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Research Article

Flipped Classroom: Effect on the Academic Performance and Motivation of Grade 8 Students in Mathematics

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ABSTRACT

Teachers nowadays are being challenged due to continuous decrease in the analytical and numerical ability of the students. Strategies were continuously studied by teachers to address such concern answering also questions such as how students perceived flipped classroom setting as an aid to the teaching learning process. This study utilized descriptive quasi-experimental design through 189 Grade 8 students where it had found out that in terms of the Pre-Assessment results, most of the students are in the "did not meet expectation" category but still are motivated in terms of Performance Task Making, Problem Solving, Classroom Participation and Examination. In terms of the post-assessment results, most of the students are in the "satisfactory" category and are highly motivated in terms of Performance Task Making, and motivated in Problem Solving, Classroom Participation and Examination. There is a significant improvement in the academic performance of the students where post-assessment results showed higher mean score than the pre-assessment results. There is a positive significant relationship between Performance and Level of Motivation. The main issues and concerns of the students in the implementation of flipped classroom is the slow internet connection at school and at home. Thus, concludes that indeed Flipped Classroom Learning is a way to better improve education identifying the effect on the academic performance and motivation of students in mathematics noting also that internet connection plays a crucial role in this type of learning setting.

Keywords: *Classroom participation and examination, Flipped classroom, One-group research design, Performance task making, Problem solving*

Introduction

Mathematics is one of the most difficult subjects that are taken by an individual which needs total focus in finding correct formulas and solutions to the problems (Molina, 2004; 2012). According to Nation's Report Card

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(2023), mathematics performance of students since 1990 continues to decrease. As such is their report in 2009 and 2022. In 2009, it showed that 27% of the students especially in High School had not mastered the basic math, and the 66% left were not proficient in the subject. In the year 2022, the average score of an eighth-grade student decreased by 8 points compared to previous assessment years. Most of the students fail in this subject because of the several factors influencing the level of absorption of knowledge of the students.

At Notre Dame University – Junior High School, it was observed that as students return to school after the pandemic, their performances got low. Pandemic had hit hard the level of comprehension of students in the mathematics subject. Not only did their level of comprehension was affected but also their level of knowledge, analysis, application, evaluation, and creation. Efforts were made by teachers such as including learning recovery plan, diagnostic tests, and remedial and intervention program before and after each quarter. Numerous strategies were checked on by teachers and incorporated it in their classrooms for better teaching-learning experience in the post-pandemic.

The invention of the flipped classroom and its usability caused by the pandemic had been a great help to most of the educational institutions in the Philippines who had long waited to open their eyes that teaching does not only revolve around the traditional way of teaching and learning inside the classroom. According to Utami (2023), flipped classroom is a reverse classroom learning model that requires more active student participation where students must study the learning material before the teacher discusses it in class. Flipped classroom also develop students' active participation and independence for the teacher only acts as the facilitator. Satparam and Apps (2021) using 722 research articles from three research databases narrated in their study that flipped classroom are mostly done in the high school context where huge variations on the design of pre-class, in-class, bridging activities and technologies were utilized. They also narrated that viewing of instructional videos, performance of individual and group activities, and conducting question and answer sessions were found to be the prevalent forms of pre-class, in-class and bridging activities.

In recent years, due to the pandemic, flipped classroom gained popularity and such proof is the study conducted by Asad, Ali, Churi, and Moreno-Guerrero (2022) in Pakistan where it has been found out that flipped classroom setting is a practical learning approach that enhances student engagement, performance, and learning in class. Moreover, their study also narrated that a large number of students favored flipped classroom approach than the traditional classroom approach. Moreover, a research article by Gonzales (2019) on the use of flipped classroom by a certain University in the Visayan Region of the Philippines revealed that there were challenges encountered by the students which mainly focused on the flipped classroom approach and the technological package. She also narrated that flipped classroom approach could be used effectively in subjects like Child and Adolescent Development and Action Research in Mathematics.

As various researchers narrate the effects of using flipped classroom approach in terms of academic performance, it is also worthy to note that one should also check the effect in terms of motivation to students specifically in terms of Performance Task Making, Problem Solving, and Class Participation and Examination. There are two main types of motivation namely the intrinsic and extrinsic motivation. According to Tarver (2020), intrinsic motivation represents all the things that motivates a person based on internal rewards like self-improvement or helping a friend in need while extrinsic motivation represents all the things that motivates a person based on external rewards like money or praise.

As flipped classroom approach is used nowadays in the global setting and in some universities and colleges in the Luzon and Visayas area in the Philippines, unfortunately, in the area Bangsamoro Autonomous Region in Muslim Mindanao (BARMM) and in the City of Cotabato, there were no researches found regarding the implementation and effect of the Flipped Classroom setting on the academic performance and motivation in Mathematics. Aside from this, the researcher had seen that

nowadays due to the emergence of technology, only few students enjoy the traditional lecture method in class for they more enjoy in active learning such as incorporating activities and technology in the subject.

With the pandemic, it has been now an eye-opener to educational institutions that indeed flipped classroom setting can be done in schools to facilitate learning through student centered approach. But the question lies on how students perceived this new type of setting as an aid to the teaching learning process and this is why the researcher is eager to know the effects of flipped classroom on the academic performance and motivation in Mathematics of the students. As this research comes to an end, through applying flipped classroom learning, it is expected that students will have a higher performance most especially in their level of comprehension and mathematical ability.

This study is primarily to find out the effect of flipped classroom on the academic performance and motivation of grade 8 students in mathematics. This study will help the grade 8 students to create meaning as they go through the process of learning mathematics. In addition, they will be able to know the possible effects of flipped classroom to their academic performance and level of motivation. Mathematics teachers will also be helped as this may provide them the opportunity to reflect and reexamine their teaching methods and styles according to students' needs. This study will also help modify their strategies in terms of teaching mathematical equations and processes, including their styles and techniques in solving algebraic expressions, creating graphs, and simplifying mathematical equations. Math Coordinators too will be helped to identify whether flipped classroom approach may be recommended to be used in the teaching and learning process by Mathematics teachers in the entire school campus in the years to come.

Moreover, school administrators may be able to reexamine the teaching and learning process through strategies done by the teachers to help the students improve their performance in Mathematics. The outcome of the study will be use by the administrator to promote an innovative teaching strategy in the school. Parents may also be aware of their shared responsibility in the improvement of the performance and motivation of the learners. The results of this study may provide assistance to their sons or daughters in learning Mathematics. They may use this research as an aid on how to understand and provide their child's needs. Finally, the Department of Education Policy Makers may set policies based on the result of the study to effectively implement the use of the said strategy in order to improve the mathematical performance and motivation of the grade eight learners.

Objectives

This study determined the effect of flipped classroom on the academic performance and motivation among Grade 8 students in Mathematics of Notre Dame University in Cotabato City during the School Year 2023 – 2024, as basis for the development of a teaching model.

Specifically, the study aims to answer the following questions:

1. What is the pre-assessment results of Grade 8 students in Mathematics in terms of:
   1.1 academic performance; and
   1.2 motivation?
2. What is the post-assessment results of Grade 8 students in Mathematics after the intervention in terms of:
   2.1 academic performance; and
   2.2 motivation?
3. Is there a significant improvement on the academic performance and level of motivation of Grade 8 students after the implementation of the flipped classroom?
4. Is there a significant relationship between the academic performance and level of motivation of Grade 8 students after the implementation of the flipped classroom?
5. As perceived by Grade 8 students, what are the issues and concerns they encountered in the implementation of flipped classroom?
6. Based on the results, what teaching model can be developed?

Hypothesis

Ho1. There is no significant improvement on the academic performance and level of

motivation of Grade 8 students after the implementation of the flipped classroom.
Ho2. There is no significant relationship between the academic performance and level of motivation of Grade 8 students.

Methods

Research Design

This study utilized a quantitative research design specifically one group pre-test post-test design. It is quasi-experimental since the researcher would like to describe the academic performances through the pre-assessment and post-assessment results and motivation through the survey instrument checklist among Grade 8 students of Notre Dame University – Junior High School at Cotabato City, School Year 2023 – 2024. Descriptive research design according to McCombes (2023) aims to accurately and systematically describe a population, situation or phenomenon.

