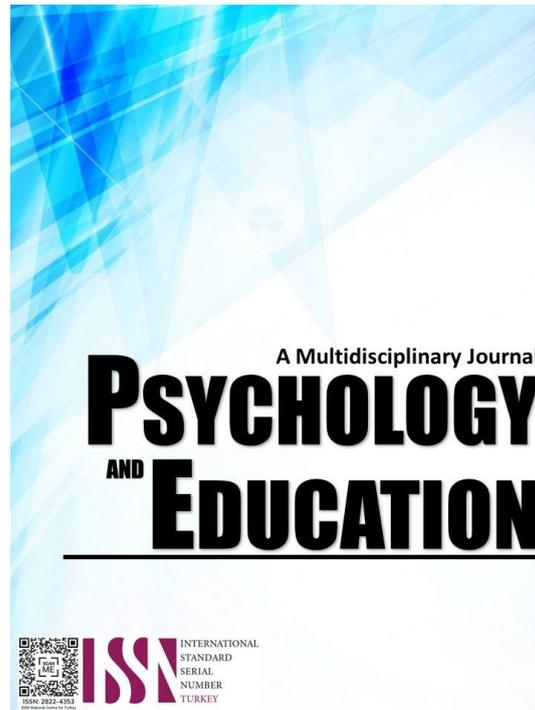


**IMPLICATIONS OF TEAM - BASED LEARNING
STRATEGIES ON THE ATTITUDE OF FRESHMEN
STUDENTS IN MATHEMATICS IN A STATE
UNIVERSITY IN CAGAYAN VALLEY, PHILIPPINES**



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Implications of Team - Based Learning Strategies on the Attitude of Freshmen Students in Mathematics in a State University in Cagayan Valley, Philippines

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Abstract

In terms of attitude toward Mathematics, the three groups of samples had remarkable increase in their post-test mean scores in the attitude scale in Mathematics as supported by the overall post-test mean score of 141.67 as compared to the initial overall mean of 115.82. Likewise, the pre-test mean scores registered in the attitude scale by the three groups of samples are 116.40, 115.07, and 116.00 for the TAI, STAD and control groups, respectively. The mean differences of the three groups of sample were treated and yielded F-value 0.0875 with corresponding p -value of 0.9164 which is higher than the level of significance of 0.05. This means that the three groups of samples are comparable at the start of the experiment. In like manner, the experimental group taught by cooperative learning strategy Student Team Achievement Division registered a mean difference of 27.66 in their pre-test and post-test scores in the achievement test in Business Mathematics which when treated using dependent t-test yielded t-value of 11.4629 with corresponding p -value of 0.0000 which is much lesser than the level of significance of 0.05. This could mean that the cooperative learning strategy STAD is likewise effective strategy in teaching. Furthermore, the experimental group taught by cooperative learning strategy STAD registered a mean difference 34.40 in their attitude toward Mathematics. This mean difference when treated using dependent t-test yielded t-value of 11.7251 with corresponding p -value of 0.0000 which is much lesser than the level of significance of 0.05. This could mean that the cooperative learning strategy STAD is effective strategy in improving the samples attitude toward Mathematics. Lastly, the control group taught by the traditional method recorded a mean difference of 14.07 in their attitude toward Mathematics which when treated using dependent t-test yielded t-value of 5.4423 with corresponding p -value of 0.0000 which is much lesser than the level of significance of 0.05. This could mean that the traditional method is also effective in improving the samples attitude toward Mathematics. In the case of attitude toward Mathematics, the post-test mean scores registered by the three groups of samples are 145.47, 149.47, and 130.07 for the TAI, STAD and control groups, respectively. The mean differences of the three groups of sample were treated statistically and yielded F-value of 76.4688 with corresponding p -value of 0.0000 which is very much lower than the level of significance of 0.05. This indicates that the cooperative learning strategies TAI and STAD are more effective in improving the samples attitude toward Mathematics than the traditional method of teaching.

