STUDENTS' MATHEMATICS PERFORMANCE AND ANXIETY LEVEL USING CONCEPT ATTAINMENT MODEL

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ABSTRACT: *A way to make students' learn is to present examples and no-examples of the concept which is espoused by the concept attainment model (CAM). This study determines the students' mathematics anxiety and performance using concept attainment model in instruction. It sought to: 1) determine the level of students' mathematics performance when exposed to CAM and to those exposed to a non-concept attainment model (non-CAM) in terms of their pretest, post-test, and retention test scores; 2) describe the level of anxiety in mathematics when exposed to CAM and those exposed to non-CAM; 3) identify the difference between the mathematics performance of the students when exposed to CAM and to those exposed to non-CAM in terms of their post-test and retention test scores;and lastly 4) compare the difference of the anxiety of students' in mathematics when exposed to CAM and those exposed to non-CAM. A quasi-experimental research design was utilized for this study, which was conducted at Malinao High School, Malinao, Banisilan, North Cotabato. The grade eight students were the research respondents of this study. To determine the students' mathematics performance, a researcher-made test was employed with a Cronbach-alpha value of 0.933 for data collection.. For the anxiety level, a Mathematics Anxiety Rating Scale developed by Ikegulu was adapted and used by the researchers, with a Cronbach-alpha value of 0.92. The study found that the students' under the CAM and Non-CAM has "very low performance" and a "moderate performance" for both in the pretest and post-test, respectively. However, the CAM during the retention test has "high performance" while the Non-CAM maintained has "moderate performance". Yet, there was an improvement in their performances based on the increase of the mean scores in the post-test and retention test of the students. Furthermore, for the level of students' anxiety towards mathematics, they are "moderately anxious" before the treatment and became "highly anxious" after the intervention for both CAM and Non-CAM groups. The mathematics performance of students who were exposed to CAM is significantly higher compared to those students who were exposed to non-CAM. In addition, there is a significant difference in the mathematics anxiety of the students in both groups infavor of the CAM group. The students tend to improve their mathematics performance as they become highly anxious.*

Keywords: *mathematics performance, anxiety level, mathematics, concept attainment model, grade 8 students*

1. INTRODUCTION

Learning and understanding mathematics is indeed important because it develops students' abilities to think and to discover new things. Different skills in mathematics help students' reasoning, conceptual, and procedural knowledge; and one of the mathematics skills that students need to improve is conceptual understanding. Thus, it has become one of the most valued areas in mathematics education. In the Philippines' educational realm, conceptual understanding is one of the major aspects of the mathematics curriculum which requires students to apply and to integrate many mathematical concepts and skills. Even though it has been regarded as one of the essential skills to excel in mathematics, many countries not only in the Philippines have a problem with how to raise students' proficiency in understanding mathematical concepts. A number of Filipino researchers had conducted investigation to improve mathematics performance of high school students utilizing varied teaching methods and approaches [1, 2, 3, 4], rich assessment tasks [5], and the influence of other factors [6, 7, 8, 9, 10], however, only a few studied on conceptual understanding [11].

In a recent study, the data revealed the alarming facts for the participating countries most especially the Philippines [12]. The recent PISA 2018 data showed that in Mathematics and Science Filipino students scored 353 and 357 points, respectively, in which the scores are found at the lowest point which further implies that this is significantly lower than the OECD average (489 points) and is classified as below Level 1 proficiency. Moreover, most students in the Philippines expressed fear of failure; some agreed or strongly agreed that, when they fail, they worry about what others think of. In almost every education system, including in the Philippines, this scenario is attributed to the anxiety level experienced by the students.

This problem is also evident in Malinao High School as depicted on its national achievement rate in Mathematics. During the school years, 2012 – 2013, 2013 – 2014, and 2014 – 2015, the school got a mean percentage score of 54.05%, 48.83%, and 49.87%, respectively which is below average [13]. This implied that most of the students failed to achieve the 75% mean percentage score (MPS). With the PISA results also considering the students' performance in the National Achievement Test, the researcher recognized the need of dealing with the issues and gaps in attaining quality of basic education in the Philippines particularly in his school.

