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## EFFECTS OF FLIPPED CLASSROOM TEACHING STRATEGY ON PUPILS' MOTIVATION AND ACHIEVEMENT IN NUMERACY IN BASIC SCHOOLS IN TUMU, GHANA

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### Abstract

*This study examined the effects of the flipped classroom teaching strategy on students' motivation in numeracy and achievement in basic schools in Tumu Municipal, Ghana. The study was motivated by the need for alternative teaching strategies in basic schools in the Upper West Region of Ghana. The study was led by two hypotheses. The study employed a quasi-experimental research design. The 500 Basic One (1) students from the 2022–2023 academic session made up the study's population. A total of 120 students—50 men and 70 women—were selected from six complete classes across six different schools to make up the study's sample. Out of the six schools, six entire classes were chosen by simple random sampling. The tools utilised to collect the data were the Mathematics Achievement Test (MAT) and the Situation Motivation Scale (SMS). The internal consistency of (SMS) was calculated using the Cronbach Alpha formula, which produced a dependability estimate of 0.76%. The reliability of (MAT) was ascertained using Kuder-Richardson formula 20 (K-R 20), which produced a reliability estimate of 0.82. The study employed Analysis of Covariance (ANCOVA) together with mean, standard deviations, and research hypotheses raising the pre- and post-test data analysis. The results of the investigation showed that, in Ghanaian Basic schools, the flipped classroom teaching model improved students' achievement in numeracy and raised their motivation levels more than the traditional approach. The study suggests that, in order to improve students' motivation and numeracy achievement, basic schools should implement the flipped classroom teaching style.*

**Keywords:** Achievement, Flipped classroom teaching strategy, Motivation, Numeracy and nursery school

## Introduction

Unquestionably, education is a key instrument used to spur global growth in both wealthy and underdeveloped countries. The world's developed nations have transformed their countries through science and technology through education. Education is a tool that helps young people fit into and have an impact on society by passing along discoveries, ideas, skills, values, theories, and research findings. Education is a "socially organised and regulate process of continuous transference of socially significant experiences from previous to the following generations," according to Muraina and Oladimeji (2022). Leaders from around the world use it as a tool to promote science and technology in their countries. Any country's potential to develop depends on the quality and quantity of its human resources. It is an essential tool that gives people the capacity and problem-solving abilities that have historically led to both individual and societal progress (Ojonugwa, 2022).

The flipped classroom approach is a modern teaching strategy that encourages students to switch between in-class activities and traditional homework. With the use of technology, this approach seeks to prepare students for the topic of the next lesson so they can become acquainted with it prior to participating in activities and discussions in class. The teaching method known as the "flipped classroom," according to Karadag and Keskin (2017), entails replacing customary homework assignments with in-class activities. With an emphasis on individualised instruction made possible by technology, flipped classrooms involve moving learning activities from the typical classroom setting outside. Students can use this platform to find possibilities for getting information about their next classes.

The goal of the flipped classroom teaching method is to accomplish the opposite of the conventional teaching strategy (Muraina et al., 2021). In conventional learning environments, students are usually given homework to accomplish at home and then turn in for evaluation. Instruction and teaching take place inside the classroom. But by promoting a reversal of these roles, the flipped classroom teaching model opposes this traditional methodology. This alternate method has students get the course materials ahead of time for solo study, with the classroom serving as the gathering place for group projects and assignment completion.

Flipped learning is a method of teaching in which students get theoretical knowledge outside of the traditional classroom, frequently at home, and then apply that knowledge practically in the classroom. As stated in the previous paragraph, flipped learning is an instructional strategy that assigns traditional homework assignments to be completed in-person in the classroom while distributing class-related materials via online platforms (Kara, 2015; Muraina et al., 2021). Within the context of blended learning, the flipped classroom teaching technique is a pedagogical strategy and framework. Its goal is to employ technology to move regular classroom activities into the home while also moving homework completion back into the classroom setting.

