Effectiveness of Blended E-Learning Approach in a Flipped Classroom Environment

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Abstract
Researchers have persuaded educational institutions that there is a new set of vital skills that students are required to have, thus giving rise to a new trend in education called Blended Learning. An example of this is a Flipped classroom where the traditional in-class and out-of-class activities is switched. The purpose of this study is to determine the effectiveness of this type of classroom. The research method used for this paper is quasi-experimental design in which the process consists of three analyses: first is evaluating the effectiveness of flipped classroom; second is comparing the effectiveness of flipped with a traditional classroom; and third, comparing the effectiveness of a flipped classroom to high and moderate to low performing students. Results show that a flipped classroom environment had a large significant effect ($d = 3.180$) in improving the trigonometry performance of the students. Additionally, a flipped classroom environment had a quite larger effect ($d = 3.619$) in improving students' performance compared to traditional classroom environment ($d = 2.004$). However, this difference of effect is considered not to be statistically significant ($F = 1.837$, $p > 0.05$). Furthermore, the effectiveness of a flipped classroom is significantly larger to high performing students compared to moderate to low performing students ($F = 10.165$, $p < 0.05$).

Keywords: Flipped Learning, Blended Learning, 21st Century Skills, e-Learning, Traditional Learning, In-Class Activity, Out-of-Class Activity, Module

Introduction

The 21st century offers new opportunities due to the emergence of new ideas and technology. On the other hand, it also offers new challenges. Information where students could attain knowledge is very accessible because of new technology. However, knowledge itself is not enough. Researchers have proposed and subsequently persuaded educational institutions that there is a necessary set of skills that students require to be successful in the 21st century (Schgrader & Lawless, 2011). A student must have the skills on how to use their knowledge. These skills include thinking critically, applying knowledge to new situations, analyzing information, comprehending new ideas, communicating, collaborating, solving problem, making decisions (Partnership for 21st Century Skills, 2011). These skills are further defined into three broad categories: information and communication skills, thinking and problem-solving skills, and interpersonal and self-directional skills. With this development in education, it was imperative to acquire a new approach in methodology, hence blended learning was born.

The term "blended learning" is increasingly being popular in both academic and corporate circles; even so, this term does not give a universal definition that educators could use (Graham, 2004). Definitions were suggested by various authors but still focused on a central idea – combination of approaches, technologies, and methodologies (Sharma, 2010). Three definitions of blended learning are considered relevant: blended learning is the integrated combination of traditional learning with web based on-line approaches; blended learning is the combination of media and tools employed in an e-learning environment; and, blended learning is the combination of a number of pedagogic approaches.

The importance of blended learning came from the fact that traditional and online learning had their limitations. A physical classroom training program limits the access to only those who can participate at a fixed time and location, whereas a virtual classroom event is inclusive of remote audiences (Singh, 2003). However, if teachers rely too much in e-learning and disregard face-to-face instruction, students might not experience the full extent of benefits learning in communities could offer (Hrastinski, 2008). In blended learning, the combination of two approaches could complement the limitations of the other. The value of this approach could be attributed to six benefits it could bring (Osguthorpe & Graham 2003) viz., (1) pedagogical richness, (2) access to knowledge, (3) social interaction, (4) personal agency, (5) cost effectiveness, and (6) ease of revision.

As has been mentioned, blended learning is the combination of learning approaches and one example of which is a flipped classroom. By definition, a flipped classroom is an educational technique that consists of two parts: interactive group learning activities inside the classroom and direct computer-based individual instruction outside the classroom (Bishop & Verleger, 2013). Combining interactive group learning and direct individual instructions such as a flipped classroom is a good example of blended learning. Studies suggest specific advantages of flipping classrooms. To start with, teachers who use flipped classrooms have time to work individually with students (Steed, 2012). Another benefit of flipping classrooms is

that classroom time will be spent working through problems, advance concepts, and engaging in collaborative learning (Tucker, 2012).
Even though blended learning, specifically flipped classroom, is a trend to cater to 21st century needs, there is limited amount of scholarly research on its effectiveness (Bishop & Verleger, 2013). Due to this gap, the researcher wanted to pursue a study to evaluate the efficiency of a blended e-learning approach thru a flipped classroom.