Moreover, students' anxiety level in a mathematics class has an important role to play particularly on their mathematics achievement. Based from a study, it revealed that success in mathematics requires not only knowledge of mathematical concepts but also the right mindset [14]. Moreover, the right mindset and not just knowledge of mathematical concepts is a requirement that can help attain success in mathematics performance. Thus, when students are anxious in a math class or in the subject itself their performance is below that of their actual abilities.

This research addressed mathematics performance by utilizing the Concept Attainment Model (CAM). The CAM is the process of defining concepts by determining the attributes that are essential to the meaning and discriminate between what is and what is not an example of the concept [15]. It is designed to teach concepts and help students become more efficient to learn and create concepts and effective in definition, comprehension, application, and utilization of concepts. It places an emphasis on teaching students to understand the concepts of math before memorizing facts, algorithms, and operations. Thus, it is based on the assumption that one of the best ways to learn a concept is by observing examples of it.

The use of the CAM fosters consistent results in teaching skills concerning mathematics performance. More so, the researcher believes that this teaching method helped to improve students' mathematics performance and anxiety levels towards mathematics. The CAM was used to determine its effectiveness and efficiency in improving students' performance and anxiety in mathematics. It is imperative that teachers should consider the teaching method that suits to upgrade student's learning. Thus, this study was conceived.

2. MATERIALS AND METHODS

The study assessed the performance and anxiety level of Grade eight students in mathematics using CAM at Malinao High School. The study made use of a quasi-experimental research design with two different intact classes. One of the two intact classes was set as the

experimental group while the other class was the control group. The two groups of students were instructed with the same lessons. Students in the experimental group were exposed to instruction using CAM while the control group was exposed to teaching using Non-CAM.

There were two (2) instruments used to gather the data, namely, the mathematics anxiety rating scale and the validated teacher-made test. One instrument used in the study was a matrix form-close-ended questionnaire that helped the researchers gathered the students' anxiety level in Mathematics. The questionnaire used by the researchers has a Cronbach-alpha of 0.92 with a scaling rating that ranges from 5 to 1. The reverse scoring procedure was done for negative statement. A validated teacher-made test was used to measure mathematics performance of the students with 50 items covering the topics in the 4th quarter period. Items were scored 1 for every correct response, and 0 if otherwise.

The participants of the study were the Grade 8 students of the Malinao High School, Malinao, Banisilan, Cotabato with 30 students in each group.

Before the start of the study, pretest on mathematics performance and the anxiety level was administered to the students. After the intervention, the students took again the same tests which served as the posttest. Four days after the posttest, the researchers administered the retention test to the students due to the pandemic situation. The results of these tests were employed to seek answers to the problems stated in this study.

The data collected were tabulated and analyzed using appropriate statistical tools using statistical software. Descriptive statistics like mean, standard deviation, frequency, and percentage were used to answer the questions on the descriptive levels. Analysis of Covariance (ANCOVA) was used to investigate the significant difference in the students' performance and anxiety level in mathematics between the two groups after the intervention.

The following tabulated rating scale was used to better understand the data:

Rating	Scale	Descriptive Rating	Qualitative Interpretation
5	4.20 – 5.00	Strongly agree	Very Less Anxious (VLA)
4	3.40 – 4.19	Agree	Less Anxious (LA)
3	2.60 – 3.39	Undecided	Moderately Anxious (MA)
2	1.80 – 2.59	Disagree	Highly Anxious (HA)
1	1.00 – 1.79	Strongly disagree	Very Highly Anxious (VHA)

Percentage score	Descriptive rating	Interpretation
90% - 100%	Very High Performance	Outstanding
86% - 89%	High Performance	Very Satisfactory
80% – 85%	Moderate Performance	Satisfactory
75% – 79%	Low Performance	Fairly Satisfactory
65% - 74%	Very Low Performance	Did Not Meet Expectations

3. RESULTS AND DISCUSSIONS

This part presents the analysis and interpretation of data collected from the respondents of the study, which are significant in testing the hypothesis. Tables and other figures are also illustrated in this chapter to give a convenient analysis of the data. The order of presentation follows the sequence identified as objectives of the study.

3.1 Mathematics Performance of the CAM and Non-CAM Group

As illustrated in the table, 30 or 100% of the students exposed to CAM had a very low performance in the pretest. Also, it can be observed that in the Non-CAM group there were 30 or 100% of the students had a very low performance. Out of 50 items, the group which was exposed to CAM had a mean score of 16.33 and MPS of 66.33 which indicates that scores of the students did not meet expectations indicating a very low performance. The non-CAM group had a mean score of 16.03 and MPS of 66.03 which indicates that scores of the students did not meet expectations which means a very low performance also. This can be ascribed to the difficulties that students encounter in learning such as lack of understanding of the concepts.