Keywords: *attitude towards mathematics, cooperative learning strategies*

Introduction

Cooperative learning is one of the most remarkable and fruitful areas of theory, research and practice in education. Soriano (2000), as cited by Duco, (2012) states that cooperative learning exist when students work together to accomplish shared learning goals. Each student can then achieve his or her learning goal if and only if the other group achieve theirs.

There are certain principles and requirements for the implementation of CL. These are: positive interdependence where each individual depends on the other members of the group and complements others; individual accountability which involves the evaluation of each individual's performance and the effect of the result on individual and group success; face to face interaction wherein group members reach success by helping each other and by sharing ideas. As face to face interaction increases in this process, the sense of responsibility and social solidarity increases. Other principles and requirements for the

implementation of the CL are social skills wherein the students are in a group; evaluation of group processing wherein at the end of the group work, students gather and discuss the productivity of the project and to assess whether they have reached the goals. (Johnson & Johnson, 2003; Johnson, Johnson & Smith, 2008)

In the past four decades, modern cooperative learning has become a widely used instructional procedure in pre – school through graduate school levels, in all subject areas, in all aspects of instruction and learning, in non – traditional as well as traditional learning situations, and even in after – school and non – school educational programs.

One factor contributing to the widespread use of cooperative learning is the variety of cooperative learning methods available for teacher use, ranging from very concrete and prescribed to very conceptual and flexible. Cooperative learning is actually generic term that refers to numerous methods for organizing and conducting classroom instruction. Hence, teachers can find a way to use cooperative learning strategies

that is congruent with his or her philosophies and practices.

Johnson, Johnson and Smith (2011), as cited by Vygotsky (2013), regard cooperative learning as a special type of group work in which two or more students interact with the common goal of mastering specific academic materials.

What makes cooperative learning strong in the literature is its strong theoretical foundation. The method is based on Bandura's Social Dependency Theory, Behavioral Learning Theory (Johnson, Johnson & Smith, 2011) and Vygotsky's (2013), "Zone of Proximal Development" theory. Social Dependency Theory assumes that the way to form social dependency is about how social dependency develops, how individual interacts and what the result will be as a result of the interaction. Accordingly, positive interdependence (cooperative approach) results in such an interaction that the group members encourage, support and improve the efforts of the individuals. Behavioral Learning Theory focuses on the effect of group consolidation and rewards on learning.

According to this theory, behaviors, which are rewarded externally, are repeated. While, Skinner (2005), one of the representatives of behavioral cult, focuses on the group coincidences, Bandura focuses on the imitation. Slavin (2009), has recently stated that external "group awards" are needed in order to motivate the individuals to learn in groups based on cooperative learning (Saban, 2005). According to the Vygotsky's zone of proximal development Theory, a student can take his/her learning to the optimum level by asking for help when he/she is stuck. The person to whom he asks for help may be his/her teacher or friend.

Cooperative learning is a peer – centered pedagogy that promotes academic achievement and builds positive social relationships. Student Teams Achievement Division (STAD) is one of the simplest and most extensively researched forms of all the cooperative learning techniques, and it could be an effective instrument to begin with for teachers who are new to the cooperative learning technique (Beyaztas, 2012). Research studies in the use of STAD as a teaching technique was applied with great success in various research projects. The main purpose of STAD is to drastically improve and accelerate learner performance.

Team – Assisted Individualization (TAI) is another cooperative learning strategy wherein students work in

heterogeneous teams. Whereas, in STAD all students study the same materials at the same rate, in TAI, students are given individualized materials, and work at their own levels and rates. Team mates check each other's work against answer sheets, except for final tests, which scores are monitored. Team scores are based on the average number of units completed each week by the team members and the accuracy of the unit; teams that meet present criterion receive attractive certificates or other rewards. (Ong and YueBorich, nd)

Attitudes, like student's academic achievement, are important outcomes of science education in the tertiary level. The development of students' positive attitudes regarding mathematics as a general education subject is one of the major responsibilities of mathematics educators. Unfortunately, research has revealed that much of what goes on in the mathematics classrooms is not particularly attractive to students across ages. (Cheung, 2009)

An attitude may be defined as a predisposition to respond in a favourable or unfavourable manner with respect to a given attitude (Schultz, 2005). Attitude towards Business Mathematics denotes interest or feelings towards studying Business Mathematics. It is the students' "like" or "dislike" of business mathematics while attitude in business mathematics is described as the scientific approach which is assumed by an individual for solving problems, assessing ideas and making decisions. Student beliefs and attitude have the potential to either facilitate or inhibit learning.