Moreover, this study also utilized a one group pre-test post-test design to find out if there is significant improvement on the academic performance and level of motivation of Grade 8 students after the implementation of the flipped classroom and if there is a significant relationship between the academic performance and level of motivation of Grade 8 students. One group pre-test post-test design is a type of quasi-experiment in which the outcome of interest is measured twice namely, once before and once after exposing a non-random group of participants to a certain intervention or treatment. Quasi-experimental design aims to establish a cause-and-effect relationship between independent and dependent variable and single group design is used when a treatment is implemented or an independent variable is manipulated and then a dependent variable is measured once after the treatment is implemented. (Thomas, 2023; Price, Jhangiani, Chiang, Leighton, and Cuttler, 2023).

Population and Sampling

To ensure a higher degree of accuracy and reliability, the researcher used the cluster sampling technique to determine the effect of flipped classroom on the academic performance and motivation of Grade 8 students in Mathematics. Cluster sampling is where a researcher divides a population into smaller groups known as clusters then randomly select among these clusters to form a sample (Thomas, 2023).

At Notre Dame University Junior High School, there are 7 sections which comprised 37 to 40 students in each classroom thus resulting to obtain a population of 268 Grade 8 students. These were the chosen respondents of this study because of their low performance in the Mathematics subject. In this study, one section was randomly chosen for the pilot testing of the survey questionnaire, and the six remaining sections was chosen for the Experimental Group. In addition, to answer the fifth statement of the problem, the researcher randomly chose 15 students for the informal discussion.

Instrument

There are two types of instruments used in the study namely the adopted questionnaire and the researcher made questionnaire. The adapted questionnaires are from the Mathematics 8 Learning Modules of the Department of Education CARAGA Region published in 2021 and the researcher made questionnaire were face validated by five Language experts, content validated by three Mathematics experts, and reliability tested by 34 students in determining the level of acceptance and reliability of the used questionnaire.

The first instrument adapted from the Mathematics 8 Learning Modules of the Department of Education CARAGA Region published in 2021 was a Pre-Assessment which consist 90 Multiple Choice items arranged in a Table of Specification (TOS) to know the Academic Performance of the students before the given intervention. The second instrument adapted from the Mathematics 8 Learning Modules of the Department of Education published in 2021 was a Post-Assessment which consist 90 Multiple Choice items arranged in a Table of Specification (TOS) which are parallel to the given Pre-Assessment questions to know the Academic Performance of the students after the given intervention. The third instrument which was a researcher made questionnaire is a Checklist that consist questions about the level of motivation of students in the Control and experimental group in terms of Performance

Task Making, Problem Solving, and Class Participation and Examination.

The face validation from 5 Language experts resulted to accept 60 out of 60 items with an overall impact factor of 4.05. The content validation from Mathematics experts resulted to identify 58 items with high validity, 2 items with medium validity, and an overall validity of 0.96. The reliability result from 34 students also obtained a rate of 0.96 which is interpreted as excellent. The values obtained are interpreted through the following: 3.25 – 4.00 Highly Motivated, 2.50 – 3.24 Motivated, 1.75 – 2.49 Less Motivated, and 1.00 – 1.74 Not Motivated. The fourth instrument was a single question questionnaire which was asked to 15 randomly chosen participants during the informal discussion to support and validate the responses.

Data Collection

The researcher undergone three phases for data gathering namely, the preliminary phase, actual data gathering phase, and post data gathering phase.

Pre-Data Gathering. In the preliminary phase, the researcher started with creating three titles for the title proposal which was then submitted to the Dean of the Graduate School of Education for approval. After the approval of the Dean, the researcher proceeded in creating the chapters one to three for the design hearing. After creating the chapters one to three, for the approval of the design hearing, an application was submitted to the Program Coordinator. After the approval of the application, the researcher presented the chapters one to three to the panelist. Comments and suggestions enumerated by the panelist was then be complied by the researcher afterwards.

After the approval of the panelist, the researcher submitted the revised research proposal to the Research Ethics Committee (REC). After the approval of the REC and obtaining Notice to Proceed (NTP), the researcher asked the permission of the Dean of the Graduate School of Education to conduct the study at Notre Dame University – Junior High School (NDU – JHS) which was outside the University. After the approval, the researcher sent a written request to the University President of Notre Dame University to conduct the research in one of its departments – NDU - JHS. Upon the approval of the University President, the researcher asked the approval of the principal to conduct the study to the Grade 8 classes where the researcher due to the respondents age distributed first consents to the research respondents to be signed by their parents.

Actual data gathering. The second phase was the actual data gathering phase which started after the parents signed the consent, wherein the researcher gave the pre-assessment where students answered the 90-point multiple choice assessment. After which, the teacher used the flipped classroom learning approach in the entire logic and reasoning classes which lasted three weeks. In this flipped classroom approach, the teacher researcher sent videos and power point materials which were the lessons for logic and reasoning. The teacher then asked the students to read in advance the lessons at their homes answering also questions about the topic. As students comes to school, the teacher gave emphasis on activities where students were able to remember, understand, analyze, apply, and evaluate what they learned at their homes and create ideas, concepts, and outputs out of it.

A week after the logic and reasoning topic ends, the researcher again came in class and distributed a 90-item post assessment which was parallel with the pre-assessment and also the survey questionnaire. Upon entering the classroom, the researcher again explained his purpose, distributed the survey questionnaire, and asked the respondents to read the consent form and data conditions on this study. The researcher again emphasized that the respondents have the freedom whether to answer or not to answer the survey questions as it is deemed voluntary. They too were reminded that their answers will remain confidential and will only between them and the researcher. After obtaining the answers, the researcher invited 15 students for an informal discussion and asked the question "what are the issues and concerns that you encountered in the implementation of flipped classroom?" Their answers were written to support and validate the responses in the given survey instrument.

Post data gathering. Finally, in the third phase was the post data gathering phase. The researcher after retrieving the survey questionnaires from the respondents tallied, tabulated, analyzed and interpreted the collected data in determining the effect of flipped classroom on the academic performance and motivation in Mathematics.

Treatment of Data

The data gathered and tabulated in this research was analyzed using inferential statistics, particularly T-tests for dependent samples, mean, standard deviation, and mean percentage score. The following statistical treatment was used in order to provide the most accurate results.

In question number 1 and 2, the mean percentage score, standard deviation, and proficiency level on Mathematics in accordance with the Department of Education (DepEd) was utilized together with the mean and standard deviation in measuring the motivation of students. Mean percentage score according to DepEdTrends.com (2024) is the percentage of properly answered items on a test which represents the proportion of correctly answered items to all test questions. Standard deviation according to Bhandari (2020) is the average amount of variability in the dataset that narrates how far each value lies from the mean. Mean according to BYJU's.com (2024) is said to be one of the measures of central tendency where it can be calculated through adding all the observations divided by the total number of observations.

In question number 3, the Paired Samples T-test was utilized in determining whether there is a significant improvement on the academic performance and level of motivation of Grade 8 students after the implementation of the flipped classroom. According to Zach (2018), paired samples t-test is used to compare the means of two samples when each observation in one sample can be paired with an observation in the other sample.

In question number 4, the Pearson Product Moment Correlation Coefficient was utilized in determining whether there is a significant relationship between the academic performance and level of motivation of Grade 8 students. According to Turney (2022), Pearson Product Moment Correlation Coefficient is the most common way of measuring a linear correlation. It is a number between –1 and 1 that measures the strength and direction of the relationship between two variables. Specifically, it describes the strength and direction of the linear relationship between two quantitative variables.

In question number 5, the frequency count was utilized in determining the issues and concerns they encountered in the implementation of flipped classroom. According to Turney (2022), frequency distribution describes the number of observations for each possible value of a variable. Frequency distributions are depicted using graphs and frequency tables.

Ethical Considerations

The researcher made sure that this study followed ethical standards of doing Research. Thus, the following are given emphasis: Protection of Human Rights; Respect for Persons; Beneficence Justice; Autonomy; Transparency; (a) risk and benefit assessment that includes; benefits; risks; physical harms; psychological harms; social and economic harms; (b) content, comprehension, and documentation of implied content that includes; participant status; study goal; type of data; procedures; nature of commitment; sponsorship; participants selection; potential risks; potential benefits; alternative; compensation; confidentiality pledge; voluntary consent; right to withdraw and withhold information; contact information; authorization to access private information; privacy and confidentiality; debriefing and communications; incentives and compensation; conflict of interest; vulnerability assessment; collaborative terms of reference

Protection of Human Rights. Protection of human rights. The researcher assured accountability by protecting the participants information taken from them. The researcher explained clearly to the participants that the result of the study is for academic purposes only.