The main problem of the study is to determine the effectiveness of blended e-learning approach in a flipped classroom environment. The study sought to investigate the effectiveness of flipped classroom in improving students' trigonometric achievement, to compare students' performance under flipped classroom and traditional classroom, and to evaluate the extent of effect of flipped classroom to the achievement of high and moderate to low performing students.

Conceptual Framework

The study aims to evaluate the effectiveness of Blended e-learning Approach in a Flipped Classroom Environment. Blended learning suggests a number of definitions that address combination of approaches, technologies, and methodologies of learning (Sharma, 2010). In this study, the considered definition of blended learning is the combination of traditional learning and web based on-line learning (e-learning) approaches (Oliver &Trigwell, 2005). Traditional learning refers to lecture method where students listen to explicit instruction from the teacher. Alternatively, e-learning refers to the intentional use of networked information and communications technology in teaching and learning (Naidu, 2006). Blended learning has a myriad of learning formats: synchronous physical formats, and self-paced asynchronous formats (Singh, 2003). First, synchronous physical formats refer to face-to-face approaches where activities are done in the classroom with teacher supervision. Second, self-paced asynchronous formats refer to on-line methods done outside of the classroom, without live teacher supervision and students dictate their own pace.

Today, a blended learning program may combine one or more of the dimensions, thus the study chose the simplest level – a blended learning experience that combines offline and online forms of learning where the online learning usually means "over the Internet or Intranet" and offline learning happening in a more traditional classroom setting (Singh, 2003). This dimension of blended learning is associated with flipped classrooms. By definition, flipped classroom is an educational technique that consists of two parts: activities inside the classroom, and activities outside the classroom (Bishop & Verleger, 2013). In this study, in-class activities employ group-based interactive learning activities inside the classroom, citing student-centered learning theories thru synchronous physical formats of learning approaches (Bishop & Verleger, 2013). On the other hand, out-of-class activities employ individual on-line learning activities outside the classroom thru synchronous online (live e-learning) and self-paced asynchronous formats of learning approaches (Bishop & Verleger, 2013).

The study evaluated the effectiveness of blended learning approach using a flipped classroom environment. In evaluating, the study considered two procedures: First is comparing the efficiency of a flipped classroom environment with the efficiency of traditional classroom settings. Comparison of the approach being studied to normal setting determines if flipped classroom causes a significant improvement to students'

output. Second is determining the efficiency of a flipped classroom to high performing students and moderately to low performing students. The summary of the framework is reflected on the diagram shown in Figure 1.