A flipped (or inverted) classroom is a type of integrated learning in which the typical lecture component is relocated outside of the classroom, according to Azizah (2014). This pedagogical approach involves students learning new material through online video lectures, frequently outside of the classroom, and in-class activities supervised by teachers have replaced the traditional practice of students finishing given homework at home. Personalised guiding

and increased engagement are the main goals of these activities, as opposed to the conventional method of lecture-based training. This type of instruction is sometimes referred to as the "inverted classroom."

The goal of the flipped classroom approach is to flip Bloom's Taxonomy's traditional hierarchy. This shows that outside of the classroom, pupils are engaged in lower-level cognitive functions, such learning and comprehension. In the meantime, they apply, analyse, synthesise, and evaluate material during higher order cognitive tasks that take place in class. The flipped classroom instructional technique is a type of teaching methodology in which students get their course materials outside of the traditional classroom, frequently in the comfort of their own homes.

With this method, all learning exercises and activities take place in a classroom environment, but students are expected to become acquainted with the course material on their own. Homework assignments that are similar to each other are usually successfully completed with the help of the teacher and other students. The previously indicated methodology enables a simple and painless learning process. Mok (2014) claims that watching films before class is frequently connected to the flipped classroom method. The most common image is undoubtedly the one of the flipped classrooms.

Should a definition be offered, it would encompass a broader spectrum of ideas. The flipped classroom model is a pedagogical approach in which students complete homework and other instructional materials outside of class before attending in-person sessions where they actively participate in group projects and receive guidance from the teacher (lesson). Muraina et al. (2021) claim that the flipped classroom is more than simply a method of instruction; it is a way for teachers to break down the material that needs to be learnt and how it will be learnt. As per the previously said assertion, the flipped classroom concept is considered a deviation from conventional teaching methodologies. Under the traditional learning approach, assignments are usually given in a classroom setting and are followed by in-class activities.

In contrast, this order is reversed in the flipped classroom paradigm, where students see a teacher's quick video presentation before learning about the forthcoming subject. It has been acknowledged that the flipped classroom is a teaching strategy that encourages creativity and active learning. According to AlJaser's (2017) research, flipped classrooms are beneficial for the growth and improvement of cognitive skills like application, analysis, synthesis, and assessment. The use of flipped classrooms fosters and enhances these abilities, which are not frequently covered in traditional curriculum.

As per Mok's (2014) findings, this specific approach led to the growth of self-confidence and improved involvement with the content, hence generating additional chances for communication, education, constructive change, and a feeling of responsibility towards learning. The normal teaching strategy and the active learning technique utilised in the flipped classroom model are two separate learning approaches that are combined in the flipped classroom methodology. Traditional teaching approaches might not have all of the elements connected to active learning in a flipped classroom. Chalkboard presentations and teacher-centered teaching strategies, such as projecting learning materials onto the board and having students do related tasks, are features of the conventional teaching methodology.

According to Darak (2018), conventional methods are still widely used in schools all around the world. Muraina et al. (2021) state that a teacher-oriented classroom, where lesson planning and class activities predominantly involve instructors' active engagement and students' passive participation, is a defining feature of the traditional teaching approach. The lecture method, which focusses on controlling and commanding the learning process, is what defines the traditional teaching style. Teachers usually lead classes using a combination of spoken explanation and visual aids, like a whiteboard or chalkboard, to introduce and clarify the material.

The teacher then assigns homework to the students, which are then followed by the teacher's evaluation. According to Mok (2014), the traditional method consists of six instructional strategies that are frequently applied in elementary school contexts. The list includes a variety of strategies, including the following: prepared outline strategy, assigned topic strategy, directed and dictated strategy, expressive strategy, copy strategy, pattern and racing approach, and so on. The previously described attributes demonstrate a lack of integration of active learning components and might not efficiently cultivate motivation in an educational context. Motivation can be defined as the innate drive that propels people to initiate, maintain, and direct their actions towards certain objectives.

According to Ojonugwa's (2022) conceptualisation, motivation refers to the processes that lead people to perform particular actions and display corresponding behaviours in reaction to a range of stimuli, such as activities, events, and objects, all of which are directed towards achieving particular goals. The ability to remain motivated is essential to achieving intended objectives. According to Hamid and Muhammad (2012), motivation is the process that helps people reach greater performance levels and get beyond obstacles that stand in the way of their development. The cognitive and affective mechanisms that pique attention and create an innate desire to accomplish goals are collectively referred to as motivation.