Table 1. Level of performance of the students in the pretest.

Range	CAM			Non-CAM		
	F	%	Interpretation	f	%	Interpretation
90% - 100%	0	0	Very High	0	0	Very High
85% - 89%	0	0	High	0	0	High
80% - 84%	0	0	Moderate	0	0	Moderate
75% - 79%	0	0	Low	0	0	Low
65% - 74%	30	100	Very Low	30	100	Very Low
	Mean = 16.33			Mean = 16.03		
	MPS = 66.33 (Very Low)			MPS = 66.03 (Very Low)		

The results conform with the study, which established that the overall performance of the students falls under 74% and below bracket. It implies that students are at the beginning stage of achieving the standard set by the Department of Education [16]. In addition, the findings are similar to another study, which states that scores of the students in the pretest do not achieve a moderate level of proficiency [17]. This can be attributed to the students' insufficiency of basic foundation in Mathematics or they don't have any foundations of concepts at all.

Moreover, this finding is in parallel to the results from another study, wherein during the pretest, the students' mathematics performance is low [18]. This can be qualified for the students' lack of foundation on the topics and the mathematical concepts. In this study, it was observed that the lack of prior understanding for all students is also a valid reason.

Table 2. Level of performance of the students in the post-test.

Range	CAM			Non-CAM		
	F	%	Interpretation	f	%	Interpretation
90% - 100%	0	0	Very High	0	0	Very High
85% - 89%	0	0	High	0	0	High
80% - 84%	1	3	Moderate	0	0	Moderate
75% - 79%	2	7	Low	2	7	Low
65% - 74%	27	90	Very Low	28	93	Very Low
	Mean = 32.93			Mean = 30.43		
	MPS = 82.93 (Moderate)			MPS = 80.43 (Moderate)		

In the table, concerning the CAM group, 27 students had scores that did not meet the expectations indicating a "very low performance", 2 students had scores of fairly satisfactory representing a "low performance" and 1 student had a score of satisfactory implying a "moderate performance. On the other hand, in the non-CAM group, 28 students had scores that did not meet the expectations indicating a "very low performance" and 2 students had scores of fairly satisfactory representing a "low performance" in Mathematics.

Before the intervention, all the students in the CAM and non-CAM groups have scores that did not meet the expectations indicating a very low performance in Mathematics as been shown in Table 1.

It is obvious in the results that after the conduct of the treatment, the students had achieved a slim increase in their performance. This result can be attributed to the intervention used. This outcome in consonance to a study which states that the level of mathematics performance of the Grade 9 students in their pre-test both for both groups is very low [19]. After the intervention, the experimental group had a moderate performance while the control group had a low performance which shows an increase from a very low level in the pre-test. Yet, there has been an increase in both groups.

Moreover, the increase can be attributed to exposure of different teaching strategies and environments, students might increase their knowledge and have higher retention after the treatment [17]. Yet, in this study, it is observed that the increase in the performance of the students from the pre-test to the post-test belonged to the group with the implementation of instruction using CAM. One of the factors that result in this claim is the new style of discussion that the students were not expecting.

Table 3. Level of performance of the students in the retention test.

Range	CAM			Non-CAM		
	F	%	Interpretation	f	%	Interpretation
90% - 100%	2	7	Very High	0	0	Very High
85% - 89%	0	0	High	0	0	High
80% - 84%	2	7	Moderate	2	7	Moderate
75% - 79%	9	30	Low	6	20	Low
65% - 74%	17	56	Very Low	22	73	Very Low
		Mean = 36.23			Mean = 33.23	
		MPS = 86.23			MPS = 83.23	
		(Moderate)			(Moderate)	

As shown in Table 3, the CAM group had the following performance in the retention test: seventeen (17) or 56% of the students had a very low performance; nine (9) or 30% of them belong to a low-performance level; two (2) or 7% were under a moderate performance; two (2) or 7% fall under very high performance. On the other hand, in the non-CAM group, twenty-two (22) or 73% of the students had a very low performance; six (6) or 20% had reached a low-performance level and two (2) or 7% had attained a moderate performance.