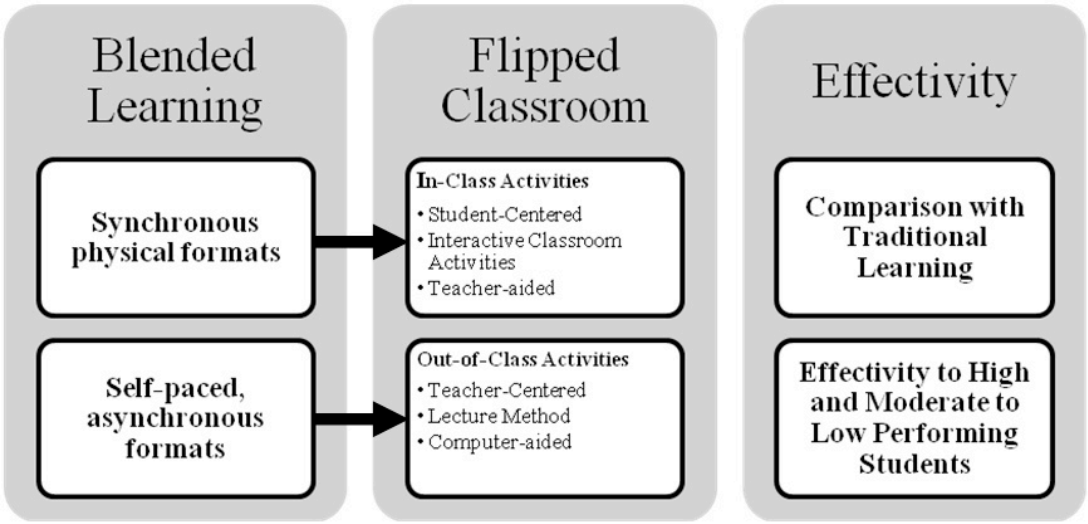

Figure 1: Conceptual Framework

Review of Related Literature

Blended Learning

Blended learning is an increasingly popular approach in education. However, various authors suggest different definitions of it. Sharma (2010) suggests a set of definition based on its combination of approaches, technologies, and methodologies. Three definitions were provided in his study: blended learning is the integrated combination of traditional learning with web based on-line approaches; blended learning is the combination of media and tools employed in an e-learning environment; and, blended learning is the combination of a number of pedagogic approaches. Graham (2004) also agreed that blended learning has no uniform definition. The study provides also three definitions: combining instructional modalities, combining instructional methods, and combining online and face-to-face instruction. Even though blended learning has a number of definitions, they are mostly just variations of a few common themes.

The original use of the phrase "blended learning" was often associated with simply combining traditional classroom training with e-learning activities. However, the term has evolved to encompass a much richer set of learning strategies or dimensions (Singh, 2004). According to Singh (2004), blended learning is expanded to five dimensions. The first is the simplest level - a blended learning experience that combines offline and online forms of learning where the online learning usually means "over the internet or intranet" and offline learning that happens in a more traditional classroom setting (Singh, 2004). Second is the blending of a self-paced and live, collaborative learning. Self-paced learning implies solitary, on-demand learning at a pace that is managed or controlled by the learner. Collaborative learning, on the other hand, implies a more dynamic communication among many learners that brings about knowledge sharing (Singh, 2004). Third is the combination of structured and unstructured learning. Formal learning program is in organized content with specific sequence like chapters in a textbook. On the other hand, most learning in the

workplace occurs in an unstructured form via meetings, hallway conversations, or e-mail (Singh, 2004). The fourth dimension is blending custom content with off-the-shelf content. Off-the-shelf content is by definition generic—unaware of an organization's unique context and requirements. However, generic self-paced content can be customized today with a blend of live experiences or with content customization (Singh, 2004). Fifth level is blending learning, practice, and performance support. Perhaps the finest form of blended learning is to supplement learning with practice and just-in-time performance support tools that facilitate the appropriate execution of job-tasks (Singh, 2004).

Blended learning does not have a universally accepted categorization. Some studies were done to set up their types of blended learning. A study from Kleber (2015) offers a tangible delineation of blended learning into four models: rotational, flex, a la carte and enriched virtual.

(1) Rotational model (station, lab, modified flipped, individual): Students move from one activity or location to mix digital teaching tools and mentored application.
(2) Flex: Credit recovery model where students work independently at an individualized pace with face-to-face support and activities.
(3) A la Carte: Students take a course entirely online to supplement their regular in class work.
(4) Enriched virtual: A course or subject in which students have required, face-to-face learning sessions with their teacher of record and then are free to complete their remaining course work remotely.

The sudden increase of blended learning is caused by the benefit it causes in the educational community. A number of studies are dedicated to explore blended learning, specifically its relevance to teacher instruction. According to Zackerman (2012), the more video segments focus on targeted bursts of context, including the 'back story' or 'field truth,' the more learner consumption and appreciation grows, the more delivery of instruction becomes an effective training. Results from Al Musawi (2011) showed that there is a dramatic rise in using blended learning approaches which also made a significant grade improvement for blended learning courses over entire online courses. Osguthorpe & Graham (2003) identified six benefits it could bring: (1) pedagogical richness, (2) access to knowledge, (3) social interaction, (4) personal agency, (5) cost effectiveness, and (6) ease of revision.