Respect for Persons. The researcher of the study has full respect for the participants. Thus, participants have the privilege of being part of the study. However, the proponent clearly explained to the participants that their identities would not be disclosed to the beneficiaries of

the study. The result of the study was properly communicated to all stakeholders, and none of the personal information will be disclosed.

Beneficence. This study was conducted for the betterment of the participants and the whole organization. Through the findings of the study, the researcher designed a teaching model that would serve as a guide for mathematics teachers in providing intervention, a pre-assessment, and a post-assessment to Grade 8 students.

Justice. The researcher practiced fairness and equality in treating the participants of the study in all aspects of the data gathering process.

Autonomy. The researcher explained to the participants that they have complete control over what they do, even if their parents have already signed the consent form in the data gathering.

Transparency. The researcher was transparent to all participants by revealing to them the results of the study. Both internal and external stakeholders were properly communicated with the study's participants, who are its intended benefactors, and the researcher is open with the institution when notifying it of the presentation and publication of this work. To request authorization, a formal letter will be addressed to the President of the University.

A. Risk and Benefit Assessment

Benefits. The research project benefited all Grade 8 students from Notre Dame University Junior High School, whose motivation to pursue the study was addressed through various interactions. There were interventions given to the Grade 8 students through various activities that helped to motivate them finish the entire lesson. There were no direct monetary or material gains or other incentives involved, and no material or non-material compensation is provided to the participants.

Risks. There were no risks as to the confidentiality of the data by ensuring that the responses were held with strict confidentiality and subjected for study purposes. Risks were minimized as the researcher carefully planned all these things in order to come up with valid data and information based on facts and destroyed evidence after it was presented, analyzed, and interpreted.

Physical Harms. The researcher was able to avoid harming the participants of the study. No pain, injury, illness, or impairment were caused by another; it was prevented by collecting adequate information and removing risky individuals.

Psychological Harms. The researcher ensured that the participants who took the study were not distressed. The researcher made sure that the participants were not be embarrassed, frightened, and offended.

Social and Economic Harms. There were no social and economic harm present in this study. The researcher carefully reviewed the issues that may occur in this research and ensured that the participants are protected from embarrassment within one's social group.

B. Content, Comprehension, and Documentation of Implied Content

An informed consent form was signed by the Dean of the Graduate School of University of the Visayas and President of Notre Dame University during the research to protect the rights of the participants.

Participant Status. As part of the requirements for the master's program, the researcher supplied the participants with information about the research concept and solely use the data they submitted for research.

Study Goal. Before distributing the questionnaire, the researcher explained the study's purpose to the participants.

Type of Data. The data was quantitative before the test questionnaire was administered. The researcher obtained the academic performance of the students' through the pre-assessment and post-assessment scores.

Procedures. Grade 8 Students at Notre Dame University Junior High School served as the study's subjects. Prior to conducting the study, the researcher sought clearance from the following parties: First, a letter of authorization for the researcher from the Dean of the Graduate School of Education. Second, the researcher explained the purpose of the study and requested permission from the Notre

Dame University President and Notre Dame University Junior High School Principal. Third, since the researcher was also the teacher at all sections in the Grade 8 level, he sought the approval of his Coordinator by letting her know about the intervention to be use in class. Fourth, the researcher sent a consent letter addressed to the parents of the participants to allow them for the conduct of the research. Finally, the researcher conducted the study.

Nature of Commitment. The researcher informed the principal and coordinator that the study will be finished at the end of the second quarter. To avoid scheduling conflicts, the researcher guaranteed that he will conduct the study within the anticipated time frame.

Sponsorship. Since the research is a requirement for an academic degree, the researcher is responsible for its costs. There were no sponsors; the research was entirely self-funded.

Participants Selection. In order to to determine the effect of flipped classroom on the academic performance and motivation in Mathematics, the researcher choose the Notre Dame University Junior High School Grade 8 students as its subject.

Potential Risks. To prevent both physical and emotional stress, the researcher did his utmost to maintain the subjects in their most relaxed states. The researcher was relaxed knowing that there won't be any competing interests when conducting the study.

Potential Benefits. The subjects were expected to gain from the success of the flipped classroom method to mathematics teaching learning process, which may help them by assessing their intellectual capacity throughout their academic careers. The students find it easier to exercise their knowledge capacity in mathematics.

Alternative. There was no alternative way in conducting the study.

Compensation. There was no compensation given to the students.

Confidentiality Pledge. The researcher emphasized his commitment to always protecting students' privacy.

Voluntary Consent. The researcher distributed voluntary consents to the subjects which was later signed by their parents or guardians due to their current age status.

Right to withdraw and withhold Information. Participants were informed that they could withhold information if they wished to and have the right to withdraw from participating in the study at any point that they want to.

Contact Information. The researcher gave the respondents' contact information in case they have any questions, comments, or concerns about the study's conduct, particularly data gathering. The researcher can be reached at 09068130531 or by email at jybaybayan@gmail.com.

Authorization to access private information. The researcher only accessed the collection of data. No private information that would harm the subjects' sense of dignity was included in the study, and all information were collected with the utmost confidentiality and anonymity.

Privacy and Confidentiality. The study utilized test questionnaires related to the research study in assessing the academic performance and motivation of students in the flipped classroom setting thus there were no potential factor endangering the subjects.

Debriefing and Communications. Debriefing was not required following the completion of the study because the researcher found nothing in the research that has the potential to cause psychological trauma to the subjects because the study solely uses test and survey questions on specific topics.

Incentives and Compensation. The researcher gave a token of appreciation to the University President, Principal, and Coordinator of the school as an incentive for rendering their help in conducting the study.

Conflict of Interest. Controlling conflicts of interest were not relevant to this investigation. The researcher will list the research adviser as co-author if this study will be presented or published.

Vulnerability Assessment. The researcher explained to the participants the process of assessing them and how important their responses are to the realization of the study.

Collaborative terms of Reference. If in case the study will be published, the adviser will be included as co-author.

Results and Discussion

Pre-Assessment result of Grade 8 students in Mathematics in terms of Academic Performance

The table below presents the pre-assessment scores of each section in terms of mean percentage score and standard deviation together with its corresponding proficiency level. Moreover, these results are based from the different sections of the Grade 8 level at Notre Dame University Junior High School before the Flipped Classroom was implemented. According to Vitug (2019), academic performance is the extent to which a student, teacher or institution has achieved their short- or long-term educational goals. It means that students' academic performance can be estimated for any student by its home environment and learning, as shown in Table 2.

Table 1. Pre-Assessment result of Grade 8 students in Mathematics in terms of Academic Performance

Class Section	Mean Percentage Score	SD	Proficiency Level
Humility	36.44	9.086	Did not meet expectation
Harmony	33.79	12.711	Did not meet expectation
Solidarity	45.94	15.190	Did not meet expectation
Courage	30.52	9.913	Did not meet expectation
Charity	23.43	8.110	Did not meet expectation
Peace	40.54	12.111	Did not meet expectation
Average	**35.11**	**11.187**	**Did not meet expectation**

Note: n = 189. Legend 90 - 100% (76 – 90) Outstanding, 85 – 89% (68 – 75) Very Satisfactory, 80 – 84% (61 – 67) Satisfactory, 75 - 79% (54 – 60) Fairly Satisfactory, 74 and below (0 – 53) Did not meet expectation

Table one presents the pre-assessment result of Grade 8 students in Mathematics in terms of Academic Performance. This further reveal that students in Solidarity got the highest mean percentage score while students in Charity got the lowest mean percentage score. Even though the following classes mentioned got the highest and lowest percentage scores respectively, still the proficiency level is "did not meet expectation" thus implying that students somehow have an advance knowledge about the lesson but still this advanced knowledge that they had does not lead to a satisfactory or passing mark. Moreover, these results were noted to be a result based from prior knowledge of students before the implementation of the flipped classroom learning.

The results are supported by Kelly et. al (2013) in which according to the Program for International Student Assessment, math achievement among American learners declined for the second year in a row in 2015. Furthermore, according to Hossain (2012), the performance of American learners in Mathematics has deteriorated. Meanwhile, in Asia, mathematics is seen as one of the most important subjects, with students urged to get a degree in the subject (Leatham and Peterson, 2010; Ronis, 2008). According to Wei and Dzeng (2014), most Asian countries have very active teaching approaches addressing children's arithmetic achievement. Mathematics is a major subject in the secondary education in the Philippines, and students are required to use problem-solving, critical thinking, reasoning, expressiveness, and decision-making concepts in real life. According to Blömeke and Delaney (2014), mathematics is fundamental and thus required as a topic in most fields. Regardless, concerns with number-crunching capability continue to exist, not only in the Philippine context, but also in other countries. According to Kaushar (2013), most students now devote less time to studying, and a sizable proportion of students are not devoted to schedules and do not know how to utilize their time as leaders do.