Motivation can be defined as the process by which a person's attention and will are piqued, maintained, and focused on achieving a certain objective with more zeal. According to Muraina et al. (2021), a person's motivation plays a big role in how well they perform in a given task. It acts as a spark that gives people the willpower to finish work and, in the end, reach their intended goals. Motivation is the force that propels a person's behaviour, causing them to start and continue at a high level of intensity until their goals are accomplished.

Motivation can be defined as an inherent state characterised by powerful impulses, urges, and internal drives that push people to start, continue, and intensify their behaviours until they reach their desired outcomes, thereby meeting social and personal expectations. Muraina and Oladimeji (2022) define motivation as a psychological concept that arises from an individual's innate desire for a particular object or result and serves as a strong incentive to continuously work towards achieving that desire. Starting something is not enough; there needs to be a deeper reason for the action in order to keep going and increase the tendency when faced with challenges, all the way to the intended outcomes.

Reamen (2016) asserts that there are numerous factors that could support increased motivation. The author contends that emotional states, curiosity, exploration, play, and learning all have an impact on motivation rather than it being a separate entity. She also

demonstrated how several factors, like the will to work hard and learn, interest in the subject matter, a general drive to succeed, a supportive environment, adequate resources, patience, and persistence, may all act as potential motivators and eventually help people achieve their goals.

The term "accomplishment" refers to the observable outcomes of academic pursuits, which are frequently assessed through teacher- or standardized-created exams and other academic evaluations. According to Ojonugwa (2018), accomplishment is the achievement of a planned goal via a methodical process and the application of particular measures intended to make such a goal easier to fulfil. Suvarna and Bhata (2015) define academic accomplishment as the quantifiable outcomes or performance that people achieve in their pursuit of education. It functions as a gauge for how well people have accomplished specific goals that constituted the main focus of their educational experiences.

The achievement of academic accomplishment requires the measurement of that success using educational instruments. Academic achievement has been found to be influenced by a number of factors. Several examples of these elements are highlighted by Bhatia (year), including general intelligence, drive for achievement, recognition, curiosity, attitude, aptitude, and personality. As a result, a wide range of factors, such as a student's performance, activities, and orientation, affect their academic success. Numerous factors have been found to have an impact on academic achievement in educational environments, according to Atchia and Chinapah (2019).

These components include variables relating to teachers, student characteristics, school leadership, and socioeconomic conditions. Together with the components outlined by Muraina et al. (2021), it is important to take into account that, as one of the teacher-related factors, the pedagogical strategy employed by teachers in all disciplines may have an impact on students' performance in a given topic, especially in the areas of mathematics and numeracy.

## Statement of the Problem

The demands and challenges facing the educational system in the twenty-first century have made it necessary for schools to look for alternate teaching methods. The review of learning experiences and curricular materials also makes this necessary. According to Muraina et al. (2021) the traditional teaching approach lacks the necessary components to support the teaching and learning of the cutting-edge curricula and learning opportunities of this century.

Among the characteristics of a traditional teaching approach include teacher-centeredness, memorisation, the instructor having complete control over the class, and others. It makes studying more like a play for kids by facilitating an environment where students are forced to memorise the alphabet, numbers, vocabulary, and other learning materials. The aforementioned pertains primarily to public schools with large student populations.

The aforementioned situation runs counter to interactive, 21st-century teaching methods that make learning tangible and applicable in the context of early childhood education. These 21st-century teaching techniques include, but are not limited to, flipped classrooms, cooperative learning, differentiated education, collaborative learning, and kinaesthetic learning methodologies. Given the contrasting circumstances described above, it is necessary to compare the effectiveness of the flipped classroom

teaching technique to that of the traditional teaching approach in this study.