Flipped Classroom

Flipping classroom means that activities that have traditionally taken place inside the classroom now take place outside the classroom and vice versa (Bishop and Verleger, 2013). This model involves the teacher delivering the 'taught' element outside of the classroom. Students complete this element of their learning prior to attending the lesson (Steed, 2012). This implies that the usual lecture methods were done as homework while usual activity assigned sheets were done inside the classroom. However, studies suggest that flipping classroom is more than flipping lectures to assignments. Flipping' a lesson means providing students with a video that explains the concepts, structure and skills, so that when they get to class, after doing a quick re-cap, they can get into a real 'workshop' of learning (Abbey, 2013). Classroom activities must not just be individual seat works, interactive should be group learning activities inside the classroom instead (Bishop and Verleger, 2013).

A flipped classroom is an educational technique that consists of two parts: interactive group learning activities inside the classroom, and direct computer-based individual instruction outside the classroom (Bishop and Verleger, 2013). The combination of these two processes is what makes up the flipped classroom. A graphic representation of this concept is shown in Figure 2.

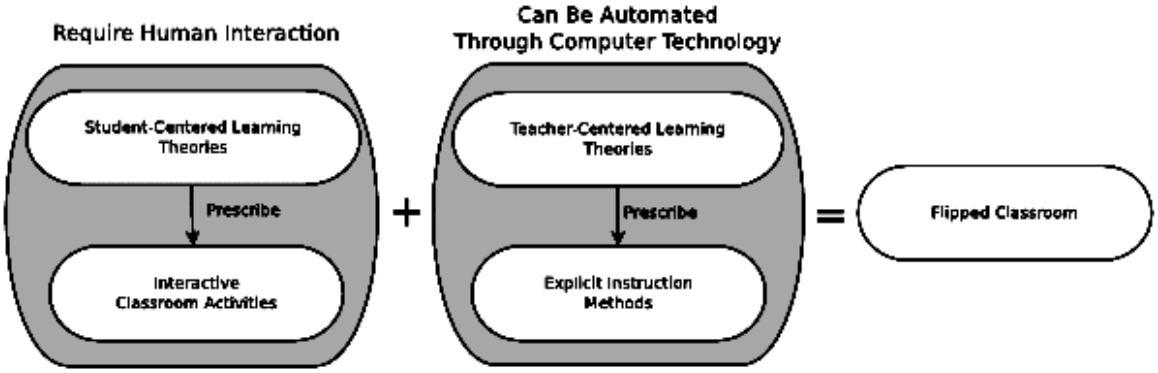

Figure 2: Flipped Classroom
(Adopted from the Flipped Classroom: A Survey of the Research by Bishop & Verleger, 2013)

It is to be noted that a flipped classroom is different form flipped learning. It is not necessary that a flipped class could result to a flipped learning (Flipped Learning Network, 2014). Implementers of such method should be aware of the dimensions for an effective flipped classroom, thus the Flipped Learning Network provides the "Four Pillars of F-L-I-P". These pillars are: Flexible Environment, Learning Culture, Intention Content, and Professional Educator (Hamdan, McKnight, Arfstrom, 2013). Standards on what should be expected in each pillar are included in Table 1.

Table 1: The Four Pillars of F-L-I-P

Flexible Learning	✓ I establish spaces and time frames that permit students to interact and reflect on their learning as needed. ✓ I continually observe and monitor students to make adjustments as appropriate. ✓ I provide students with different ways to learn content and demonstrate mastery.
Learning Culture	✓ I give students opportunities to engage in meaningful activities without the teacher being central. ✓ I scaffold these activities and make them accessible to all students through differentiation and feedback.
Intentional Content	✓ I prioritize concepts used in direct instruction for learners to access on their own. ✓ I create and/or curate relevant content (typically videos) for my students. ✓ I differentiate to make content accessible and relevant to all students.
Professional Educator	✓ I make myself available to all students for individual, small group, and class feedback in real time as needed. ✓ I conduct ongoing formative assessments during class time through observation and by recording data to inform

	future instruction. ✓ I collaborate and reflect with other educators and take responsibility for transforming my practice.