Motivational Level of the Students before the implementation of Flipped Classroom

Tables three to five presents the motivational level of the students before the implementation of Flipped Classroom Setting in terms of Performance Task Making, Problem Solving, and Class Participation and Examination through mean, standard deviation and its corresponding interpretation. According to Psychology Today (2023), motivation is the desire to act in service of a goal. It is the crucial element in setting and attaining our objectives thus is one of the driving forces behind human behavior. It fuels competition and sparks social connection. Its absence can lead to mental illnesses such as depression. Motivation encompasses the desire to continue striving toward meaning, purpose, and a life worth living, as shown in Tables 3 to 5.

Motivational Level of the Students before the implementation of Flipped Classroom Setting in terms of Performance Task Making

The table below presents the motivational level of the students before the implementation of flipped classroom setting in terms of performance task making through mean and standard deviation. Moreover, these results are based from the answers of the student before the Flipped Classroom was implemented. According to (Blog.PerformanceTask, 2015), performance tasks call for the application of knowledge and skills, not just recall or recognition for this is where one can apply what was learned and make shortcuts in making the task for easier completion., as shown in Table 2.

Table 2. Motivational Level of the Students before the implementation of Flipped Classroom Setting in terms of Performance Task Making

Statement	Mean	SD	Interpretation
Before the implementation of Flipped Classroom Setting, I am _____ in…			
1. following instructions in doing tasks or projects	3.26	.639	Highly Motivated
2. understanding instructions in making the performance tasks	3.24	.647	Motivated
3. analyzing the performance tasks carefully	3.25	.727	Highly Motivated
4. finding concepts in making the performance task	2.92	.778	Motivated
5. locating sources that serve as guides in making the performance task	3.07	.815	Motivated
6. creating new possible solutions or designs in making the performance tasks	2.97	.872	Motivated
7. creating short methods or strategies for easier completion of performance tasks	3.17	.848	Motivated
8. making the performance tasks creatively	3.16	.783	Motivated
9. submitting scaffold tasks on time	3.24	.775	Motivated
10. submitting big tasks on time	3.33	.743	Highly Motivated
Overall	**3.161**	**.763**	**Motivated**

Note: n = 189. Legend 3.25 – 4.00 Highly Motivated, 2.50 – 3.24 Motivated, 1.75 – 2.49 Less Motivated, 1.00 – 1.74 Not Motivated

Table three presents the Motivational Level of the Students in the Traditional Classroom Setting in terms of Performance Task Making. This further reveal that overall, students are motivated in doing Performance Task Making. Moreover, statement number 10 "submitting big tasks on time" got the highest rated mean wherein the students are highly motivated in doing such. This is followed by statement number one "following instructions in doing tasks or projects" with a mean which is interpreted as highly motivated. Finally, statement number three "analyzing the performance tasks carefully" got the third highest rated mean which is

interpreted as highly motivated. On the other hand, statement number four "finding concepts in making the performance task" got the lowest rated mean but the students are still motivated on such. Following this is statement number six "creating new possible solutions or designs in making the performance tasks" with a mean which is interpreted as motivated. Finally, statement number five "locating sources that serve as guides in making the performance task" got the third lowest rated mean which is interpreted as motivated.

The results are supported by White (2015) narrating that to master material, students need to make it their own. As teachers, one should structure interactions with mathematics in ways that are memorable, meaningful, and fun. One way to do this is to provide activities that stretch beyond the textbook and lead students to think and talk to one another about mathematics. White's thesis contains set of activities designed to enhance a course, along with solutions and feedback on each activity. Following instructions is important in helping students learn new skills and function well in different environments.

Motivational Level of the Students before the implementation of Flipped Classroom Setting in terms of Problem Solving

The table on the next page presents the motivational level of the students before the implementation of flipped classroom setting in terms of problem solving through mean and standard deviation. Moreover, these results are based from the answers of the student before the Flipped Classroom was implemented. As part of the Principles and Standards for School Mathematics of Mundy (2000) and researches of Tambychick & Meerah (2010), students need to describe strategies, explain their reasoning, justify solutions, and make persuasive arguments, both orally and in writing. They need to learn mathematical vocabulary and use it to express mathematical ideas with precision and clarity. In class and small group discussions, they need to build on the thinking of their classmates and to ask questions to help them understand and clarify another person's strategies, as shown in Table 4.

Table 3. Motivational Level of the Students before the implementation of Flipped Classroom Setting in terms of Problem Solving

Statement	Mean	SD	Interpretation
Before the implementation of Flipped Classroom Setting, I am _____ in…			
1. analyzing the problem situations based on the different topics presented	2.78	.853	Motivated
2. identifying the formula to solve the problem given	2.86	.839	Motivated
3. creating own formulas for better understanding	2.61	.987	Motivated
4. processing questions and problems using the step-by-step procedure	3.06	.813	Motivated
5. using step by step process in answering problem solving questions	3.05	.849	Motivated
6. applying the formula in solving questions/problems	3.04	.889	Motivated
7. using other formulas in checking the answer	2.71	1.003	Motivated
8. formulating short methods in answering situational problems	2.90	.900	Motivated
9. specifying correct and valid formulas in each question	2.83	.926	Motivated
10. applying the concept in real life situation problems	2.74	1.069	Motivated
Overall	**2.858**	**.913**	**Motivated**

Note: n = 189. Legend 3.25 – 4.00 Highly Motivated, 2.50 – 3.24 Motivated, 1.75 – 2.49 Less Motivated, 1.00 – 1.74 Not Motivated

Table three presents the Motivational Level of the Students in the Traditional Classroom Setting in terms of Problem Solving. This further reveal that overall, students are motivated in doing Problem Solving. Moreover, statement number four "processing questions and problems using the step-by-step procedure" got the highest rated mean wherein the students are motivated in doing such. This is followed by statement number five "using step by step process in answering problem solving questions" with a mean which is interpreted as motivated. Finally, statement number six "applying the formula in solving questions/problems" got the third highest rated mean which is interpreted as motivated. On the other hand, statement number three "creating own formulas for better understanding" got the lowest rated mean but the students are still motivated on such. Following this is statement number seven "using other formulas in checking the answer" with a mean which is interpreted as motivated. Finally, statement number ten "applying the concept in real life situation problems" got the third lowest rated mean which is interpreted as motivated.

The Principles and Standards for School Mathematics emphasize the integral role of problem solving in mathematical learning. The Problem-solving standard states that "students should have frequent opportunities to formulate, grapple with and solve complex problems that require a significant amount of effort." (NCTM, 2000; Billstein, Libeskind, & Lott, 2013). Solving these complex problems involves several organizational demands: figuring out how to get started; carrying out a sequence of steps; keeping track of the information from prior steps; monitoring one's progress and adjusting the strategies accordingly; and presenting solutions in an organized manner. Students must also organize their time to ensure that they do not rush through tasks and make careless errors or spend an excessive amount of time and not complete the task.

Motivational Level of the Students before the implementation of Flipped Classroom Setting in terms of Class Participation and Examination

The table on the next page presents the motivational level of the students before the implementation of flipped classroom setting in terms of class participation and examination through mean and standard deviation. Moreover, these results are based from the answers of the student before the Flipped Classroom was implemented. Standards-based mathematics places a strong emphasis on the communication of mathematical ideas through classroom discourse. Students work together in pairs or small groups to carry out mathematical investigations and then share their findings in a whole class discussion. They may give their peers constructive feedback to help them improve a problem solution or project report, as shown in Table 4.