## Objectives of the study

The following objectives were formulated and guided this study;

1. To find out the differences in the value of numeracy mean motivation scores of pupils exposed to the “flipped classroom teaching strategy” and those exposed to numeracy using the “conventional method”.
2. To find out the differences in the value of numeracy mean achievement scores of pupils exposed to the “flipped classroom teaching strategy” and those exposed to the “conventional method”.

## Hypotheses

1. Flipped classroom teaching strategy has no significant effect on pupils’ motivation in numeracy as measured by their mean scores.
2. Flipped classroom teaching strategy has no significant effect on pupils’ achievement in numeracy as measured by their mean scores.

## Review of related literature

The flipped classroom teaching strategy has gained significant attention in recent years as an innovative approach to enhance student engagement and learning outcomes. This method involves reversing the traditional teaching model by introducing students to new content at home, usually through video lectures, and using classroom time for active learning activities such as problem-solving, discussions, and collaborative projects. This literature review examines the effects of flipped classroom teaching strategy on pupils’ motivation and achievement in numeracy in basic schools.

## Theoretical Framework

The flipped classroom model is grounded in constructivist learning theory, which posits that learners construct knowledge through experiences and interactions with their environment. By shifting the initial exposure to new content outside the classroom, students can engage more deeply with the material during in-class activities, facilitating a more active and personalized learning experience.

## Motivation in Flipped Classrooms

Several studies have indicated that the flipped classroom model enhances student motivation by increasing engagement and autonomy. Students are given more control over their learning pace and can revisit instructional videos as needed, which can lead to greater confidence and interest in the subject matter (Wilson, 2013).

According to Self-Determination Theory (SDT), motivation is driven by the need for autonomy, competence, and relatedness. The flipped classroom model supports these needs by allowing students to manage their learning process, providing opportunities for mastery through interactive activities, and fostering collaborative learning environments that enhance relatedness among peers (Van Vliet, Winnips, and Brouwer, 2015).

## Achievement in Numeracy

Research has shown that the flipped classroom strategy can lead to improved academic performance in numeracy. Studies have reported higher test scores, better problem-solving skills, and enhanced understanding of mathematical concepts among students who experienced flipped classrooms compared to those in traditional settings (Bergmann and Sams, 2012).

The active learning component of the flipped classroom is particularly beneficial for numeracy. In-class activities that focus on applying mathematical concepts help students develop critical thinking and problem-solving skills, leading to a deeper understanding and retention of numerical knowledge.

## Flipped Classroom and Numeracy Achievement

A study by Bergmann and Sams (2012) found that students in a flipped classroom demonstrated significantly higher achievement in mathematics compared to their peers in traditional classrooms. The researchers attributed this improvement to the increased opportunities for practice and immediate feedback during class time.

## Motivation and Engagement

A study conducted by Wilson (2013) investigated the impact of flipped classrooms on student motivation in numeracy. The findings revealed that students in the flipped classroom reported higher levels of engagement and intrinsic motivation, which positively influenced their academic performance.

## Longitudinal Effects

Longitudinal research by Van Vliet, Winnips, and Brouwer (2015) explored the long-term effects of the flipped classroom model on numeracy achievement. The results indicated sustained improvement in numeracy skills and increased student motivation over time, suggesting that the benefits of the flipped classroom extend beyond immediate academic outcomes.

## Challenges and Considerations

One of the primary challenges of implementing a flipped classroom model is ensuring equitable access to technology. Students without reliable internet access or appropriate devices may struggle to engage with instructional videos at home, potentially widening the achievement gap.

Effective implementation of the flipped classroom strategy requires substantial teacher training and preparedness. Educators must be skilled in creating engaging instructional videos and designing meaningful in-class activities that reinforce and extend students’ learning.

## Conclusion

The flipped classroom teaching strategy holds significant promise for enhancing pupils’ motivation and achievement in numeracy in basic schools. By fostering an active and student-centered learning environment, the flipped classroom model can lead to improved academic outcomes and increased engagement. However, successful implementation requires careful consideration of accessibility issues and investment in teacher training. Future research should continue to explore the long-term effects of this approach and identify best practices for its integration into diverse educational settings.