The table also shows the mean scores of the retention test of the students. The CAM group had a mean score of 36.23 and MPS of 86.23 indicating a "high performance" result, while the non-CAM group got a mean score of 33.23 and MPS of 83.23 which also indicate a "moderate performance" result.

Based on the results in the table, the students were able to maintain their overall performance in the retention test with a comparable increase only where the CAM group has a higher mean than the non-CAM group. This can be credited to the intervention being applied on the experimental group during class instruction. This result contradicts the findings of a study with student's achievement in Mathematics for experimental and control groups are statistically comparable in the post-test and retention test [20]. This study shows an improvement in the level of achievement of the students from a deficient level to the average level for both groups when an intervention is taken into consideration.

However, the result of this study negates from another study that when the majority of the students' mathematics performance after exposure to Game-Aided Instruction is at a very low level [21]. In addition, this study also disagrees with the result from another study that the retention of students exposed to GRRIM is still at the beginning level which indicates a very low performance [19]. The results of this study show that when the students are exposed to a new instructional model, the performance of the students' increases and the retention rate is higher after the treatment. However, improvement of the mean score in the retention test of the students may be caused by the time span of the retention test due to the pandemic situation.

The result based on the retention test has the same findings from another study, where it revealed that the achievement of students who were taught using CAM has a better performance than those who were taught by the other method [22]. Moreover, it was concluded that there is a relationship between preschool children learning who trained numerical mathematics concepts by concept attainment and children in the traditional group [23]. Thus, these ideas suggest the once concept attainment model is introduced and applied during class instruction it depicts an improvement in the students' performance whether significant or comparable increase.

3.2 Mathematics Anxiety of Students before and after intervention

As given in Table 4, among the 40 items of the mathematics anxiety rating scale, students in the CAM group were least anxious on 6 items, moderately anxious on 31 items, and highly anxious on 3 items. In addition, in the Non-CAM group, the students were least anxious on 17 items, moderately anxious on 17 items, and highly anxious on 6 items.

As to the CAM group, the table also displays that before the intervention, three (3) items with higher means are as follows: "I volunteer myself to solve math problems on the board" (4.00), "I blame myself for my poor performance in mathematics" (3.90) and "I depend on my tutors for help in math" (3.53).

Based on the results, it can be asserted that on the three higher means the students are less anxious towards mathematics. Students volunteer themselves in solving math problems on the board. In addition, they are independent learners since they do not depend on tutors to help them in mathematics. Thus, it can be concluded that when students work together, they are anxious about it. With these ideas, students see themselves as responsible for their own learning and do not blame themselves for their performance.

The findings above were supported by another study where it found that over-dependence between the math teacher and the math student is the root of the problem – the problem of anxiety [24]. This over-dependence encourages the students to heavily rely on the teacher where they are afraid to take initiative to do the tasks because they believed that teachers are the sole source of learning. However, the same study suggested that it would be wise to allow group activities for the students to have a relaxed atmosphere. On contrary, the findings revealed that students are anxious when they work together or when the teacher provides group activity.

Table 4. Student's Anxiety in Mathematics between CAM and Non-CAM before and after the intervention.