(Adopted from the Four Pillars of F-L-I-P™ by Flipped Learning Network, 2014)

Various studies suggest that benefits of flipped classroom, especially in the emergence of outline technology, could make e-learning possible. According to Steed (2012), teachers who use flipped classrooms had time to work individually with students. The approach promotes one-to-one discussions with students in classrooms. Another study suggests classroom time will be spent working through problems, advance concepts, and engage in collaborative learning with flipped classrooms (Bill, 2012). The Flipped Learning Network suggests that in a flipped classroom, the teacher moves lower levels of the taxonomy outside of the class where students work on mastering concepts and can pause, rewind and review the lesson at any time. The teacher and students can focus on upper levels of the taxonomy in class (Hamdan, McKnight, Arfstrom, 2013).

Methodology

Research Design

The purpose of this study is to evaluate the effectiveness of a blended e-learning approach using a flipped classroom environment. The research method that was selected for this paper is quasi-experimental design for non-equivalent groups. Through quasi-experimental research, performance between group X (group which has undergone traditional learning) and group Y (group which undergo blended e-learning) was compared. Random assignment of participants to conditions or other control was no longer considered. In addition, group Y was further classified into two sub groups: high performing students (Subgroup Y1) and moderate to low performing student (Subgroup Y2). The difference in performance of these two subgroups was analyzed and compared to conclude the effect of flipped approach on different types of students.

Participants

The study was conducted at a certain Catholic school in Metro Manila. The module for unit 1, Trigonometry, was used for blended learning with a flipped classroom environment. The participants came from three Grade 10 sections, each consisting of an average of 42 students. All of the students in each section of the study belonged to sections named group X and group Y. Group X consisted of one section while group Y consisted of two. Group X underwent traditional method while group Y used the blended learning with flipped classroom environment. In comparing traditional and flipped approach, only one section for both group X and Y was used.

In determining the effect of flipped classroom to high and moderate to low performing students, two sections of Group Y were used. Group Y was divided into two Subgroups: Subgroup Y1 which consisted of high performing students and Subgroup Y2 which consisted of moderate to low performing students. The basis for determining high and moderate to low performing students was based on their National Career Assessment Exam (NCAE) results on Mathematics proficiency for academic year 2014-2015. High Performing students had a score of 90 and above while Moderate to Low performing students had a score of 89 and below.

competencies in the Department of Education K-12 curriculum were used in the tests. Table 2 shows the table of specifications used for the pre and post tests.

Procedure

To evaluate the efficiency of a blended e-learning approach in a flipped classroom environment, a module was produced by the researcher and was used in class. In preparation of the module, a curriculum map was first created. Topics, standards, and activities that were implemented during the course of the unit were based in the curriculum map. Specifically, the curriculum map is a matrix in which the following are listed: unit topics, content and performance standards, essential questions, enduring understanding, transfer goals, skills, assessments, and strategies.

In preparing the module, the Lasallian Learning Module format was used as a template. The module caters to the "Backward Design" since it starts with determining the desired outcomes which will establish the design of curriculum units, performance assessments, and classroom instruction (Wiggins & McTighe, 2005). Aside from standards and expected outcomes, also included in the module is the lesson flow for the whole unit. Since blended e-learning was the approach used in the module, there is be a portion where blended tools are be listed i.e. face to face and e-learning activities are two dimensions of blended tools.

A pre-test was conducted to students before implementing the revised module. This test determined the prior knowledge of the students. These scores were compared to their post test to see the difference in performance before and after implementing the module. The same pre-test will be given to all students of group X and group Y. The 15-item pre-test was answered for 30 minutes. A brief clarification before the pre-test in which details about the objective, mechanics, time duration, and other instructions in answering the test was given.

The module was implemented after the students took their pre-test. Different modules were given to group X and group Y. Group X, as the controlled group, took the module that uses a traditional approach, while group Y, as the experimental group, took the module that uses blended e-learning approach. The module for group X had the following flow for the lessons: First part includes in-class activities which are teacher-centered and uses lecture method, the second part includes out-of-class activities that consists of student-centered formative assessments. The module of group Y had the following flow for the lesson: First part includes out-of-class teacher-centered activities with online lecture as a method while the second part includes student-centered formative assessment. Figure 2 shows the process of implementation of the module with the pre and post test.