People form attitudes according to how they are conditioned or how our experiences condition people. B.F. Skinner's Operant Conditioning theory is a form of learning in which a response is made in anticipation of a stimulus. In operant conditioning, reinforcement increases the likelihood that behaviour will be repeated (Ntim, 2010). Behaviours that are followed by positive consequences are reinforced and are more likely to be repeated than are behaviours and attitudes that are followed by negative consequences (Moris&Maisto, 2001).Operant conditioning requires the use of reinforcement and punishment. A case in point is if a child's mother smiles at her anytime she picks something up for her, the child begins to realize that it is good to be helpful and she is likely to repeat the behaviour. Conversely, if a mother screams at a child for picking up a puff of a piece of cigarette, the child will grow up having an unfavourable attitude towards smoking and probably those who smoke. This is due to the negative consequence of her action.

People also learn attitude through observation of people around them, especially if they are people they admire, respect or hold in high esteem. Children therefore invariably observe the attitude of parents and teachers and learn a lot from them.

Research has shown that formation of attitude is experiential. People form attitudes through their experiences in life. Social psychology explains how attitudes are formed using three major learning theories which are classical conditioning, operant conditioning and observational learning. Propounded by Ivan Pavlov, classical conditioning is a procedure for modifying behaviour in which repeated pairing of conditioned stimulus with an unconditioned stimulus leads to the development of a conditioned response (Ntim, 2010, Linero & Hinojosa, 2012). Classical conditioning entails neutral stimuli that naturally elicit a response. Children, for instance, become fans of football clubs of their fathers.

Many factors could contribute to students' attitude towards studying business mathematics. Batool (2012), have concluded that a number of factors have been identified as related to students attitude to mathematics. Such factors include teaching methods, teacher attitude, influence of parents, gender, age, cognitive styles of students, career interest social view of mathematics and achievement.

There is a relationship between attitude and methods of instruction and also between attitude and achievement and that it is possible to predict achievement from attitude scores. Results of these types of studies are likely to broaden a teacher's knowledge as to how he or she can affect students' attitude positively towards business mathematics.

Most students perceive mathematics negatively considering it as a difficult subject. This is based on observations and feedback given by math teachers in the campus. Hence, in view of the desire to contribute to the emerging body of research on area of Mathematics, particularly to make Business Mathematics learning easier and more enjoyable for his students, the researcher was motivated to conduct this study. Cooperative learning is presumed to provide better approach that could benefit the students' attitude and achievement in mathematics.

Premised on the aforementioned ideas, the study on the effectiveness of cooperative learning strategies on the achievement in Business Mathematics and attitude toward Mathematics among freshmen of the College of Arts and Sciences, Nueva Vizcaya State University-Bambang campus was conducted

Research Questions

This study sought answers to the following questions:

1. What are the levels of attitude toward Mathematics of the three groups of samples after being separately taught using the TAI, STAD and traditional methods?
2. Are there significant differences in the pre-test mean scores in the attitude scale in Mathematics of the three groups of samples?
3. Are there significant differences in the pre-test and post-test mean scores in the attitude scale in Business Mathematics of the two experimental groups and the control group?
4. Are there significant differences in the attitude scale in Mathematics of the three groups of samples?