Table 4. Motivational Level of the Students before the implementation of Flipped Classroom Setting in terms of Class Participation and Examination

Statement	Mean	SD	Interpretation
Before the implementation of Flipped Classroom Setting, I am _____ in…			
1. presenting reports on assigned topics	3.12	.830	Motivated
2. presenting solutions to the problems that are easy to understand	3.07	.812	Motivated
3. presenting self-made solutions in activities and examinations	2.77	.914	Motivated
4. participating in class discussion	2.99	.890	Motivated
5. participating in group discussion	3.08	.850	Motivated
6. participating in group activities	3.25	.778	Highly Motivated
7. participating in board activities	2.87	.914	Motivated
8. answering questions during quizzes	3.05	.836	Motivated

Statement	Mean	SD	Interpretation
9. answering questions during unit tests	3.16	.842	Motivated
10. answering questions during quarterly exams	3.22	.863	Motivated
Overall	**3.058**	**.853**	**Motivated**

Note: n = 189. Legend 3.25 – 4.00 Highly Motivated, 2.50 – 3.24 Motivated, 1.75 – 2.49 Less Motivated, 1.00 – 1.74 Not Motivated

Table four presents the Motivational Level of the Students in the Traditional Classroom Setting in terms of Class Participation and Examination. This further reveal that overall, students are motivated in doing Class Participation and Examination. Moreover, statement number six "participating in group activities" got the highest rated mean wherein the students are highly motivated in doing such. This is followed by statement number ten "answering questions during quarterly exams" with a mean which is interpreted as motivated. Finally, statement number nine "answering questions during unit tests" got the third highest rated mean which is interpreted as motivated. On the other hand, statement number three "presenting self-made solutions in activities and examinations" got the lowest rated mean but the students are still motivated on such. Following this is statement number seven "participating in board activities" with a mean which is interpreted as motivated. Finally, statement number four "participating in class discussion" got the third lowest rated mean which is interpreted as motivated. Examination assesses student mastery of skills and concepts required for a subject.

Students need confidence to try new mathematical investigations, to persist through frustration, and to share their ideas in public. All these types of tasks involve psycho-social skills (Pourdavood and Wachira 2015). Moreover, according to Francisco, M. (2015), in terms of examinations which includes unit tests, quarter tests, and quizzes, there are various test types that can be used in mathematics namely multiple choice, essay, matching type, and completion type. A large portion of the exam is devoted to testing a student's understanding of functions and their properties. (College Board, 2016).

Post-Assessment result of Grade 8 students in Mathematics in terms of Academic Performance

The table on the next page presents the post-assessment scores of each section in terms of mean percentage score and standard deviation together with its corresponding proficiency level. These results were gathered to student respondents after the implementation of the flipped classroom setting. According to Vitug (2019), the nature of motivation and learning strategy is vital to improve student learning outcomes. It is intended to explore the motivational beliefs and learning strategy used to find the connection with the academic performance of the students, as shown in Table 5.

Table 5. Post-Assessment result of Grade 8 students in Mathematics in terms of Academic Performance

Class Section	Mean Percentage Score	SD	Proficiency Level
Humility	58.00	9.588	Fairly Satisfactory
Harmony	69.26	15.524	Very Satisfactory
Solidarity	60.88	8.913	Satisfactory
Courage	65.79	11.242	Satisfactory
Charity	59.67	10.354	Fairly Satisfactory
Peace	52.97	8.750	Did not meet expectation
Average	**61.10**	**10.729**	**Satisfactory**

Note: n = 189. Legend 90 - 100% (76 – 90) Outstanding, 85 – 89% (68 – 75) Very Satisfactory, 80 – 84% (61 – 67) Satisfactory, 75 - 79% (54 – 60) Fairly Satisfactory, 74 and below (0 – 53) Did not meet expectation

Table five presents the post-assessment result of Grade 8 students in Mathematics in terms of Academic Performance. This further reveal that students in Harmony got the highest mean percentage score while students in Peace got the lowest mean percentage score. Moreover, this table also reveals an increase in the level of knowledge of the students for from a "did not meet expectation" category, one section got a very satisfactory proficiency level, two sections got satisfactory proficiency level, two sections got fairly satisfactory level, and only one section remained in the got did not meet expectation proficiency level. Though this one section remained in the did not meet expectation proficiency category, the mean percentage score is higher that the pre-assessment thus there is still an improvement to these students. With these results, this also shows that Flipped Classroom learning setting is an effective teaching-learning strategy to help students get a higher score.

The results are supported by Polat and Karabatak (2019) where it has been found out that students' academic achievement, academic satisfaction, and general belongingness levels significantly increased in the flipped classroom compared with the other classroom models. In the study of Stackpool, Premarathna, and Leahy (2023), it was found out that flipped classroom teaching learning model when offered in conjunction with the supplemental instruction faculty-facilitated learning enhancement tutoring significantly enhances student academic achievements and leads to a decrease in the academic equity gaps among several groups of students. Contemplative tendencies, on the other hand, appear to be an essential element in determining how well students perform in class (Cerna & Pavliushchenko, 2015). When students excel in areas such as problem-solving, they develop a more positive self-concept, which leads to higher levels of achievement in their academic performance.

Motivational Level of the Students in the Flipped Classroom Setting

Tables seven to nine presents the Motivational Level of the Students in the Flipped Classroom Setting in terms of Performance Task Making, Problem Solving, and Class Participation and Examination through mean, standard deviation and its corresponding interpretation. According to Tarver (2020), intrinsic motivation represents all the things that motivates a person based on internal rewards like self-improvement or helping a friend in need. Moreover, Santos-Longhurst (2019) which was medically reviewed by Timothy J. Legg, mentioned that the activity itself is the reward for intrinsically motivated individuals. It also made mentioned that it intrinsically motivated individuals seek and engage into activities which are challenging, interesting, and internally rewarding without the prospect of any external reward while extrinsic motivation represents all the things that motivates a person based on external rewards like money or praise. These types of motivation are more common than intrinsic motivators and include achieving things due to a tangible incentive, fear, or expectation, all of which depend on external factors. Kapeleris (2014) and Tagata & Que (2013) said that some reasons why procrastination occurs have been outlined, including the fear of failure, anxiety in starting or completing tasks, the need for an adrenalin hit as a result of self-imposed working being under pressure, ineffective decision-making, perfectionism and 'planning fallacy', which means underestimating the amount of time required to complete a set of tasks, as shown in Tables 7 to 9.

Motivational Level of the Students in the Flipped Classroom Setting in terms of Performance Task Making

The table on the next page presents the motivational level of the students in the flipped classroom setting in terms of Performance Task making through mean and standard deviation. Moreover, these results are based from the answers of the student after the Flipped Classroom was implemented. According to Kapeleris, (2014) and Tagata & Que (2013) procrastination occurs are being outlined, including the fear of failure, anxiety in starting or completing tasks, the need for an adrenalin hit as a result of self-imposed working being under pressure, ineffective decision-making, perfectionism and 'planning fallacy', which means underestimating the amount of time required to complete a set of tasks., as shown in Table 6.

Table 6. Motivational Level of the Students in the Flipped Classroom Setting in terms of Performance Task Making

Statement	Mean	SD	Interpretation
Through the Flipped Classroom Setting, I am _____ in…			
1. following instructions in doing tasks or projects	3.36	.770	Highly Motivated
2. understanding instructions in making the performance tasks	3.35	.697	Highly Motivated
3. analyzing the performance tasks carefully	3.28	.730	Highly Motivated
4. finding concepts in making the performance task	3.17	.836	Motivated
5. locating sources that serve as guides in making the performance task	3.18	.850	Motivated
6. creating new possible solutions or designs in making the performance tasks	3.16	.867	Motivated
7. creating short methods or strategies for easier completion of performance tasks	3.29	.733	Highly Motivated
8. making the performance tasks creatively	3.21	.804	Motivated
9. submitting scaffold tasks on time	3.29	.768	Highly Motivated
10. submitting big tasks on time	3.42	.737	Highly Motivated
Overall	**3.271**	**.779**	**Highly Motivated**

Note: n = 189. Legend 3.25 – 4.00 Highly Motivated, 2.50 – 3.24 Motivated, 1.75 – 2.49 Less Motivated, 1.00 – 1.74 Not Motivated

Table six presents the Motivational Level of the Students in the Flipped Classroom Setting in terms of Performance Task Making. This further reveal that overall, students are highly motivated in doing Performance Task Making. Moreover, statement number ten "submitting big tasks on time" got the highest rated mean wherein the students are highly motivated in doing such. This is followed by statement number one "following instructions in doing tasks or projects" with a mean which is interpreted as highly motivated. Finally, statement number two "understanding instructions in making the performance tasks" got the third highest rated mean which is interpreted as highly motivated. On the other hand, statement number six "creating new possible solutions or designs in making the performance tasks" got the lowest rated mean but the students are still motivated on such. Following this is statement number four "finding concepts in making the performance task" with a mean which is interpreted as motivated. Finally, statement number five "locating sources that serve as guides in making the performance task" got the third lowest rated mean which is interpreted as motivated.