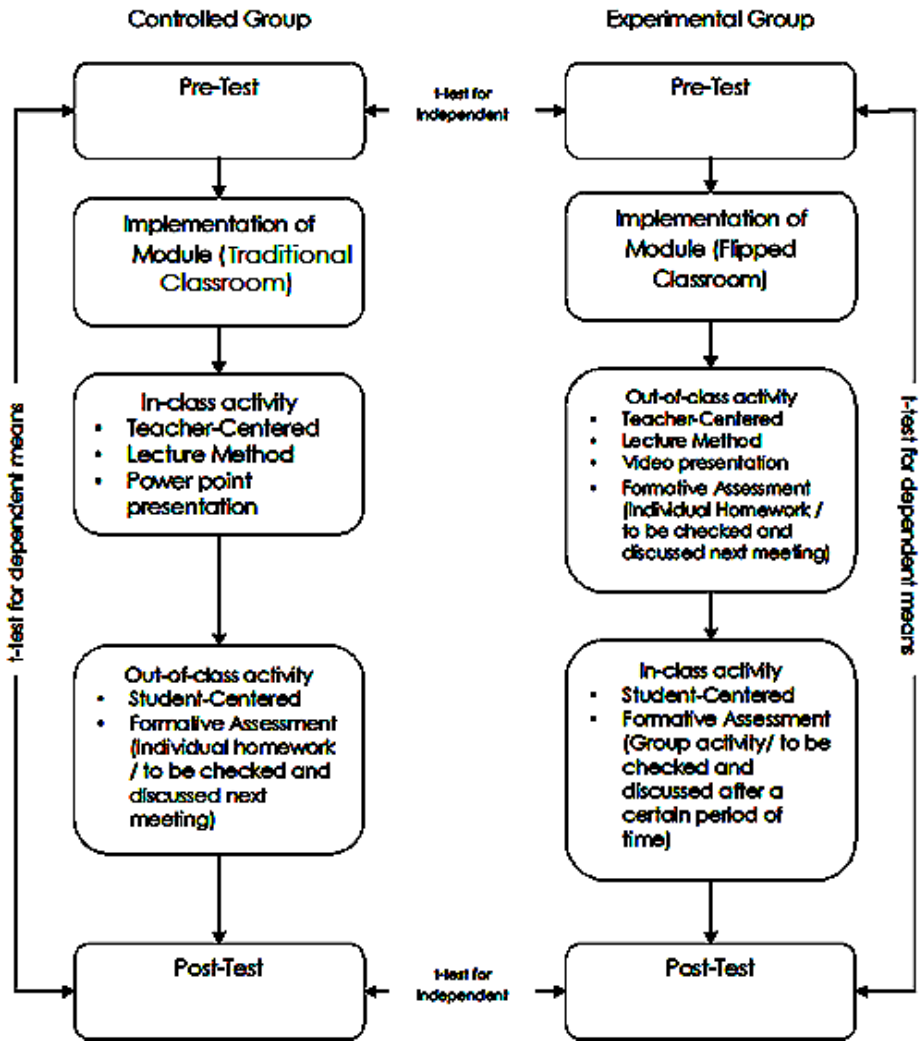

Figure 2: Module Implementation

A post-test was given at the end of the unit. The test, served as their final scores, was compared to their pre-test scores to see the difference in performance before and after implementing the module. The same post-tests were given to all students of groups X and Y. The tests were answered by the students for 30 minutes. A brief clarification was given before the post-tests in which details for the mechanics and time duration were discussed.

Data from the assessments were analyzed to determine the following: the effectiveness of the flipped classroom, the difference of flipped classroom to traditional classroom, and the effect of flipped classroom to high and moderate to low performing students.

Statistical Treatment

The data were analyzed using two statistical treatments: t-test of dependent means and Analysis of Covariance (ANCOVA). To find out if the flipped classroom has a significant effect on the performance of the students, t-test of dependent means was used to compare the scores on pre and post tests of students. The result determined that the intervention caused significant increase on the performance of the students.