## Methodology

The effect of the flipped classroom teaching technique (FCTS) on the motivation and numeracy achievement of basic school students was investigated using a quasi-experimental research method. A design that shares characteristics with experimental research but falls short of being properly referred to as an experimental research design is called a quasi-experimental research design. According to Chiang (2015), a quasi-experimental study design involves manipulating participants in the experimental group without providing a comparable intervention for the control group.

The traditional approach for nursery schools and the flipped classroom teaching strategy (FCTS) were the two teaching philosophies employed in the study. The FCT Universal Basic Education Board's nursery school numeracy curriculum served as the source of the study's numerical elements.

The traditional approach uses the same learning objectives, materials, and methods of assessment. The main distinction between the two approaches to learning is that, although the conventional method used manual packages that were exactly the same as those used by the "flipped classroom teaching strategy (FCTS)" for the same class, the flipped classroom teaching strategy (FCTS) required the manipulation of learning materials in small group activity-based teaching. The treatment group employed the "flipped classroom teaching strategy (FCTS)," whereas the control group used the "conventional method."

Prior to the start of the research, participants in both groups completed pre-tests using draft versions of the Numeracy Achievement Test (NAT) and Situation Motivation Scale (SMS). Following the pre-test, teachers were required to use the instructional packages created during the training session, which are specifically tailored for teaching numeracy. The four-week experiment was integrated into the regular school schedule in accordance with the timetable. After the trial concluded, the subjects in the experimental and control groups were given the opportunity to take the Situation Motivation Scale (SMS) and Numeracy Achievement Test (NAT) as post-tests.

After the pre-test, certain items in the post-test package were rearranged, but the content stayed the same. For research hypotheses at an alpha level of 0.05 level of significance, data from the experimental and control groups' pre- and post-tests were separated and analysed using the "mean and standard deviation" method.

**Results**

**Hypothesis 1. H01:** "flipped classroom teaching strategy (FCTS)" has no significant effect on 'motivation' in numeracy as measured by their mean score on SMS.

**Table 1: Pre-test and post-test mean motivation numeracy scores of nursery school pupils taught using flipped classroom teaching strategy (FCTS) and those taught with the Convectional Method**

Variable	Pre-test			Post-test		
	N	Mean	SD	Mean	SD	Mean Gain
Flipped Classroom	50	1.121	0.210	3.67	0.51	1.12
Conventional method	70	1.120	0.208	2.76	0.23	0.13

Table 1 presents the average numeracy motivation scores for students in a nursery school who received instruction using the "flipped classroom teaching strategy (FCTS)" in comparison to students who received instruction using the "traditional approach" (control group). The results show that students who received instruction using the "flipped classroom teaching strategy (FCTS)" (experimental group) had an average pre-test numeracy motivation score of 1.121 with a standard deviation of 0.210. Furthermore, 3.67 on average, with a standard deviation of 0.51, was the post-test numeracy motivation score. The experimental group's mean

increase in numeracy motivation mean scores, as determined by comparing the pre- and post-test results, was 1.12 for participants who received instruction using the "flipped classroom teaching strategy (FCTS)". The results also show that the pre-test numeracy motivation mean for the control group was 1.120 with a standard deviation of 0.208. In addition, the control group's post-test mean was 2.76, with a 0.23 standard deviation. In the control group, there was an average 0.13 rise in numeracy motivation mean scores from the pre-test to the post-test. The posttest mean scores for numeracy motivation were higher in the experimental and control groups than they were in the pretest.

In particular, there was a greater mean increase in the experimental group, which received instruction utilising the "flipped classroom teaching strategy (FCTS)." This implies that, in comparison to the traditional teaching method, the implementation of the "flipped classroom teaching strategy (FCTS)" increased the motivation of nursery school children in numeracy.

**Hypothesis 2 H02:** "flipped classroom teaching strategy (FCTS)" has no significant effect on pupils' "achievement" in numeracy measured by their mean score on MAT.

