount of those who didn't. She concluded that students may not like experiencing a new instructional approach so different from what they're used to (p. 838). Even if students didn't like the approach, she noted students improved their scores and participated well in the course.

Teacher Perspectives

Similar to student responses, teacher's perspectives toward the flipped instruction were generally positive throughout the entirety of the research. Teachers enjoyed watching students learn, were able to get a clear sense of the learning occurring, and could adjust lessons accordingly (Cilli-Turner, 2016; Guerrero, Beal, Lamb, Sonderegger, & Baumgartel,

2015; McGivney-Burelle & Xue, 2013; Sahin, Cavlazoglu and Zeytuneu, 2015). Teachers reported feeling that this instructional format kept students engaged and allowed them to reach a deeper-level of thinking through small group activities (Cilli-Turner, 2016; Guerrero, Beal, Lamb, Sonderegger, & Baumgartel, 2015) One study compared an instructor's perspective on teaching both a traditional and flipped model class. They found that the same amount of information could be taught in both courses, in the same amount of time (McGivney-Burelle & Xue, 2013).

Instructors reported in three studies that the flipped classroom can have some minor downfalls. First and foremost, it was quite common to hear that the amount of time it takes to make the corresponding videos for the flipped instruction is extensive. Because of that, teachers may be frustrated or apprehensive to try the pedagogy (Phillips & Trainor, 2014; Sahin, Cavlazoglu and Zeytuneu, 2015; Ziegelmeier and Topaz (2016). Teachers also experienced technical issues that could also hinder others from making the necessary videos. But, once an instructor is experienced and learns how to work the technology, all of these studies agree, it's necessary and worth the payout.

Recommendations

There are three types of recommendations. These involve research, teachers and policy makers. First, recommendations for future research are suggested as follows:

Research. Currently, according to the studies found in this literature review, research only been done in the content areas of math, science, pharmacy, library studies and computers. It is recommended that future research be done in a variety of other content areas, specifically writing, reading, language and CTE (Career and Technical Education). After

reading the research and obtaining a clear understanding of how the approach is structured, I strongly recommend that the pedagogy can be implemented into any curricular area. Having the background as a teacher of CTE, it would be quite applicable and essential to see effect the flipped classroom can have in those areas. Understanding now how the flipped classroom can be motivating, engaging and academically achieving, I think it's time we see how it can affect students in other content areas. Currently, there are no studies on courses in CTE, let alone the content area I teach, FCS (Family and Consumer Science).

It is also recommended that research be done in the primary and secondary grade levels. Currently, there is little to no research for students younger than the high school level. It would be interested to see how the affects are different among different grade levels. I feel this pedagogy would fit quite well with younger students, especially those who cannot read. Watching a video as homework would be attainable for them and assumed successful. Future research for K-12 grade levels is recommended.

Finally, it is recommended that more research be done by practitioners, not just researchers. Most studies are conducted by outsiders, those that are not in the classrooms full-time. Being able to compare studies conducted by practitioners could greatly influence the way others implement the design.

Teachers. The second recommendation is for teachers. It is important for teachers to adopt appropriate pedagogy when planning flipped instruction. They must take opportunities to engage in new practices, take the time to learn the new approaches, and implement them accordingly. They can learn implementation ideas from other educators, observe others in action in their own classrooms, or ask for mentors in the building to oversee their pedagogy

adoption. Students are changing the way they learn and therefore, teachers must change the way they teach according to their needs. Embracing in professional development and finding confidence in new ways to teach can truly impact a child's future.

Policy Makers. Finally, it is recommended that policy makers provide technical support to those wanting to implement the design and give educators time to collaborate with one another. With the responsibilities of the teacher increasing, the amount of time to research, investigate and implement new strategies is going to the wayside. Teachers no longer have the time to collaborate like once they used to. If given the time to collaborate and learn new instructional approaches, amazing things could happen inside the classroom. Professional development should be offered with skilled coaches offering explanations, tips and resources for the teachers. We cannot expect change to happen alone, we must all work together.

In conclusion, I believe the flipped classroom can have a positive impact on both students and teachers. I believe it fosters learning, increases motivation and inspires learning in a new way. I recommend teachers trying this pedagogy in their classroom in at least one way or another after all, it may be the future way all teachers teach. After researching the flipped classroom extensively, I have a new understanding and appreciation for the instructional design. Just like any other implementation inside the classroom, it takes time and effort on behalf of the teachers and students. If a new pedagogy can increase student achievement, with accountability and rigor, provide students with positive attitudes in motivation, enthusiasm and engagement, and leaves the teacher feeling like they've reached students in a whole new way, I'd consider it successful. Each student deserves the

opportunity to get excited to learn, according to their own style, and find success in what they do. The flipped classroom may be the answer.

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