Literature Review

Cooperative Learning

Cooperative learning consists of having students work together to achieve a joint learning goal in temporary, ad-hoc groups that last from a few minutes to one class period. (Johnson, Johnson, & Holubec, 2008). Cooperative learning is very versatile. This learning encourages students to verbalize their ideas and to compare them with the ideas and feelings of the other students which are useful when they are solving problems. Cooperative learning can change the verbal interaction patterns, so that they make greater use of specific verbal patterns believed to be related to increased learning. (Dumas, 2003)

Bernero (2000), studied 25 second grade Black and Hispanic students working in cooperative groups. Bernero (2002) used surveys of teachers and students and found that students felt more comfortable working in a cooperative group. Gillies (2004) studied the effects of cooperative learning on 223 ninth grade students in structured and unstructured groups. Gillies (2004) found that students in structured groups were more willing to work with others on assigned tasks and aid their peers than the students in the unstructured groups. The students worked in three- or four-person mixed-gender and mixed-achievement groups.

It is important to create an atmosphere in the classroom where students feel comfortable to share their ideas. This may take time for the group members to become aware of the strengths that each member can bring to the entire group. Structure of the groups is important. In the research by Gillies (2004) and Yamarik (2007), children in the structured groups



demonstrated less non-cooperative behaviors and less off – task behaviors than their peers in the unstructured groups. They were more willing to work with others on the task, listen to what they had to say, and share ideas and information (Gillies, 2004). The novelty of working in small groups sparked a greater interest in the material. (Yamarik, 2007)

Understanding what happens as students work cooperatively together – in particular, how they interact to facilitate learning and how they perceive these experiences – is critical to understanding how this approach to learning can be used more effectively in classrooms to achieve academic and social goals (Gillies, 2004). Helping students to achieve at the highest academic level possible is important to me. Cooperative learning has been shown with the reviewed literature to be a useful method at achieving this goal.

According to Brady and Tsay (2010), cooperative learning strategy is an active pedagogy that fosters high academic achievement. Further, they claim that cooperative learning has many outcomes. It helps students build a feeling of community in the classroom and foster a warmer classroom climate, which promotes learning and achievement.

During a lecture, demonstration, or film, informal cooperative learning can be used to focus student attention on the material to be learned, set a mood conducive to learning, help set expectations as to what will be covered in a class session, ensure that students cognitively process and rehearse the material being taught, summarize what was learned and pre – cue the next session, and provide closure to an instructional session. The teacher’s role for using informal cooperative learning to keep students more actively engaged intellectually entails having focused discussions before and after the lesson (bookends) and interspersing pair discussions throughout the lesson. Two important aspects of using informal cooperative learning groups are to make the task and the instructions explicit and precise and require the groups to produce a specific product. (Smith, 2011)

Procedures in cooperative learning come in different forms. One of which is the introductory focused discussion wherein teachers assign students to pairs or triads and explain the task of answering the questions in a four to five-minute time period and the positive goal interdependence of reaching consensus. The discussion task is aimed at promoting advance organizing of what the students know about the topic to be presented and establishing expectations about

what the lecture will cover. Individual accountability is ensured by the small size of the group. A basic interaction pattern of eliciting oral rehearsal, higher-level reasoning, and consensus building is required. Another process is intermittent focused discussions: Teachers divide the lecture into 10 to 15 minute segments. This is about the length of time a motivated adult can concentrate on information being presented. After each segment, students are asked to turn to the person next to them and work cooperatively in answering a question (specific enough so that students can answer it in about three minutes) that requires students to cognitively process the material just presented. Under this procedure each student formulates his or her answer, students share their answer with their partner, students listen carefully to their partner’s answer, the pairs create a new answer that is superior to each member’s initial formulation by integrating the two answers, building on each other’s thoughts, and synthesizing. The question may require students to summarize the material just presented, give a reaction to the theory, concepts, or information presented, predict what is going to be presented next; hypothesize, solve a problem, relate material to past learning and integrate it into conceptual frameworks and resolve conceptual conflict created by presentation.

