Students' Learning Outcomes and Self-efficacy Perception in a Flipped Classroom

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Abstract: The purpose of this study was to investigate the implications of the use of flipped teaching strategy on preservice teachers' learning outcomes, self-efficacy and perception. The investigators employed a within-subject design with independent variable: the teaching method (flipped-based (FB) or lecture-based (LB) and two dependent variables: (1) learning outcome (2) students' perception of self-efficacy to integrate technology in teaching. The results showed that there were differences between students' mean test scores and the differences were statistically significant (higher in FB). The results also showed that students' self-efficacy mean scores were higher after using FB compared to LB and the differences were statistically significant. Finally, preservice teachers favor the use of FB strategy in technology integration course compared to the LB (452 in favor vs. 104 not in favor), (62.90% in favor vs.14.50% not in favor).

1. Objective

Although lecture-based teaching strategy (LB) used for decades as an effective way to help students acquire new knowledge (e.g., Hattie, 2009; Schwerdt, 2009), many educators argue that this teaching model is mostly static, passive and not suitable for teacher candidates preparing for extended field experience and careers in teaching. Students reported also that the information delivered during lectures may come too slowly or cover what they already know; other students have trouble taking in information so rapidly, or they may lack the prior knowledge needed to understand the presented content (Goodwin & Miller, 2013).

A growing number of teachers started recently using different teaching strategy through creating flipped or inverted classrooms. This teaching strategy involves moving the lecture content before class and working on homework and hands-on activities during class time. For example, the data from the Flipped Learning Network (2012) indicated that membership on its social media site rose from 2,500 teachers in 2011 to 9,000 teachers in 2012. In the flipped teaching strategy (FB), educators can employ online asynchronous educational video, recorded lectures or readings and spend time in class working on problems or exercises through active, group-based problem solving activities. The learning materials can incorporate multimedia visual representations, such as interactive graphs, photos or animation. During watching the video, lectures or reading the text, students have the chance to control the pace of the multimedia streaming to match their own learning preferences. Students can also watch or listen to recordings of class lectures on their computers, tablets, smart phones, or personal media players outside of class, leaving class time to engage in learning activities that might otherwise assigned as homework (Frydenberg, 2013).

Reports of student perceptions of the FB found to be somewhat mixed, but are generally positive overall. For example, some prior research found that students tend to prefer in-person lectures to video lectures, but prefer interactive classroom activities to lectures (Bishop & Verleger, 2013). Although there is steady increase in the number of teachers who adopt the FB in classrooms, there is little research on the effect of this teaching strategy on preservice teachers. Therefore, the purpose of this study is to examine the implications of the use of flipped classroom teaching strategy on preservice teachers' learning outcomes, self-efficacy and perception in a technology integration course.

2. Theoretical Framework

Cognitive Theory of Multimedia Learning:

Since the introduction of television, large body of empirical studies on the use of multimedia in education have demonstrated that students not only prefer it over text, but are also more likely to gain deeper learning from multimedia than from words alone (Baggett, 1984; Mayer, 2002, 2003, 2005; Mayer & Moreno, 2002; Salomon, 1984; Shepard, 1967; Wetzel, Radtke, & Stern, 1994). Researchers suggested that because multimedia contain two representations, visual that conveys information about objects and its relation to other objects, and verbal that communicates abstract meaning and special attributes of this information, a combination of both representations should increase the learning effect (e.g., Guttormsen Schar, Kaiser, Krueger, & th, 1999; Lowe, 1999). A major assumption underlying this empirical work is that humans can construct a mental representation of the semantic meaning from either auditory or visual information alone, but when instruction presented in both formats, each source provides complementary information that is relevant to learning (Baggett, 1984).

Cognitive theory of multimedia learning (CTML) (Mayer, 2001), proposed several assumptions regarding the relationship between cognition and learning from dual representation information formats. Four of these assumptions are particularly relevant to learning from multimedia learning materials. First, the cognitive architecture assumption postulates that the human mind consists of an unlimited, long-term memory (LTM) in which all prior knowledge is stored and a limited working memory (WM) in which new information is processed. Second, the dual-channel assumption proposes that WM has two channels for visual/pictorial and auditory/verbal processing and that the two channels are structurally and functionally distinct (Clark & Paivio, 1991). Third, the limited capacity assumption states that each cognitive channel has limited capacity for information that can be processed at one time (Baddeley, 1986; Baddeley & Logie, 1999). Fourth, the active processing assumption explains that humans actively engage in the cognitive processes to select relevant verbal and non-verbal information from the learning materials, organize the selected information into cognitive structures, and integrate these cognitive structures with the existing knowledge to construct a new (or update an old) mental representation (Mayer, 1996).