MATHEMATICS ANXIETY TOWARDS MATHEMATICS	CAM				Non-CAM			
	Before		After		Before		After	
	Mean	Interpretation	Mean	Interpretation	Mean	Interpretation	Mean	Interpretation
I volunteer myself to solve math problems on the board.	4.00	LA	2.23	HA	3.50	LA	2.20	HA
I blame myself for my poor performance in mathematics.*	3.90	LA	1.93	HA	3.67	LA	2.37	HA
I depend on my tutors for help in math.*	3.53	LA	2.13	HA	3.00	MA	2.13	HA
Taking math test is frightening experience for me.*	3.47	LA	2.00	HA	3.97	LA	2.47	HA
I have special dislike for mathematics.*	3.47	LA	1.83	HA	3.33	MA	2.20	HA
It takes me a while to solve math problems.	3.40	LA	1.97	HA	2.43	HA	1.76	VHA
Mathematics comes easy for me.	3.37	MA	2.53	HA	3.77	LA	2.57	HA
I am fond of the mathematics logic.	3.37	MA	1.60	VHA	2.93	MA	1.93	HA
I enjoy showing others how to solve math problems.	3.33	MA	2.23	HA	2.57	MA	1.83	HA
Mathematics is one of my worse subjects.*	3.33	MA	1.57	VHA	2.10	HA	1.37	VHA
Mathematics is one my favorite subjects.	3.30	MA	2.13	HA	3.53	LA	2.50	HA
My peers seem to understand me better than our teachers.	3.23	MA	1.63	VHA	3.50	LA	2.50	HA
I feel a lot of stress in taking a math test.*	3.20	MA	2.20	HA	3.57	LA	2.13	HA
Mathematics is an exciting course.	3.17	MA	1.83	HA	3.93	LA	2.37	HA
I like answering math questions in class.	3.17	MA	1.60	VHA	3.10	MA	2.27	HA
It is difficult for me to grasp math concepts.*	3.17	MA	2.00	HA	3.57	LA	2.63	MA
I always do well on mathematics examination.	3.10	MA	1.93	HA	2.57	MA	1.87	HA
I feel a lot of pressures in taking math courses.*	3.10	MA	1.97	HA	3.47	LA	2.07	HA
I generally cram a lot of information before math	3.10	MA	2.07	HA	3.57	LA	1.97	HA

tests.*								
It is a joy to transform word problems into math expressions.	3.10	MA	2.10	HA	2.67	MA	1.77	VHA
Math formulae are difficult to remember during math tests.*	3.07	MA	2.07	HA	3.73	LA	1.90	HA
Learning and understanding math can be fun.	3.07	MA	1.63	VHA	2.80	MA	1.93	HA
I am not good in solving math problems.*	3.03	MA	1.77	VHA	3.70	LA	2.13	HA
Most of my courses are math-related.	3.00	MA	1.67	VHA	3.10	MA	2.13	HA
I feel confident in my ability to solve math problems.	3.00	MA	2.23	HA	2.77	MA	2.17	HA
Mathematics is a great challenge for me.	3.00	MA	2.10	HA	2.60	MA	1.77	VHA
Doing workbook exercises help improve my math scores.	3.00	MA	1.77	VHA	2.70	MA	1.83	HA
I am afraid to submit my math tests or assignments.*	2.93	MA	1.90	HA	2.77	MA	1.90	HA
I am nervous about mathematics.*	2.93	MA	2.00	HA	3.57	LA	2.17	HA
I like seeing my steps I used to arrive at my solutions.	2.90	MA	1.83	HA	2.50	MA	2.00	HA
I enjoy mathematics.	2.87	MA	1.73	VHA	2.67	MA	2.00	HA
Mathematics is a boring subject.*	2.87	MA	1.90	HA	3.03	MA	2.03	HA
I avoid mathematics course.*	2.77	MA	1.93	HA	3.20	MA	2.60	MA
I do my math homework alone.	2.73	MA	1.53	VHA	2.90	MA	1.90	HA
I learn math by solving problems.	2.67	MA	1.53	VHA	2.77	MA	2.10	HA
It is difficult for me to understand math instructions.*	2.63	MA	1.93	HA	2.63	MA	1.77	VHA
My mind seems to go blank during math tests.*	2.60	MA	1.87	HA	3.57	LA	2.50	HA
I make low scores on my math tests.*	2.23	HA	2.00	HA	3.70	LA	2.53	HA
I do not want my math tests and assignments to be evaluated.*	2.23	HA	1.97	HA	2.43	HA	1.60	VHA
I make low scores on my math assignments.*	2.10	HA	1.87	HA	3.70	LA	2.50	HA
Overall Mean Interpretation	3.06	MA	1.92	HA	3.14	MA	2.11	HA

(*) means scoring is reversed

Legend:

Rating	Scale	Descriptive Rating	Qualitative Interpretation
5	4.20-5.00	Strongly Agree	Very Least Anxious (VLA)
4	3.40-4.19	Agree	Least Anxious (LA)
3	2.60-3.39	Undecided	Moderately Anxious (MA)
2	1.80-2.59	Disagree	Highly Anxious (HA)
1	1.00-1.79	Strongly Disagree	Very Highly Anxious (VHA)

On the other hand, the students in CAM group have three (3) items with the lowest mean scores as follows "I make low scores on my math tests" (2.23), "I do not want my math tests and assignments to be evaluated" (2.23) and "I make low scores on my math assignments" (2.10).