**Table 2: Pre-test and post-test mean achievement scores of numeracy achievement of nursery school taught using "flipped classroom teaching strategy (FCTS)" and those taught using the "conventional method"**

Variable	Pre-test			Post-test		
	N	Mean	SD	Mean	SD	Mean Gain
Flipped Classroom	50	2.121	0.210	3.67	0.51	1.12
Conventional method	70	2.120	0.208	2.76	0.23	0.13

The results are presented in Table 2, which compares the usage of the "flipped classroom teaching strategy (FCTS)" to a control group and shows the average accomplishment scores (pre-test and post-test) of numeracy in a nursery school context. According to the results, students who received instruction in numeracy using the "flipped classroom teaching strategy (FCTS)" had an average accomplishment score (pre-test) of 2.121 with a standard deviation of 0.210. In addition, the average achievement score after the test was 3.67, with a 0.51 standard deviation.

The average achievement scores of students in numeracy before and after they were taught using the "flipped classroom teaching strategy (FCTS)" differed by 1.38. Table 2 shows that the pretest mean accomplishment score for the control group was 2.120 with a standard deviation of 0.208. Furthermore, the control group's post-test mean achievement score was 2.76, with a 0.23 standard deviation.

The control group's numeracy accomplishment scores showed a mean difference of 0.13 between the pre- and post-test periods. According to the findings, both the experimental and control groups performed better on the post-test in terms of numeracy than they did on the pre-test. Nonetheless, there was a greater mean improvement in accomplishment scores for the experimental group, which received instruction utilising the "flipped classroom teaching strategy (FCTS)". According to the study's findings, students' numeracy performance improved more when the

kinaesthetic learning strategy (KLS) was used in place of the traditional teaching method.

## Discussion

According to the study's findings, students who experienced the "flipped classroom teaching strategy (FCTS)" demonstrated greater academic achievement and a greater interest in numeracy than students who experienced the traditional teaching method. This claim is consistent with a study by Ezeudu and Gbendu (2022), which found that, in contrast to a typical lecture format, the use of a flipped classroom method significantly improved students' attitudes towards the study of geography.

The present study's results are in line with those of Makinde's (2017) investigation, which showed that the adoption of a flipped classroom strategy resulted in improved mathematical achievement. The results of this study are consistent with those of Muraina et al. (2021), who found that the use of the flipped classroom teaching technique was responsible for statistically significant variations in average test scores.

The learners in the experimental group outperformed the control group in terms of scores. Furthermore, notable differences were noted in the means of the motivation scale between the subjects in the experimental and control groups. The results of this study are consistent with those of a study by Muraina et al. (2021), which showed that using the flipped classroom teaching method significantly improved students' academic performance in government courses.

The results of this study are consistent with those of Ganiyu (2022), who found that NCE students performed better when taught using a flipped classroom package than when taught using conventional teaching techniques. The results of this study support those of Unamba et al. (2016), who noted that the adoption of the flipped classroom paradigm enhances students' behavioural, emotional, cognitive, and agentic involvement in addition to encouraging active learning in the algebra classroom. Reamen (2016) states that a number of factors affect motivation. The author contends that emotional states, curiosity, exploration, play, and learning all have an impact on motivation rather than just isolated situations.

## Conclusion

The findings indicate that: "flipped classroom teaching strategy (FCTS)" improved numeracy achievement among basic school pupils more than the conventional method and enhanced numeracy motivation among students in basic schools more than the conventional method, based on the available data as shown in all the above tables.

## Recommendations

In accordance with the findings of this investigation and the conclusions reached, the researchers suggest the following recommendations:

1. That interactive teaching methods, such as the "flipped classroom teaching strategy (FCTS)," ought to be promoted in schools, particularly for basic school students, in order to improve their motivation and numeracy proficiency.
2. That activity-based learning strategies be implemented in government and private schools, stakeholder seminars be

held, and all Ghanaian schools be required to implement the "flipped classroom teaching strategy (FCTS)"

To improve students' motivation and achievement in numeracy in Ghanaian basic schools, teachers are urged to implement the "flipped classroom teaching strategy (FCTS)" in the teaching of numeracy and other subjects. Governments and private organisations, such as NGOS, should take up the task of promoting the "flipped classroom teaching strategy (FCTS)"

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