Flipped Classroom:

Researchers on the flipped classroom do not agree on the type of activity that constitutes the flipped teaching model. For example, some researchers tend to delineate the flipped classroom in a broad definition and suggest that assigning video or reading outside of class and having discussions in class constitutes the flipped classroom. Bishop & Verleger (2013) reject this definition and describe the flipped classroom as an educational technique that consists of two parts: interactive group learning activities inside the classroom, and direct computer-based individual instruction outside the classroom. According to this definition, flipped teaching strategy may use videos or readings as an outside of the classroom activity. For example, Demetry (2010) provides lecture notes for students to read at home prior to the class session, rather than providing video lectures to help meet the goal of increasing "time on task" to complete course-related activities. Other researchers identified flipped classroom as "events that have traditionally taken place inside the classroom, now take place outside the classroom and vice versa" (p.32) (Lage, 2000). Therefore, flipped classroom is based on the idea that students are engaged in group interactive learning activities inside the classroom. To make sure that students watched the videos or completed the reading at home, students can respond to "clicker questions" to report their progress as they work on the exercises (Houston, 2012). Finally, the learning activities as well as the assigned homework in flipped teaching model vary widely between studies. For example, some activities are made up of asynchronous web-based video lectures and closed-ended problems or quizzes, while others consider that the flipped classroom actually represents an expansion of the curriculum, rather than a mere re-arrangement of activities (Bishop & Verleger, 2013).

Self-efficacy and Learning

According to social cognitive theory (Bandura, 1997) self-efficacy is a form of self-judgment that influences decisions about what behaviors to undertake, the amount of effort and persistence put forth when faced with obstacles, and finally, the mastery of the behavior. According to Bandura, self-efficacy is not a measure of skill; rather, it reflects what individuals believe they can do with the skills they possess. For example, in discussing self-efficacy in computer use, Compeau and Higgins (1995) distinguished between component skills such as formatting disks and booting up the computer and behaviors individuals can

accomplish with such skills, such as using software to analyze data. Thus, preservice teachers' perception of their self-efficacy focuses on what they believe can accomplish with the knowledge they master during their learning. It does not refer to a person's skill at performing specific learning related tasks (e.g. class management, integrate technology in their teaching and mastering a content area). Instead, it assesses a person's judgment of his or her ability to apply knowledge and skills in a broader context.

Preservice teachers participating in a technology integration course learn skills and knowledge of teaching with technology in an actual classroom. Self-efficacy beliefs are a key component for preservice teachers' success in overcoming the fear they may experience in this new area. For example, Compeau and Higgins (1995) empirically show that there is a relationship between computer self-efficacy and computer use. Staples (1999) found that those with high levels of self-efficacy in remote computing situations were more productive and satisfied, and better able to cope when working remotely. Consequently, novice teachers enrolled in a technology integration course are required to develop set of skills to prepare them to teach with technology and to perform successfully a distinct set of behaviors required to establish, maintain and utilize effectively teaching with technology beyond basic personal Internet and computer skills.

Research questions

The focus of this study was to investigate the implications of the use of the flipped teaching strategy on preservice teachers' learning outcomes and self-efficacy in a technology integration course. Based on previous studies of CTML and self-efficacy, this study will be guided by the following questions:

(1) Will the flipped teaching strategy improve preservice teachers' learning outcomes compared to lectures-based teaching strategy in a technology integration course?
(2) Will the flipped teaching strategy improve preservice teachers' self-efficacy in a technology integration course?
(3) What is the perception of preservice teachers regarding the use of flipped teaching strategy in a technology integration course?

The first question: Will the flipped teaching strategy improve preservice teachers' learning outcomes compared to lectures-based teaching strategy in a technology integration course? This primary research question was at the heart of the study, as the answer to this question will inform instructors and trainers the effect of the use of flipped teaching strategy on preservice teachers' learning outcomes. In general, prior research found that the flipped teaching strategy resulted in improvement of students' learning outcomes. Other studies, however, found that overall class testing scores do not support that flipping the classroom improved the entire class (Sparks, 2013). Therefore, the result of this study will examine the effect of the flipped teaching strategy on students' learning outcomes in the context of a technology integration course.