The results are being supported by Kapeleris, (2014) and Tagata & Que (2013) which states that big tasks are somewhat hard to do that is why most students procrastinate. The best way to complete a big task is to start doing it as early as possible so that the person will not feel pressured in doing it due to time constraint. Steffe & Thompson (2000); Thompson & Silverna (2008) also suggested that, "One simple way to make certain that the students understand your directions is to ask a student (or several) to repeat the directions back to you".

Motivational Level of the Students in the Flipped Classroom Setting in terms of Problem Solving

The table on the next page presents the motivational level of the students in the flipped classroom setting in terms of Performance Task making through mean and standard deviation. Moreover, these results are based from

the answers of the student after the Flipped Classroom was implemented. According to (Larson, 2011), there are many approaches one could use in solving the problem such as to look for a pattern, solve a simpler problem, work backwards, draw a diagram, use technology, or any of several other approaches, as shown in Table 7.

Table 7. Motivational Level of the Students in the Flipped Classroom Setting in terms of Problem Solving

Statement	Mean	SD	Interpretation
Through the Flipped Classroom Setting, I am _____ in…			
1. analyzing the problem situations based on the different topics presented	3.08	.887	Motivated
2. identifying the formula to solve the problem given	3.04	.889	Motivated
3. creating own formulas for better understanding	2.78	.991	Motivated
4. processing questions and problems using the step-by-step procedure	3.06	.864	Motivated
5. using step by step process in answering problem solving questions	3.06	.906	Motivated
6. applying the formula in solving questions/problems	3.05	.871	Motivated
7. using other formulas in checking the answer	2.82	.989	Motivated
8. formulating short methods in answering situational problems	2.95	.904	Motivated
9. specifying correct and valid formulas in each question	3.08	.831	Motivated
10. applying the concept in real life situation problems	2.90	1.001	Motivated
Overall	**2.982**	**.913**	**Motivated**

Note: n = 189. Legend 3.25 – 4.00 Highly Motivated, 2.50 – 3.24 Motivated, 1.75 – 2.49 Less Motivated, 1.00 – 1.74 Not Motivated

Table seven presents the Motivational Level of the Students in the Flipped Classroom Setting in terms of Problem Solving. This further reveal that overall, students are motivated in doing Problem Solving. Moreover, statement number one "analyzing the problem situations based on the different topics presented" and nine "specifying correct and valid formulas in each question" got the highest rated mean wherein the students are motivated in doing such. This is followed by statement number four "processing questions and problems using the step-by-step procedure" and five "using step by step process in answering problem solving questions" with a mean which is interpreted as motivated. Finally, statement number six "applying the formula in solving questions/problems" got the third highest rated mean which is interpreted as motivated. On the other hand, statement number three "creating own formulas for better understanding" got the lowest rated mean but the students are still motivated on such. Following this is statement number seven "using other formulas in checking the answer" with a mean which is interpreted as motivated. Finally, statement number ten "applying the concept in real life situation problems" got the third lowest rated mean which is interpreted as motivated.

This shows that students are motivated to make their own formula to arrive the correct answer. It is necessary that the teacher will recognize the strategies or techniques used by the students to get the correct answer. As for the result, most students are motivated to create their own formulas or patterns in solving. It means that they are motivated to analyze the problem and make their own formulas based on the problem. Using a formula is a problem-solving strategy that students can use to find answers to math problems. To solve these problems, students must process, analyze, and choose the appropriate formula and substitute data in the correct places of a formula in step-

by-step procedure (TeacherVision, 2017). According to Stendall (2009), the abilities to give good concentration, to make meaningful perceptions, to think logically and to use memory effectively are important factors in learning skills and solving problems.

Motivational Level of the Students in the Flipped Classroom Setting in terms of Class Participation and Examination

The table below presents the motivational level of the students in the flipped classroom setting in terms of class participation and examination through mean and standard deviation. Moreover, these results are based from the answers of the student after the Flipped Classroom was implemented. In terms of examinations which includes unit tests, quarter tests, and quizzes, there are various test types that can be used in mathematics namely multiple choice, essay, matching type, and completion type. According to White (2015) As teachers, one should structure students' interactions with mathematics in ways that are memorable, meaningful, and fun, as shown in Table 8.

Table 8. Motivational Level of the Students in the Flipped Classroom Setting in terms of Class Participation and Examination

Statement	Mean	SD	Interpretation
Through the Flipped Classroom Setting, I am _____ in…			
1. presenting reports on assigned topics	3.22	.863	Motivated
2. presenting solutions to the problems that are easy to understand	3.13	.805	Motivated
3. presenting self-made solutions in activities and examinations	2.93	.942	Motivated
4. participating in class discussion	3.18	.812	Motivated
5. participating in group discussion	3.19	.796	Motivated
6. participating in group activities	3.28	.772	Highly Motivated
7. participating in board activities	2.99	.940	Motivated
8. answering questions during quizzes	3.17	.816	Motivated
9. answering questions during unit tests	3.25	.829	Highly Motivated
10. answering questions during quarterly exams	3.31	.786	Highly Motivated
Overall	**3.165**	**.836**	**Motivated**

Note: n = 189. Legend 3.25 – 4.00 Highly Motivated, 2.50 – 3.24 Motivated, 1.75 – 2.49 Less Motivated, 1.00 – 1.74 Not Motivated

Table eight presents the Motivational Level of the Students in the Flipped Classroom Setting in terms of Class Participation and Motivation. This further reveal that overall, students are motivated in doing Class Participation and Motivation. Moreover, statement number ten "answering questions during quarterly exams" got the highest rated mean wherein the students are highly motivated in doing such. This is followed by statement number six "participating in group activities" with a mean which is interpreted as highly motivated. Finally, statement number nine "answering questions during unit tests" got the third highest rated mean which is interpreted as highly motivated. On the other hand, statement number three "presenting self-made solutions in activities and examinations" got the lowest rated mean but the students are still motivated on such. Following this is statement number seven "participating in board activities" with a mean which is interpreted as motivated. Finally, statement number two "presenting solutions to the problems that are easy to understand" got the third lowest rated mean which is interpreted as motivated.

According to White (2015) Making Mathematics Memorable, Meaningful, and Fun, to master the material, students need to make it their own. As teachers, one should structure students' interactions with mathematics in

ways that are memorable, meaningful, and fun. One way to do this is to provide activities that stretch beyond the textbook and lead students to think and talk to one another about mathematics.

Improvement on the academic performance and level of motivation of the Grade 8 students after the implementation of the flipped classroom

The table on the next page shows the improvement on the academic performance and level of motivation of the Grade 8 students after the implementation of the flipped classroom through dependent samples t-test. According to University of the People (2023), a traditional classroom is a physical location where a teacher presents knowledge to students in person. It is also the most common means by which students acquire their education where it tends to be interactive, allowing students to ask questions and participate in activities to absorb new material and teachers base their lessons on standardized curriculums and administer tests to gauge how well their students are learning. Meanwhile, according to Utami (2023), in the flipped classroom, students' active participation and independence are developed as the teacher only acts as the facilitator. It can also foster a sense of responsibility, critical thinking skills, curiosity, honesty, creativity, and motivate students tik earn according to their own pace of learning, as shown in Table 9.

Table 9. Improvement on the academic performance and level of motivation of the Grade 8 students after the implementation of the flipped classroom

Observations		MPS	SD	Mean Gain	t	p	Decision	Interpretation
Academic Performance	Pre	35.46	13.555	25.61	-19.828	.000	Significant	Reject Ho
	Post	61.07	12.150					
Level of Motivation (Performance Task Making)	Before	31.63	4.236	1.09	-3.622	.000	Significant	Reject Ho
	After	32.72	4.899					
Level of Motivation (Problem Solving)	Before	28.57	5.471	1.24	-3.092	.002	Significant	Reject Ho
	After	29.81	5.907					
Level of Motivation (Class participation and Examinations)	Before	30.59	5.410	1.06	-3.330	.001	Significant	Reject Ho
	After	31.65	5.934					
Level of Motivation (Overall)	Before	90.79	12.473	3.38	-4.497	.000	Significant	Reject Ho
	After	94.17	14.433					

Table nine presents the improvement on the academic performance and level of motivation of the Grade 8 students after the implementation of the flipped classroom. This further reveal that there is a significant difference in terms of the Academic Performance ($t(188) = -19.828$, $p = .000$) where the Post Assessment result showed a higher mean of 61.07 as compared to the Pre Assessment result with a mean of 35.46. This also showed a significant difference in terms of the Level of Motivation in Performance Task Making ($t(188) = -3.622$, $p = .000$) where the students rated Flipped Classroom setting higher than the Traditional Classroom, with a mean of 32.72 and 31.63 respectively. Moreover, this also showed a significant difference in terms of the Level of Motivation in Problem Solving ($t(188) = -3.092$, $p = .002$) where the students rated Flipped Classroom setting higher than the Traditional Classroom, with a mean of 29.81 and 28.57 respectively. In addition, this also showed a significant difference in terms of the Level of Motivation in Class Participation and Examinations ($t(188) = -3.330$, $p = .001$) where the students rated Flipped Classroom setting higher than

the Traditional Classroom, with a mean of 31.65 and 30.59 respectively. Overall, this also showed a significant difference in terms of the Level of Motivation t(188) = -4.497, p = .000) where the students rated Flipped Classroom setting higher than the Traditional Classroom, with a mean of 94.17 and 90.79 respectively.