ANCOVA was used to determine if the academic achievement of students who have experienced flipped approach is significantly different to students who have undergone traditional approach. ANCOVA is an analysis procedure for looking at group effects on a continuous outcome when some other continuous explanatory variable also have an effect on the outcome. To determine the difference between the traditional and flipped approach, the post tests of group X and group Y were compared considering the results of the pre-tests of the two groups. The treatment showed the difference of the two approaches (traditional or flipped) affected the post test scores considering the covariate which is the pre test scores.

To find out the effect of a flipped classroom to high and moderate to low performing students, t-test of dependent means and ANCOVA were used. T-test determined the effect size of flipped classroom to the performance of Subgroup Y1 and Y2.

Results

Effectiveness of flipped classroom in improving students' trigonometric achievement

The first analysis showed the effectiveness of blended e-learning in a flipped classroom environment by inspecting the significance of difference between the pre-test and post-test scores before and after the intervention respectively. To analyze pre-test and post test scores of flipped classroom group (Group Y), t-test of dependent means with 95% confidence is used. Results are shown in Table 2.

Table 2: Comparison of pre and post test results of flipped classroom group

	M	*SD*	*t-value*	*p*	*Cohen's d*
Post Test	*10.348*	*2.8148*	*17.333*	*.000*	*3.180*
Pre Test	*3.350*	*1.3269*			

Results show the difference between the post and pre test to be statistically significant where $t = 17.333$, $p < .05$; $d = 1.56$. The effect size for this analysis ($d = 3.180$) was found to exceed Cohen's (1988) convention for a large effect ($d = .80$). These results indicate that the post test scores of the students were significantly higher than their pre test results. Consequently, effect size suggests that the intervention of flipping the classroom shows a large effect on the students' trigonometry achievement.

Flipped classroom is expected to cause significant change to students' performance before and after instruction. Nevertheless, results show that flipped classroom is an effective method in delivering instruction to students.

Comparison of students' performance under flipped classroom and traditional classroom

The second analysis examined the effectiveness of flipped classroom environment as compared to a traditional classroom. To compare the two classroom environments, the effect sizes of the traditional classroom group (Group X) and flipped classroom group (Group Y) was determined. Results are shown in Table 3. Additionally, the significance of the difference between the two approaches will be determined by using analysis of covariance with 95% confidence level. Results are summarized in

Table 4.

Table 3: Effect Sizes of Traditional and Flipped Classroom Group

		M	*SD*	*t-value*	*p*	*Cohen's d*
Traditional (Group X)	*Post Test*	*9.806*	*3.362*	*8.706*	*.000*	*2.004*
	Pre Test	*4.417*	*1.779*			
Flipped (Group Y)	*Post Test*	*10.906*	*2.728*	*13.831*	*.000*	*3.619*
	Pre Test	*3.281*	*1.198*			

Table 4: Comparison of Traditional and Flipped Classroom Group

	M	*SD*	*F-value*	*P*
Traditional (Group X)	*9.81*	*3.362*	*1.837*	*.180*
Flipped (Group Y)	*10.91*	*2.728*		

It is implied by the results in Table 3 that traditional classroom environment and flipped classroom environment caused significant change on the performance of students (Traditional $t = 8.706$, $p < .05$; Flipped $t = 13{,}831$, $p < 0.05$). Furthermore, the effect sizes of the two approaches differ in which traditional classroom had Cohen's d value of 2.004 while flipped classroom had a d value = 3.619. Even though effect sizes of the two approaches differ, the interpretation remains the same as the values of Cohen's d exceeds 0.80 interpreted as large effect (Cohen's, 1988). Table 4 summarizes the results of analysis of covariance between post test scores of traditional classroom and flipped classroom groups given pre-test scores as a covariate. Results of ANCOVA ($F = 1.837$, $p > 0.05$) suggest that although the effect sizes of the two approaches differ, the two approaches are still not significantly different with each other. This implies that the change of performance caused by flipped classroom is statistically same as the change caused by the traditional classroom.