The second question: Will the flipped teaching strategy improve preservice teachers' self-efficacy in a technology integration course? According Bandura's social cognitive theory, it is important to assess students believes and ability to apply the knowledge and skills they acquire during a lesson as indication of understanding the learning content (Compeau, 1995). The answer of this question will help instructors and trainers to evaluate the effect of the flipped teaching strategy to improve preservice teachers' self-efficacy to apply the knowledge they acquire in the context of the technology integration course.

The third question: What is the perception of preservice teachers regarding the use of flipped teaching strategy in a technology integration course? The answer of this question attempts to recognize the perception of preservice teachers' toward the use of flipped teaching strategy in the technology integration course. The answer will help instructors and trainers to use the appropriate teaching strategies for students with different learning preferences. Particularly, the question focuses on whether learners will perceive the flipped teaching method positively or not.

Research Hypotheses:

In this study, the investigators hypothesize that:

- The flipped teaching strategy will improve preservice teachers' learning outcomes in a technology integration course.
- The flipped teaching strategy improves preservice teachers' self-efficacy in a technology integration course.
- The majority of preservice teachers will prefer the use of flipped teaching strategy in a technology integration course.

3. Methods

This study employed a within-subject design to assess the effect of using flipped teaching method on preservice teachers' learning outcome and self-efficacy in technology integration courses. The study has one independent variable: the teaching method (lecture-based or flipped-based method) and two dependent variables: (1) learning outcomes (2) students' perception of self-efficacy to integrate technology in teaching.

The participants were sixty preservice teachers (39 undergraduates, 21 graduates), enrolled in technology integration courses at a midwestern university. Participants were non-science majors and attending three sections: section one: 19 undergraduate students, section 2: 20 undergraduate students and section three: 21 graduate students (10 male, 50 female). Students were from four different majors: 32 in early childhood education, 2 in elementary education, 14 in middle-level education, 9 in high school education and 3 other education major such as physical education or speech/theater. English was reported as the native language of all participants. The average reported age of the participants was 22-25 years (SD = 1.415 years). Participants were 53 White, 4 African American, 1 Hispanic and 1 Asian, among them 4 freshmen, 11 sophomores, 23 juniors, and 22 seniors.

The lessons and activities used in this experiment were adapted from the textbook "Integrating Educational Technology into Teaching" by Roblyer and Doering, Sixth Edition (2012). Participants taught with two different teaching methods: traditional lecture-based method to teach one topic: learning with technology in special education and the flipped-based method used to teach four topics: Technology tools for 21st century teaching, hypermedia tools for 21st century teaching, distance teaching and learning and the role of the internet and developing and using web-based learning activities and teaching

4. Materials

All learning materials used in the flipped teaching method, including videos, post-tests and surveys were online as part of the Blackboard course content and released to students every week based on the topic covered in that week. The instrumentations consisted of the following items: demographic survey, 10-question multiple-choice post-test for each of the five learning topics, 10-question 11-level Likert scale to assess students' perceived self-efficacy based on Bandura' measure (Bandura, 2006). All learning measures were selected or developed by the course instructor and were used regularly with students attending the technology integration courses.

Pre-test

Demographic survey: This questionnaire was to collect information about the participants' makeup, such as students' gender, years in college, area of specialization and age.

Students' self-efficacy survey (pre and post): This questionnaire designed with 11-point scale ranges from "Cannot do at all" at zero to "Highly certain can do" at 100. Students are asked to answer how confident are they in their belief that they have this ability". For example, in question number three, students were asked the following question: "How certain are you that you can identify and use technology tools and information resources in your content area to increase productivity, promote creativity, and facilitate academic learning. Rate your degree of confidence by recording a number from zero to 100 using the scale given below". Participants could rate their confident by selecting a number starting from zero "Cannot do at all" to 100 "Highly certain can do".

The investigators developed the self-efficacy measure based on Bandura's "Guide to the construction of self-efficacy scales" in (Pajares, 2006). The measure tailored to assess students' ability to integrate technology in their teaching. The initial ratings of the measure indicated that all items adequately reflect and assess the topics covered in all conditions and the scores averaged across the 10 items. Mean for the total sample M = 83.00, SD = 11.30, range = 8.38. The investigators calculated the inter-rater reliability of the

measure by intra-class correlation coefficients to evaluate the consistency of the ratings. The reliability for the measure Cronbach's alpha (an estimated of internal consistency) was .92 (across all sections). Further, the investigators used this measure as self-efficacy assessments in other classes related to teaching technology for preservice teachers (face and construct validity). Finally, the investigators examined the measure's scale results and scale results of other concepts in the technology integration courses such as computer- assisted instruction, virtual classroom and course management system, and found that the results of this measure significantly correlated with the results in other concepts and Cronbach's alpha was .88 (criterion-related validity).