These three lower means are the indicators that are students are more anxious. As displayed, they are anxious to obtain high scores in mathematics tests and assignments which leads to the fact that whenever a teacher gives an assignment or test it needs to be evaluated immediately. In short, immediate feedback must be given right away to the students. It leads to an idea where if a student obtained low scores in math, he or she is anxious to improve his or her performance next time.

This finding is supported by another study, wherein they have found out that students with less anxiety perform less in mathematics compare to those students with moderate anxiety level who performed best in the test [25]. The result of the present works conforms to the statement above since it was observed that when students are anxious, they tend to display anxiety on obtaining high scores in Mathematics.

There were three (3) items with higher means in the Non-CAM group. These are as follows; "Taking math test is a frightening experience for me" (3.97), "Mathematics is an exciting course" (3.93), and "I am afraid to submit my math tests or assignments" (3.77).

Based on the outcomes, the students had lesser anxiety in the following items. Students are not frightened towards mathematics as a subject as a result, they see it as exciting and challenging. Moreover, they were not afraid to submit their assignments or tests which implies they are eager to evaluate their learning and progress. These contradict a particular study, where it found out that students had high anxiety levels because they find mathematics challenging and get tense during mathematics tests [26].

Moreover, the three (3) items with the lowest mean scores for the Non-CAM group are "I do not want my math tests and assignments to be evaluated" and "It takes me a while to solve math problems" (2.43) and "Mathematics is one of my worse subjects" (2.10).

As to the scores with lower means, which implies students experience higher anxieties. Students consider math as one of the subjects to be taken seriously; as a result, their mind is on point during a math test. The students are willing to evaluate their math tests and assignments. Hence, they receive higher scores in math assignments once feedback is given. In addition, they enjoy solving math problems and they don't see mathematics as the least subject to be preferred. This idea is parallel to another study, where it revealed that students had high anxiety levels when they consider mathematics as their least favorite subject [26].

Conclusively, the overall mean score of the student's anxiety in mathematics before the intervention is 3.06 and 3.14 for the CAM and Non-CAM groups, respectively. This implies a moderate level of anxiety in mathematics as a subject. The result gives additional information that the two groups have a moderate level of anxiety in mathematics which indicates that students are reasonably anxious in grasping the fundamental concepts in mathematics.

Moreover, this result conforms to a study, where students in both groups have high anxiety towards Mathematics as a subject before their intervention [20]. With this claim, the utilization of other teaching strategies such as CAM affects students learning and grasping of the basic concepts in mathematics. Thus, it is suggested that in order to make students perform better in mathematics and decrease their anxiety towards the subject, teachers must devise a strategy that helps improve the overall performance of the students.

After the intervention, three (3) items with the highest mean scores in the CAM group are as follows: "Mathematics comes easy for me" (2.53), "I feel confident in my ability to solve math problems" and "I enjoy showing others how to solve math problems" (2.23).

This implies that after the intervention, students had lesser anxieties in these areas. It can be observed that the CAM group consider math as a worthwhile subject since they perceive it as easy. This idea resulted in the students to have the confidence to solve math problems and they are fond of showing their solutions. They enjoyed it much where grasping math concepts seem easy for them. Hence, students tend not to avoid mathematics as a subject.

These findings run parallel to another study, where they have revealed that when students have a low level of anxiety in mathematics, they feel more confident and excited to learn mathematics [27]. The result is in consonance as well from a different study, where if students worry about mathematics it appears that the math skills of students in problem-solving weaken [28, 29].

On the other hand, three (3) items in the Non-CAM group with the highest mean scores are "It is difficult for me to grasp math concepts"* (2.63), "I avoid mathematics course"* (2.60) and "Mathematics comes easy for me" (2.57).

Based on the results, students in the Non-CAM have lower anxiety levels. Students do not experience difficulties in grasping math concepts. It further implicates that the students consider math as an easy subject for them and they do not tend to avoid it. This can idea can be attributed to the fact that the schedule for the Non-CAM group is during the morning session (2nd period in the morning) while the CAM group is scheduled during the afternoon session (1st period in the afternoon).

This claim is supported by a study, where they have shown that success in mathematics is not only about knowledge of concepts but also the right mindset [14]. Thus, when the students tend not to hate and avoid mathematics as a subject there is a chance, they will not have the difficulty in grasping math concepts.