These results are negated by Kapur (2020), emphasizing that lecture method is regarded as the most comprehensively used pedagogical method within educational institutions at all levels. In simple terms, this is the method in which the instructors are imparting information to the students in terms of lesson plans and academic concepts within the classroom settings. Moreover, as cited by Kapur (2020), Learning Spark (2017) narrated advantages and disadvantages of lecture method. The following advantages are effective lecturers can communicate the intrinsic interest of a subject through their enthusiasm, lectures can be specifically organized to meet the needs of particular audiences, lectures can present large amounts of information, lectures can be presented to large audiences, lecturers can model how professionals work through disciplinary questions or problems, lectures allow the instructor maximum control of the learning experience, lectures present little risk for students, and lectures appeal to those who learn by listening.

Jamaludin and Osman, (2014) also narrated that in a traditional classroom, the teaching and learning process is based on live lectures rather than the use of information and communication technology tools in the learning process. In other words, the typical classroom relies primarily on the teacher acting as a barrier between pupils and knowledge. This signifies that the students have minimal knowledge of the subject and that the teacher explains everything in class.

Kelly (2023) added that during a typical lecture, an instructor stands before their class and presents information to students. Lecturing can go on for any amount of time on any topic. They are versatile in that sense but quite limited in others. She added that nowadays lecturing is ultimately an outdated form of instructional delivery that does not benefit students citing pros and cons of the traditional lecture method. She narrated that the pros of traditional lecture method are lectures are straightforward, efficient, and can be pre-recorded and recycled. On the other hand, the cons are lectures needs students to get as much as possible from a lecture, they must take detailed notes, not engaging, teacher-centered, do not accommodate individual needs, and cause students to rely on their teachers.

On the other hand, Kapur (2020) and Learning Spark (2017) also narrated the disadvantages are lectures fail to provide instructors with feedback about the extent of student learning, in lectures, students are often passive because there is no mechanism to ensure that they are intellectually engaged with the material, students' attention wanes quickly after fifteen to twenty-five minutes, information tends to be forgotten quickly when students are passive, lectures presume that all students learn at the same pace and are at the same level of understanding, lectures are not suited for teaching higher orders of thinking such as application, analysis, synthesis, or evaluation; for teaching motor skills, or for influencing attitudes or values, lectures are not well suited for teaching complex, abstract material, lectures requires effective speakers, and lectures emphasize learning by listening, which is a disadvantage for students who have other learning styles which are in the flipped classroom learning setting.

According to Elazab and Alazab (2015), flipped classroom teaching learning model is a new pedagogical method which uses asynchronous type of learning such us video lectures with practice problems and such may be done at home or in class. Video lectures are said to be used as a tool as it is like the face-to-face way of teaching students inside the premises of the classroom where information is delivered. Video lectures are also effective as it can be assigned to students to be done at home thereby letting the class available for interactive group-based problem-solving activities.

Finally, the results are supported by Polat and Karabatak (2019) stating that students' academic achievement, academic satisfaction, and general belongingness levels significantly increased in the flipped classroom compared with the other classroom models. In the study

of Stackpool, Premarathna, and Leahy (2023), it was found out that flipped classroom teaching learning model when offered in conjunction with the supplemental instruction faculty-facilitated learning enhancement tutoring significantly enhances student academic achievements and leads to a decrease in the academic equity gaps among several groups of students.

Moreover, mathematics is a well-established subject that is included in every curriculum around the world. According to the Program for International Student Assessment by Kelly et al. in 2013, math achievement among American learners declined for the second year in a row in 2015. Furthermore, according to Hossain (2012), the performance of American learners in Mathematics has deteriorated. Meanwhile, in Asia, mathematics is seen as one of the most important subjects, with students urged to get a degree in the subject (Leatham and Peterson, 2010; Ronis, 2008). According to Wei and Dzeng (2014), most Asian countries have very active teaching approaches addressing children's arithmetic achievement.

Relationship between the academic performance and level of motivation of Grade 8 students

The table below shows the relationship between the academic performance and the level of motivation in terms of Performance Task Making, Problem Solving, and Class Participation and Examination of Grade 8 students through Pearson Product Moment Correlation Coefficient, as shown in Table 10.

Table 10. Relationship between the academic performance and level of motivation of Grade 8 students

Factors	r	p	Description	Interpretation	Decision
Academic Performance and Motivation (Performance Task Making)	.255	.000	Low Correlation	Significant	Reject Ho
Academic Performance and Motivation (Problem Solving)	.238	.001	Low Correlation	Significant	Reject Ho
Academic Performance and Motivation (Class Participation and Examination)	.177	.015	Negligible Correlation	Significant	Reject Ho
Academic Performance and Motivation (Overall)	.303	.000	Low Correlation	Significant	Reject Ho

Note: n = 189. Legend ± 0.90 - ± 0.99Very High Correlation**,** ± 0.70 - ± 0.89 High Correlation**,** ± 0.40 - ± 0.69Moderate Correlation**,** ± 0.20 - ± 0.39 Low Correlation**,** ± 0.01 - ± 0.19 Negligible Correlation

Table 10 presents the relationship between the academic performance and level of motivation of Grade 8 students. This further reveal that there is a positive significant low relationship between Academic Performance and Motivation (Performance Task Making) with a p value of .255 and an r value of .000. Moreover, there is a positive significant low relationship between Academic Performance and Motivation (Problem Solving) with a p value of .238 and an r value of .001. In addition, there is a positive significant negligible relationship between Academic Performance and Motivation (Class Participation and Examination) with a p value of .177 and an r value of .015. Finally, there is a positive significant negligible relationship between Academic Performance and Motivation (Overall) with a p value of .303 and an r value of .000.

Bergmann and Sams (2012); Strayer (2012); Gerstein (2011); and Baker (2000), narrated that there are two phases of instruction that are “flipped”, “inverted” or “reversed” namely the pre-class learning phase and in-class learning phase. Pre-Class learning phase is where students gain knowledge by either

watching or reading the learning materials given by the teacher either through online videos, podcasts, or formatted text materials before the class. The In-Class learning is where student centered is emphasized. Interactive lectures, problem solving, laboratory experiments, role-playing, and collaborative design and creation are said given to students to promote active learning in class. The flipped classroom activities take place outside of the classroom, and students use class time for active learning strategies such as problem solving and discussion among students in the presence of the lecturer.

Students in the flipped classroom are given videos that teach the topics before class, and the class sessions are devoted to activities and discussions. Students in the flipped classroom are exposed to the topic before class and complete exercises (Jamaludin and Osman, 2014). The University of Texas at Austin – Center for Teaching and Learning (2023), cited reasons why instructors flipped their classroom namely, students learn more deeply, students are more active participants in learning, interaction increases and students learn from one another, and instructors and students get more feedback.

Issues and concerns that the respondents encountered in the implementation of flipped classroom

The table below shows the issues and concerns being encountered by students in the implementation of the flipped classroom learning through content analysis. These data were gathered after gathering quantitative answers from the student respondents, as shown in Table 12.

Table 11. Issues and concerns that the respondents encountered in the implementation of flipped classroom

Issues and concerns	F	%
Slow internet connection in school	6	40.00
Slow internet connection at home	3	20.00
None	6	40.00
Total	**15**	**100.00**

Table 11 presents the issues and concerns that the respondents encountered in the implementation of flipped classroom. six out of 15 respondents mentioned “Slow internet connection at school” was their concern during the implementation of flipped classroom, three out of 15 respondents mentioned “Slow internet connection at home” and six out of 15 respondents mentioned “none”.