Post-test

The learning outcome test: This measure consisted of five quizzes cover five different learning topics to elicit participants' retention and transfer of knowledge of these topics. The five topics are: learning with technology in special education (lecture teaching method), technology tools for 21st century teaching, hypermedia tools for 21st century teaching, distance teaching and learning and the role of the internet, developing and using web-based learning activities and teaching (flipped teaching method). The questions of these measures based on the topics covered in this experiment. An example of the multiple-choice question in the topic "learning with technology in special education" is: "Technology offers potential to help address this characteristic, which arises when an individual is unable to fulfill a role due to a limiting condition:" Participants could choose from the following responses: "Impairment, handicap, disability, or deficit". Another example of multiple-choice question in the topic "hypermedia tools for 21st century teaching": "In this system, as originally conceptualized by Ted Nelson, items of information from all over the world could be logically connected with links". Participants could choose from the following responses: multimedia, hypertext, hypercard, linkway. Each correct answer yields 1 point, for a total of 10 points and scores ranged from zero (no correct responses) to 10 (all correct responses) for every quiz.

The retention and knowledge transfer measurements developed by the textbook's author, selected, and reviewed by the course instructor to assess participants' understanding and application of the five topics. The initial ratings of the measures indicated that all quizzes adequately reflected and assessed the five topics covered in this study.

Materials

The learning materials used in the present study were five topics to help preservice teachers to integrate technology in teaching. The materials were identical in all sections and released every week with the related activities. There were two different teaching methods: traditional (lecture-based) and flipped. Traditional method was based on lectures and direct teachings conducted by the instructor and the information was delivered during the meeting, while students listen to lectures and learn from them. In this method, the lesson's content and delivery was most important aspect of instruction and students learn knowledge through the assignments completed at home. For example, to teach the topic "learning with technology in special education", the instructor lectured about the topic and used a power point presentation during the class time and covered the following points: Introduction to special education, current issues in the use of technology in special education, effective ways for technology to be integrated into special education and the Tech-PACK needs and challenges in special education. Students in all sections attended the class in a computer lab and worked and submitted their work through computers.

The assignment of this teaching strategy was based on lecture notes and the textbook. The assignment was in form of essay questions and students had to complete all work at home with no help except of their notes. For example, an assignment asked students to review the teaching notes and textbook (pages, 398 -400) regarding impairment, disability and handicap. Students were asked to "explain in no less than 600 word the difference between Impairment, Disability and Handicap with examples for each definition.

In the flipped teaching strategy, the instructor did the following: Students read the chapter or online materials before class (at home). For the difficult points, students asked to watch video or screencast. To insure that students completed the assigned readings or videos, instructor conducted a Q & A in the first five minutes of the class and then the assigned topic introduced in another five minutes. The instructor dedicated the class time for hands-on activities. Students worked through activities related to the assigned topic and with the

guidance of the instructor and the support of their peers. In this method, instructor emphasized collaborative learning and students had the opportunity to ask questions to instructor and their peers as well. For example, in the flipped teaching strategy, the instructor started the topic "Distance teaching and learning and the role of the Internet", by asking students questions based on the home reading such as why teachers should develop rationale to use internet or what are some of the internet's problem areas teachers have to address before using the internet for teaching and learning. Students' answers include, accessing sites with inappropriate materials, safety and privacy issues for students, fraud, computer viruses and hacking, and copyright and plagiarism issues. After the Q & A, instructor introduced the topic using short power point presentation and covered the following points: Distance education: an evolving use of the internet, developing an internet use rationale, using and implementing the internet effectively: navigation, searching and storing, communicating and social networking. After the Q & A and the topic introduction, students were guided to complete hands-on activities related to the week's topic. For example, student were asked to develop a WebQuest including: deciding the lesson to be taught through the WebQuest, using Google to collect the information web links, images and videos and finally create a free website for the WebQuest that includes these pages: Introduction, Task, Process, Resource, Evaluation, Conclusion and Teacher Page. During the activity, students were free to ask for help or ask questions from their peers or instructor.