Teachers should ensure that students are seeking to reach an agreement on the answers to the questions (ensure positive goal interdependence is established), not just share their ideas with each other. Randomly choose two or three students to give 30 second summaries of their discussions. Such individual account ability ensures that the pairs take the tasks seriously and check each other to ensure that both are prepared to answer. Periodically, the teacher should structure a discussion of how effectively the pairs are working together (group processing). Group celebrations add reward interdependence to the pairs.

Closure focused discussion is another procedure in cooperative learning wherein teachers give students an ending discussion task lasting four to five minutes. The task requires students to summarize what they have learned from the lecture and integrate it into existing conceptual frameworks. The task may also point students toward what the homework will cover or what will be presented in the next class session. This provides closure to the lecture.

Informal cooperative learning ensures students are actively involved in understanding what is being presented. It also provides time for teachers to move around the class listening to what students are saying.



Listening to student discussions can give instructors direction and insight into how well students understand the concepts and material being as well as increase the individual accountability of participating in the discussions. (Slavin, 2009)

Cooperative based groups are long-term, heterogeneous cooperative learning groups with stable membership (Johnson, Johnson, & Holubec, 2008). Members' primary responsibilities are to ensure all members are making good academic progress (positive goal interdependence); hold each other accountable for striving to learn (i.e., individual accountability), and provide each other with support, encouragement, and assistance in completing assignments (promotive interaction). In order to ensure the base groups, function effectively, periodically teachers should teach needed social skills and have the groups process how effectively they are functioning. Typically, cooperative base groups are heterogeneous in membership (especially in terms of achievement motivation and task orientation), meet regularly (for example, daily or biweekly), and last for the duration of the class (a semester or year) or preferably for several years. The agenda of the base group can include academic support tasks (such as ensuring all members have completed their homework and understand it or editing each other's essays), personal support tasks (such as getting to know each other and helping each other solve non - academic problems), routine tasks (such as taking attendance), and assessment tasks (such as checking each other's understanding of the answers to test questions when the test is first taken individually and then retaken in the base group).

The teacher's role in using cooperative base groups is to form heterogeneous groups of four (or three); schedule a time when they will regularly meet (such as beginning and end of each class session or the beginning and end of each week); create specific agendas with concrete tasks that provide a routine for base groups to follow when they meet; ensure the five basic elements of effective cooperative groups are implemented, and have students periodically process the effectiveness of their base groups.

The longer a cooperative group exists, the more caring their relationships will tend to be, the greater the social support they will provide for each other, the more committed they will be to each other's success, and the more influence members will have over each other. Permanent cooperative base groups provide the arena in which caring and committed relationships can be created that provide the social support needed to

improve attendance, personalize the educational experience, increase achievement, and improve the quality of school life.

Formal cooperative learning consists of students working together, for one class period to several weeks, to achieve shared learning goals and complete jointly specific tasks and assignments (Johnson, Johnson, & Holubec, 2008). In formal cooperative learning groups, the teachers' role includes making pre - instructional decisions. Teachers formulate both academic and social skills objectives, decide on the size of groups, choose a method for assigning students to groups, decide which roles to assign group members, arrange the room, and arrange the materials students need to complete the assignment. In these pre - instructional decisions, the social skills objectives specify the interpersonal and small group skills students are to learn. By assigning students roles, role interdependence is established. The way in which materials are distributed can create resource interdependence. The arrangement of the room can create environmental interdependence and provide the teacher with easy access to observe each group, which increases individual accountability and provides data for group processing.

In instructional task and cooperative structure, teachers explain the academic assignment to students; explain the criteria for success, structure positive interdependence, structure individual accountability, explain the behaviors (social skills) students are expected to use, and emphasize intergroup cooperation (this eliminates the possibility of competition among students and extends positive goal interdependence to the class as a whole). Teachers may also teach the concepts and strategies required to complete the assignment. By explaining the social skills emphasized in the lesson, teachers operationalize the social skill objectives of the lesson and (b) the interaction patterns (such as oral rehearsal and jointly building conceptual frameworks) teachers wish to create.