Output of the Study

The model below showcases the process on how to conduct the Flipped Classroom Teaching and the possible issues and concerns that teachers may face. This model may be used as an aid in transitioning from Traditional Classroom setting to the Flipped Classroom setting.

Rationale

One of the outputs of this research aside from identifying differences between the performance before and after the implementation of the flipped classroom setting and relationship of academic performance and motivation is the teaching model that could help teachers both in public and private school basic education or higher education in transitioning from traditional classroom setting into this new type of learning setting whenever unforeseen events happen such as pandemic or spread of diseases happen. Teachers who will use the teaching model are supposed to prepare themselves of the possible issues and concerns being mentioned in the model.

Objectives

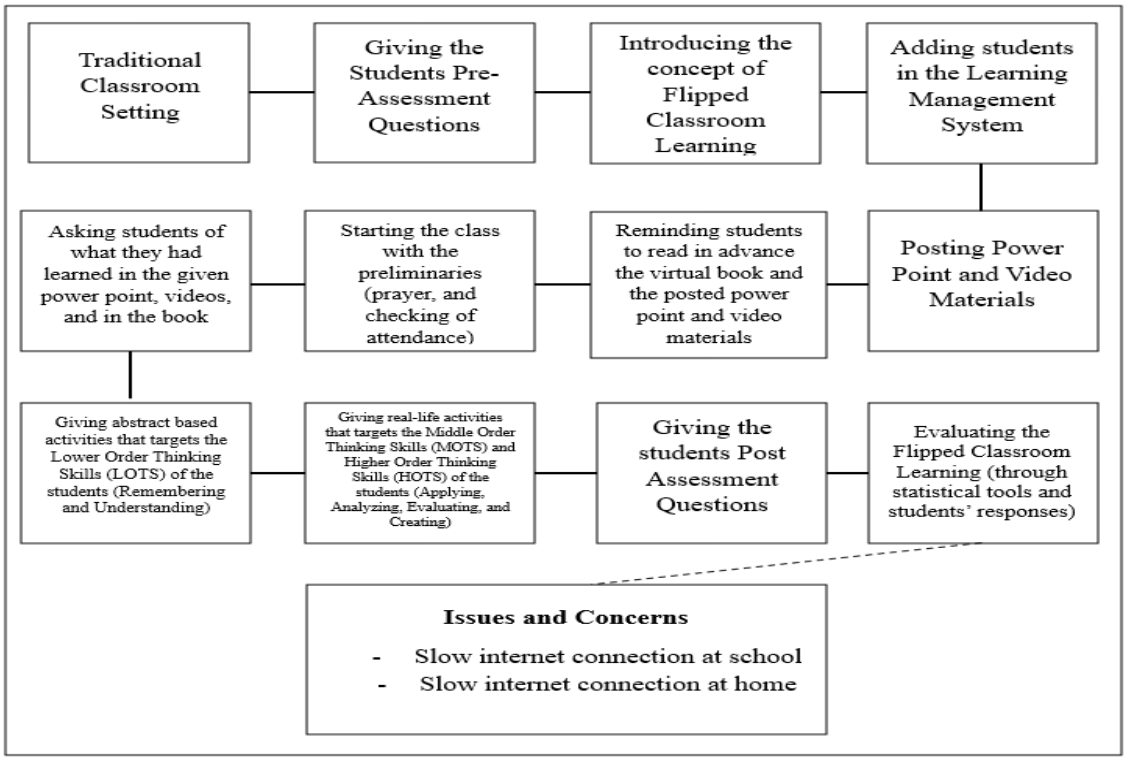
The following are the objectives in creating this model namely, teachers may:

1. help teachers both in public and private school basic education or higher education in transitioning from traditional classroom

setting into this new type of learning setting whenever unforeseen events happen such as pandemic or spread of diseases happen.

2. use the teaching model to prepare themselves of the possible issues and concerns being mentioned in the model

The Teaching Model



Traditional Classroom Setting. In transitioning to Flipped Classroom setting, one may take note that Traditional Classroom setting involves starting the teaching-learning inside the classroom afterwards activities will be given and quizzes and assignments are finally given to check on students' mastery of the topic.

Transition Phase. The Transition Phase involves giving first the students pre-assessment questions about the topic to check on their prior understanding. After identifying their level of understanding the teacher may introduce the Flipped Classroom Learning.

Flipped Classroom Learning. In this type of setting is where learning starts at home. Strategies such as adding students in the Learning Management System, posting power point and video materials, and reminding students to read in advance the virtual book and the posted power point and video materials are to be done.

Implementation of Flipped Classroom Learning. This is where the teacher starts the class with the preliminaries (prayer, and checking of attendance), then asking students of what they had learned in the given power point, videos, and in the book will follow, giving abstract based activities that targets the Lower Order Thinking Skills (LOTS) of the students (Remembering and Understanding), and giving real-life activities that targets the Middle Order Thinking Skills (MOTS) and Higher Order Thinking Skills (HOTS) of the students (Applying, Analyzing, Evaluating, and Creating) is done.

Evaluation of Flipped Classroom Learning. This is where the teacher gives the students Post Assessment Questions to check on whether there is an improvement to their performance. The teacher compares students' scores in the pre-assessment and post-assess-

ment. After which, the teacher may ask students on their issues and concerns about the flipped classroom learning and takes note of it for better re-implementation.

Benefits of using the model

This created model may benefit both the teachers and students in various ways namely, the teacher using this created model may be able to easily and effectively transition from the Traditional Classroom setting to the Flipped Classroom setting especially when all of the phases are done religiously. Aside from this, teachers who will be using this model may enjoy the benefit of facilitating the class in activities than the usual lecture method where teacher teaches most of the time. Moreover, whenever the teacher is absent in class, he or she may direct the class to watch video presentations and answer interactives even if he or she is not around as long as there is an internet connection.

As for the students, they may benefit from this for they may know the lessons ahead of the class through reading or watching in advance lessons to be taught in the following days, moths, or even the whole school year. Also, when students forgot about the lesson, they may be able to go back to reading materials, videos, and presentations to recall information. Finally, students can enjoy doing interactive activities even at the comfort of their homes.

Conclusions and Recommendations

Teachers nowadays are being challenged due to continuous decrease in the analytical and numerical ability of the students. Strategies were continuously studied by teachers to address such concern answering also questions such as how students perceived flipped classroom setting as an aid to the teaching learning process. Flipped Classroom Learning is being practiced in other countries years before and claimed to be effective in the teaching and learning process. This research, as it comes to an end, concludes that indeed Flipped Classroom Learning is a way to better improve education identifying the effect on the academic performance and motivation of students in mathematics noting also that internet connection plays a crucial role in this type of learning setting. Finally, there is a significant improvement on the academic performance and level of motivation of Grade 8 students after the implementation of the flipped classroom and there is a significant relationship between the academic performance and level of motivation of Grade 8 students.

The following are the recommendations based on the findings and conclusion derived from the study, the researcher would like to recommend the following for the

Teaching-Learning

1. The school may adopt the use of Flipped Classroom Learning setting in teaching Mathematics and retain all platforms and activities that are part of the flipped classroom learning such as the Learning Management System and use of computer laboratory in Mathematics 8 classes.
2. The administrators should include in the Professional Learning Community (PLC) program the information dissemination regarding the process, possible effects, and challenges of flipped classroom learning setting.
3. The future researchers may research on the effectiveness of flipped classroom learning in Mathematics and in other subjects throughout the Region and in the Philippines.

Policy Development

1. The School Principals and Administrators may further investigate on the flipped classroom and if found effective may consider in creating a formal recommendation to the Department of Education that may aid in policy development regarding flipped classroom learning.
2. The Department of Education as it moves into transition from the Revised Basic Education Curriculum to MATATAG Curriculum may consider checking on the usability of the flipped classroom method especially in attaining its goals and objectives.
3. The Department of Education (DepEd) and Commission on Higher Education (CHED) may revisit policies regarding the teaching and learning process and may include in its policy the possible use of flipped classroom

in the teaching learning process throughout the country.

Future Researchers

1. Flipped Classroom: Effect on the Academic Performance and Motivation of Secondary Students in all Major Disciplines
2. Flipped Classroom: Effect on the Academic Achievement and Motivation of Tertiary Students in Mathematics
3. Traditional vs. Flipped Classroom: Effect on the Academic Achievement and Motivation of Elementary Students in Mathematics

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