The overall mean scores of students' anxieties in mathematics after the intervention is 1.92 and 2.11 in the CAM and Non-CAM group, respectively. This implies that both groups have a positive level in terms of anxiety toward mathematics as a subject. In addition, students in the CAM group have a lower mean compared to those students exposed in the Non-CAM group. It further implies that the CAM group is more anxious than the Non-CAM group this can be the result if a new intervention is applied during the discussion.

As presented in Table 5, students have higher anxiety in the subject after the intervention. This scenario is a result when a teaching strategy is being applied during class instruction. The results of the study are not parallel to the result from another study which indicated that students with low levels of math anxiety are excited, confident, and highly motivated to learn mathematics when compared to students who have high anxiety levels [27]. Thus, it can be indicated that students with higher anxiety perform better in mathematics. This claim confirms the result of a study, where they have revealed that mathematics anxiety and mathematics performance have a negligible relationship [30]. This means that even if the students experienced anxiety in learning mathematics; they can still perform better. This is observed in this particular study where even if students have mathematics anxiety, still they manage their fear and worry so that they can perform well in class for them to pass the subject.

3.3 Analysis of Covariance (ANCOVA) of Posttest Results between Treatments

As shown in Table 5, the pre-test is used as a covariate to statistically equate different prognostic variables which might affect the analysis. Its F-value between groups is 6.239 with a probability of .015 ($p \geq 0.05$) indicating that there is a significant difference in the post-test result of students both in the CAM and non-CAM groups. As a result, the null hypothesis stating that there is no significant difference in the level of mathematics performance when exposed to the concept attainment model and those exposed to the non-concept attainment model in terms of post-test is rejected. This implies that the CAM group with the mean 32.93 performed statistically significantly compared to the non-CAM group with the mean 30.43. It further signifies that the mean scores fall under a moderate performance with a percentage equivalent to 80% - 85% as prescribed by the DepEd.

Table 5. Comparison of students' performance on the posttest.

GROUP	N	MEAN	SD
PEERAGOGY	30	32.93	3.40
Non-PEERAGOGY	30	30.43	4.37
TOTAL	60	31.68	4.08

Source	SS	df	MS	F-value	Sig.
Group	89.629	1	89.629	6.239	0.015**
Pre-test	70.346	1	70.346	4.897	0.131^{ns}
Error	818.887	57	14.366		
Total	61213.000	60			

**P< Highly Significant at 0.05 level

The result conforms to a study, where it concluded that there is a difference between preschool children learning who trained numerical mathematics concepts by concept attainment and children in the traditional group [23]. Also, another study supported the result of this study wherein there is a significant difference in the posttest scores of the experimental group as compared to the control group when exposed to the Gradual Release of Responsibility Instructional Model (GRRIM) [19]. Thus, it can be assumed that using the concept attainment model on class instruction helps to improve students' mathematics achievement.

3.4 Analysis of Covariance (ANCOVA) of Retention Test Result between Treatments

As seen in the table, the F-value between the groups is 7.602 that has a probability value of .008 ($p \geq 0.05$) indicating that there is a significant difference. Thus, the null hypothesis stating that there is no significant difference in the level of mathematics performance when exposed to the concept attainment model and those exposed to the non-concept attainment model in terms of retention test is rejected. This implies that the CAM group with the mean 36.23 performed statistically significantly compared to the non-CAM group with the mean 33.23. It further suggests that the mean score of the CAM group falls below 86% - 89%, which is equivalent to high performance as prescribed by the DepEd. On the other hand, the Non-CAM group maintained its moderate performance. This finding is attributed to the fact that the retention test was given 4 days after the post-test was conducted because of the pandemic situation. In addition, both groups increased their retention test scores because of the intervention employed by the researcher wherein it provides opportunities where the students build their own concepts. Thus, it provides ownership and responsibility in their learning.

Table 6. Comparison of students' performance on the retention test.