Monitoring students' learning and intervening aid in completing the task successfully or using the targeted interpersonal and group skills effectively involves the following: While conducting the lesson, teachers monitor each learning group and intervene when needed to improve task work and teamwork. Monitoring the learning groups creates individual accountability; whenever a teacher observes a group, members tend to feel accountable to be constructive members. In addition, teachers collect specific data on promotive interaction, the use of targeted social skills,



and the engagement in the desired interaction patterns. This data is used to intervene in groups and to guide group processing.

Assessing students' learning and helping students process how well their groups functioned provide teachers to bring closure to the lesson, assess and evaluate the quality and quantity of student achievement, ensure students carefully discuss how effectively they worked together (process the effectiveness of their learning groups), have students plan for improvement, and have students celebrate the hard work of group members. The assessment of student achievement highlights individual and group accountability (how well each student performed) and indicates whether the group achieved its goals (focusing on positive goal interdependence).

The group celebration is a form of reward interdependence. The feedback received during group processing is aimed at improving the use of social skills and is a form of individual accountability. Discussing the processes, the group used to function, furthermore, emphasizes the continuous improvement of promotive interaction and the patterns of interaction need to maximize student learning and retention.

These three types of cooperative learning may be used together (Johnson, Johnson, & Holubec, 2008). A typical class session may begin with a base group meeting, which is followed by a short lecture in which informal cooperative learning is used. The lecture is followed by a formal cooperative learning lesson. Near the end of the class session another short lecture may be delivered with the use of informal cooperative learning. The class ends with a base- group meeting.

Not all groups are cooperative (Johnson & F. Johnson, 2009). Placing people in the same room, seating them together, telling them they are a group, does not mean they will cooperate effectively. To be cooperative, to reach the full potential of the group, five essential elements need to be carefully structured into the situation. These are positive interdependence, individual

and group accountability, promotive interaction, appropriate use of social skills, and group processing (Johnson & Johnson, 1989, 2005). Mastering the basic elements of cooperation allows teachers to take existing lessons, curricula, and courses and structure them cooperatively; tailor cooperative learning lessons to unique instructional needs, circumstances, curricula, subject areas, and students, diagnose the problems some students may have in working together and

intervene to increase the effectiveness of the student learning groups.

The first and most important element is positive interdependence. Teachers must give a clear task and a group goal so students believe they "sink or swim together." Positive interdependence exists when group members perceive that they are linked with each other in a way that one cannot succeed unless everyone succeeds. If one fails, all fail. Group members realize, therefore, that each person's efforts benefit not only him- or herself, but all other group members as well. Positive interdependence creates a commitment to other people's success as well as one's own and is the heart of cooperative learning. If there is no positive interdependence, there is no cooperation.

The second essential element of cooperative learning is individual and group accountability. The group must be accountable for achieving its goals. Each member must be accountable for contributing his or her share of the work (which ensures that no one "hitch-hikes" on the work of others). The group has to be clear about its goals and be able to measure its progress in achieving them and the individual efforts of each of its members. Individual accountability exists when the performance of each individual student is assessed and the results are given back to the group and the individual in order to ascertain who needs more assistance, support, and encouragement in completing the assignment. The purpose of cooperative learning groups is to make each member a stronger individual in his or her right. Students learn together so that they can subsequently perform higher as individuals.

The third essential component of cooperative learning is promotive interaction, preferably face – to – face. Promotive interaction occurs when members share resources and help, support, encourage, and praise each other's efforts to learn. Cooperative learning groups are both an academic support system (every student has someone who is committed to helping him or her learn) and a personal support system (every student has someone who is committed to him or her as a person). There are important cognitive activities and interpersonal dynamics that can only occur when students promote each other's learning. This includes orally explaining how to solve problems, discussing the nature of the concepts being learned, teaching one's knowledge to classmates, and connecting present with past learning. It is through promoting each other's learning face-to-face that members become personally committed to each other as well as to their mutual goals.