Procedure

First, students in all sections completed demographic and self-efficacy surveys. Second, instructor used the flipped-based method to teach four topics in four consecutive weeks to all sections. In the fifth week, instructor used traditional lecture-based method to teach one topic to all sections. At the end of every week students completed a quiz related to the week's topic and at the end of the fifth week, students completed self-efficacy survey (post). All surveys and learning activities presented and submitted through Blackboard.

5. Results

Prior to the main analyses, the data was screened for normality, out-of-range responses and systematic patterns of missing values and found that the data is normally distributed and no apparent patterns or clusters emerging.

First question: To answer the first question: Will the flipped teaching strategy improve preservice teachers' learning outcomes compared to lectures-based teaching strategy in a technology integration course?"

To answer this question, the investigators conducted a paired-samples t-test to compare students mean test scores in the two conditions flipped and lecture-based. The analysis show that there were significant differences in the students' mean test scores in all flipped teaching method test scores: Test 1 (M=6.61, SD=1.62), test 2 (M=11.48, SD=4.44), test 3 (M=5.56, SD=1.42), test 4 (M=6.79, SD=1.76) compared to lecture-based mean test scores (M=9.4, SD=1.14) conditions; $t(30)=8.399$, $p = 0.001$, $t(30)= 9.017$, $p = 0.001$, $t(26)= 5.498$, $p = 0.001$, $t(28)= 8.681$, $p = 0.001$. These results suggest that flipped teaching strategy does have positive effect on preservice teachers' test scores in technology integration course. Specifically, our results suggest that when students engage in class activities using the flipped teaching strategy, the test scores improved. Table 1 summarizes the paired-samples t-test results.

Table 1 The Mean scores and standard deviations for the paired-samples t-test results of the all test in flipped and traditional teaching strategies

		Paired Differences					t	Df	Sig. (2-tailed)
		95% Confidence Interval of the Difference							
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Chapter 5_15	3.258	2.160	.388	2.466	4.050	8.399	30	.000
Pair 2	Chapter 6_15	8.065	4.980	.894	6.238	9.891	9.017	30	.000
Pair 3	Chapter 7_15	2.222	2.100	.404	1.391	3.053	5.498	26	.000
Pair 4	Chapter 8_15	3.345	2.075	.385	2.556	4.134	8.681	28	.000

Note: Means with different subscripts differ significantly at p<.001

Second question: Will the flipped teaching strategy improve preservice teachers' self-efficacy in a technology integration course?

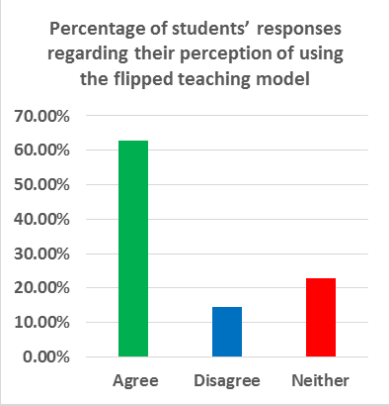
To answer the second question, the investigators conducted a paired-samples t-test to compare students' self-efficacy mean scores before and after using the flipped teaching strategy. The analysis show that there were significant differences in the students' self-efficacy mean scores after flipped teaching strategy (M=830.00, SD=113.014) compared to before the use flipped teaching strategy (M=737.30, SD=170.516); $t(36)= -4.652$, $p = 0.001$. These results suggest that flipped teaching strategy have positive effect on preservice teachers' self-efficacy in technology integration course. Specifically, our results suggest that when students engage in class activities using the flipped teaching strategy, their confidence to apply what they learn improved. Table 2 summarizes the paired-samples t-test results.