GROUP	N	MEAN	SD
CAM	30	36.23	3.87
Non-CAM	30	33.23	4.53
TOTAL	60	34.73	4.44

Source	SS	df	MS	F-value	Sig.
Group	130.909	1	130.909	7.602	0.008**
Pre-test	47.164	1	47.164	2.739	0.103^{ns}
Error	981.570	57	17.221		
Total	73548.000	60			

** P< Highly Significant at 0.05 level

The findings of these studies contradict from a different study, on the student's mathematics achievement and anxiety of students when exposed to RLE is comparable to the achievement of those who were exposed to Non- RLE in terms of retention test [20]. Moreover, the result of this study contradicts the result of another study wherein they found out that the mean score of the GRRIM group in the retention test is non-significant compared to the non-GRRIM group [19].

3.5 Analysis of Covariance (ANCOVA) of Students' Anxiety in Mathematics between Two Groups

As illustrated in Table 7, anxiety in Mathematics of students when exposed to CAM gained a mean score of 1.92 with a standard deviation of .17 while students who were exposed to non-CAM gained a mean score of 2.11 with a standard deviation of .28. Moreover, the table shows an F-value of 15.931 and a probability of .000 ($p \geq 0.05$) indicating a significant difference in the anxiety towards the mathematics of the two groups. Hence, the null hypothesis that states, there is no significant difference in the level of anxiety in mathematics when exposed to the concept attainment model and those exposed to the non-concept attainment model is rejected. It further implies that their anxiety in mathematics mean score decreased as well as presented in Table 4 which suggests that

students who experience anxiousness may perform better in mathematics.

Table 7. Comparison of students' anxiety between groups

GROUP		N	MEAN	SD	
CAM		30	1.92	0.17	
Non-CAM		30	2.11	0.18	
TOTAL		60	2.00	0.22	
Source	**SS**	**df**	**MS**	**F-value**	**Sig.**
Group	.617	1	.617	15.931	0.000**
Pre-test	.090	1	.090	2.330	0.132^{ns}
Error	2.207	57	0.39		
Total	243.255	60			

**P< Significant at 0.05 level

This result agrees with another study, where the difference in the mathematics anxiety of the two groups shows to be statistically significant [18]. The mathematics anxiety of the students in the post-test is significant in favor of the Flipped Classroom. Thus, teachers must utilize teaching strategy where it promotes the overall performance of a student in mathematics in terms of achievement.

The result of the study opposes another study, where it revealed that there is no significant difference in the anxiety towards mathematics between the two groups [20]. Moreover, it negates from another study between anxiety and mathematics performance of the students where if the student's anxiety level is low, they perform better in mathematics or vice versa [26]. This means that the higher the anxiety level, the lower the performance, and the lower the numerical anxiety the better the performance. Yet in this study, the students with higher mathematics anxiety levels engage more in mathematics which gives them a better performance in mathematics.

CONCLUSIONS AND RECOMMENDATIONS

Based on the above findings, the conclusions were drawn as follows:

The students' performance in Mathematics in the CAM group in the pre-test, post-test, and retention test is very low, moderate, and high-performance level, respectively. On the other hand, students in the Non-CAM group, the performance of the students in the pre-test is very low while on the post-test and retention is moderate performance level. Moreover, both groups have an improvement in their performances based on the increase of the mean scores in the pre-test, post-test, and retention tests.

Students in both groups are moderately anxious towards mathematics as a subject before the intervention. Yet, after the intervention, both the CAM and Non-CAM groups are highly anxious about Mathematics.

Students' mathematics performance exposed to CAM is significant to those who are exposed to non-CAM based on their post-test and retention test scores. This implies that the CAM group has longer retention compared to the non-CAM group which would mean further that there is a significant difference found in their performance-based on the retention result.

There is a significant difference in the level of anxiety in mathematics when exposed to the CAM and those exposed to non-CAM. Thus, both groups are highly anxious about mathematics.

Based on the aforementioned conclusions, teachers, administrators, and curriculum makers might consider integrating the concept attainment model into the curriculum to improve students' performance and retention of the concepts built by the students. With this, it might help the students not to dislike or hate mathematics as a subject since the concept attainment model promotes ownership of students grasping of ideas. Moreover, in the pursuit of the K to 12 curricula to produce globally and locally competent learners, this strategy might be helpful since the students are engaged and involved in the class activities. Thus, it promotes autonomous learners.

Moreover, they must have a collection of different teaching pedagogies and just kept themselves to be updated on the trend in teaching mathematics to help in lowering the students' anxiety towards mathematics. Thus, they must attend training, seminars, and workshops for their professional development to cater to students' needs and interests to foster meaningful learning experiences and achieve better results

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