From the results, it could be interpreted that the type of classroom approach was not the most influential factor in the performance of the students. The classroom situation had various factors other than the order of in-class and out-of-class activities which is the emphasis of flipped classroom. Factors that could be considered are the following: teacher knowledge, enthusiasm and responsibility for learning; classroom activities that encourage learning; assessment activities that encourage learning through experience; effective feedback that establishes the learning processes in the classroom; and effective interaction between the teacher and the students (Gurney, 2007). The researcher considers the possibility that these other factors which affect students' performance remained the same between traditional and flipped classroom results.

Effectiveness of flipped classroom environment for High and Moderate to Low performing students

The third analysis was directed at investigating the effect of flipped classroom environment on two types of students: high and moderate to low performing students. T-test of dependent means is used to see the difference of effect of flipped classroom to the two different types of students; on the other hand, ANCOVA is used to evaluate the significance of this difference. Results are shown in Table 5 and 6.

Table 5: Pre and Post Test Results of High and Moderate to Low Performing Students

		M	*SD*	*t-value*	*p*	*Cohen's d*
High	*Post Test*	*11.424*	*2.180*	*16.876*	*.000*	*4.494*
	Pre Test	*3.333*	*1.315*			
Moderate to Low	*Post Test*	*9.273*	*2.992*	*10.167*	*.000*	*2.245*
	Pre Test	*3.727*	*1.329*			

Table 6: Comparison of High and Moderate to Low Performing Students

	M	*SD*	*F-value*	*P*
High	*11.424*	*2.180*	*10.165*	*.002*
Moderate to Low	*9.273*	*2.992*		

Table 5 presents the effect size of flipped classroom environment to high performing students and moderate to low performing students. According to the result, flipping the classroom has both significant effects on both high and moderate to low performing students (High $t = 16.876$, $p < .05$; Moderate to Low $t = 10.167$, $p < 0.05$). In addition, data show that flipped classroom had a different effect size to the two groups. The effect size for high performing students was $d = 4.494$ while the effect size for moderate to low performing students was $d = 2.246$. The two groups may have different value of effect sizes; however, their effect sizes both still exceed Cohen's (1988) convention for a large effect ($d = .80$). This suggested that flipped classroom environment had a strong effect on students' achievement for both high and moderate to low performing groups. Results shown in Table 6 ($F = 10.165$, $p < 0.05$) imply that there is a significant difference between the effect of flipped classroom to high and moderate to low performing students. The result suggests that flipped classroom was significantly more effective to high performing students compared to moderate to low students.

The result for flipped classroom being differently effective to different types of students could be explained by this possible scenario. A flipped classroom environment requires complete compliance to the given out-of-class activities thus, self-study. The ability to self-study is a trait of a high performing student therefore making flipped classroom effective to this type of students compared to moderate to low performing students.

Summary

By quantitatively analyzing the results of the students' pre-test, post test, and national career achievement examination (NCAE) mathematics proficiency, the researcher come up with the following conclusions:

1. Flipped classroom environment had a large significant effect ($d = 3.180$) in improving the trigonometry performance of the students.
2. Flipped classroom environment had a quite larger effect ($d = 3.619$) in improving students' performance compared to traditional classroom environment ($d = 2.004$); however, this difference of effect is considered not statistically significant ($F = 1.837$, $p > 0.05$).

3. While a flipped classroom environment had a large significant effect in trigonometry achievement of both high performing students ($d = 4.494$) and moderate to low performing students ($d = 2.246$), the effectiveness of flipped classroom is significantly larger to high performing students compared to moderate to low performing students ($F = 10.165$, $p < 0.05$).

Recommendations

In light of the findings of this study, for future researchers who will be interested in further continuing or improving the study, the research offers the following recommendations:

1. Continue to use the advantage of technology in improving the delivery of instruction such as but not limited to using a flipped classroom environment.
2. Consider the order of in-class and out-of-class activities as a factor in improving students' achievement; however, there are other factors needed to be considered other than this order that is possibly a greater factor in improving achievement.
3. Use current data of the class from standardized tests, previous grades, and others in planning the method or approach of instruction. Data from students suggest variability which is needed to be considered as an important factor of their achievement.

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