Table 2 The Mean scores and standard deviations for the paired-samples t-test results of students' self-efficacy before and after the use of flipped teaching model

	Paired Differences					t	df	Sig.
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Before - After	-92.703	121.213	19.927	-133.117	-52.288	-4.652	36	.000

Note: Significant at $p < 0.001$ level

Third question: What is the perception of preservice teachers regarding the use of flipped teaching strategy in a technology integration course? To answer this question, the investigators collect data from 60 students through answering 12 questions to assess their perception on the flipped teaching strategy. The results were reduced to three answers regarding favoring the flipped teaching model (Agree, Disagree or Neither agree or disagree). The number of responses by agree from the 12 questions were 452 (62.9%), disagree 104 (14.5%) and neither agree or disagree were 163 (22.7%). Figures 1 summarizes statistics of students' responses



6. Scientific or scholarly significance of the study or work:

The main finding of this study is that the use of the flipped teaching strategy indeed has the potential to help preservice teachers to improve their learning outcomes in the technology integration course. This benefit demonstrated by the statistically significant differences in learning outcomes between students taught by flipped and lecture-based teaching strategies, with the highest scores achieved by students in the flipped condition and the least was in the lecture-based condition. The results of the present study support previous findings produced in the context of other content areas and with different population and provide empirical evidence that validates the flipped teaching strategy to improve students' learning outcomes (Sadaghiani, 2012; Sparks, 2013; Walker, 2011). Specifically, the preservice teachers' test scores improved in all tests after they engaged in flipped teaching activities compared to their test scores after lecture-based activities. A possible interpretation of this result is that students during the flipped classroom had the opportunity to work together and engage in hands-on

learning activities, which allowed them to participate in authentic and collaborative learning environment. According to prior studies, the effectiveness of the flipped classroom on student learning is due to the additional opportunities for students to collaborate and work on problem solving together (Demetry, 2010; Strayer, 2007).

Furthermore, assigning multimedia learning materials for students to review outside classroom allows them to learn content at their own pace and permits them to view and listen again to those sections that present important or complex concepts (Gibbons Jf, 1977). This interpretation is consistent with prior cognitive research, which noted the positive effect of allowing students to control the pace or stream of learning content. If students lack control over the pace of the learning content, this might burden their limited cognitive resources, especially learning from multimedia materials. According to cognitive theory of multimedia learning (CTML), the human cognitive system can process only small portions of the large amounts of visual and auditory stimuli received. Unlike processing printed text, learners in formal educational contexts typically do not have the opportunity to stop the multimedia presentation and reflect on what they are learning and identify potential gaps in their knowledge. Thus, information processing in this situation frequently requires longer and more intense periods of cognitive and metacognitive activity. Regardless of the amount of information presented in each sensory channel, the learner's working memory (WM) will accept, process, and send to long-term memory (LTM) only a limited number of information units (Attneave, 1954; Jacobson, 1950, 1951). Thus, working memory requires pauses or direct prompting to accept, process, and send to the long-term storage only the most crucial information (Clark, Nguyen, & Sweller, 2006).

Another significant finding of this study is that students' self-efficacy perception was significantly improved after engaging in flipped teaching strategy compared to their self-efficacy perception after lecture-based. This benefit demonstrated by the statistically significant differences in the reported self-efficacy scores after the flipped activities compared to lecture-based, with the highest scores reported by students after the flipped activities and the least was in the lecture-based.

A possible interpretation for this result is that the flipped teaching activities promote students' cognitive engagement and helped them to interact efficiently with learning content than in the lecture-based teaching activities (as reflected by the higher test scores in all tests after flipped teaching strategy) and consequently improved and promoted their self-efficacy perception. This interpretation is consistent with prior self-efficacy research. According to this theory, self-efficacy reflects what individuals believe they can do with the skills they possess and they can accomplish.

Finally, this study found that preservice teachers favor the use of flipped teaching strategy in a technology integration course compared to the lecture-based teaching strategy and this was demonstrated by the statistically significant differences in the number of students who were in favor of the flipped strategy compared to lecture-based, with the highest numbers for the flipped strategy and the least was for the lecture-based (452 vs. 104) or (62.90% vs.14.50%).

A possible interpretation for this result could be found in students' rationalizations in the perception survey. Although the majority of students who preferred the flipped classroom indicated that it promotes collaboration and hands-on activities during the class time, other students have different reasons such as: "had less lecture time", "work at my own pace", "using technology", "being able to interact more with the teacher and being able to ask questions as I worked" and "we do not have to sit and listen to an hour long lecture that goes in one ear and out the other one".

Although opinions tended to be positive, but there were invariably a few students who strongly disliked the change. One very interesting case was a student reported that she dislike the flipped teaching model because "Everyone asking questions. I wasn't able to concentrate and do my work in the classroom. I am a very ADD person. I have to be somewhere without distractions to do well". Although this student reported her dislike of the flipped teaching model, she received higher grades in all the quizzes completed after flipped classes compared to her quiz grade after the lecture-based class.

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