The fourth essential element of cooperative learning is teaching students the required interpersonal and small group skills. In cooperative learning groups students are required to learn academic subject matter (task work) and also to learn the interpersonal and small group skills required to function as part of a group (teamwork). Cooperative learning is inherently more complex than competitive or individualistic learning because students have to engage simultaneously in task work and teamwork. Group members must know how to provide effective leadership, decision – making, trust – building, communication, and conflict-management, and be motivated to use the prerequisite skills. Teachers have to teach teamwork skills just as purposefully and precisely as teachers do academic skills. Since cooperation and conflict are inherently related, the procedures and skills for managing conflicts constructively are especially important for the long-term success of learning groups. Procedures and strategies for teaching students' social skills may be found in (Johnson, 2009) and Johnson and F. Johnson, 2009)

The fifth essential component of cooperative learning is group processing. Group processing exists when group members discuss how well they are achieving their goals and maintaining effective working relationships. Groups need to describe what member actions are helpful and unhelpful and make decisions about what behaviors to continue or change. Continuous improvement of the process of learning results from the careful analysis of how members are working together. These five elements are essential to all cooperative systems, no matter what their size. When international agreements are made and when international efforts to achieve mutual goals (such as environmental protection) occur, these five elements must be carefully implemented and maintained.

According to Johnson and Holubec (2002), cooperative learning experiences promote more positive attitudes toward the instructional learning experience. Further, Brady and Tsay (2010) avers that the warm classroom climate existing because of the utilization of cooperative learning strategies expresses friendship, and provides the students the opportunity to strive to understand different ways of explaining concepts and different perspectives on solving problems thus becoming more willing to take on tough tasks because they expect to succeed and their attitude toward the subject becomes more positive.

Slavin (1991) as cited by Duco (2012), that in the Team Assisted Individualization, students work in heterogeneous teams. Each member of the team is

given a material to work on at his own pace and later own compare his work with another team mate and check their work using an answer sheet provided by the teacher. During the course of checking, team members are free to share their ideas about the assigned tasks and explain their own work to the team mates.

Soriano (2001), Villamor (2002), Regudon (2003), Santos (2006), Esteban (2007), Olonan (2010), Duco (2012), Asuncion (2014) and Remolazo (2015) studies show that there is remarkable increase in the posttest mean scores of the groups of samples in their respective studies utilizing cooperative learning strategies and the traditional methods of teaching as compared to their pretest mean scores.

Attitude toward Mathematics

According to Jacob as cited by Olonan (2010), attitude of students is the product of lifelong interaction, prediction, and environmental experiences. They seem to develop either positive or negative attitude through the process of absorption; they react to the things they see and hear and imitate their parents, teachers as well as their peers

Attitudes can change in a short period of time, and sometimes dramatically. Many students, especially those that are younger and less established students, their attitude toward a particular subject is proportional to their recent success in the class. (Hannula, 2002) In Hannula's research, he found that once established, an attitude is fairly stable and only minor changes occur based on successes and failures. This is where teachers can have a great impact on the shaping of this attitude: "Teachers can reinforce the idea that mathematics is an interesting subject, used in other disciplines, and is an admission ticket for colleges and careers. (Anderson, 2007)

Research suggests that there are three different components of attitude. These are the cognitive component, the affective component, and the behavioural component (Eagly & Chaiken, 1993; Maio & Haddock, 2010). The cognitive component of attitude is what the individual thinks or believes about the attitude object. An example is that a person might think that a snake is a dangerous reptile. The affective aspect of attitude is the feelings or emotions of the individual associated with the attitude object. For example, the sight of a snake may evoke the feeling of fear in the individual.

The behavioural component is the tendency to respond in a certain way to the attitude object. An

example is a person choosing to run away or scream upon seeing a snake. Hence the cognitive, affective and behavioural components of attitude are interrelated and interconnected.

James as cited by Kendra (2017) cited that it is the attitude at the beginning of a difficult task which, more than anything else, will affect its successful outcome.

McCleod (2002) states that attitude toward mathematics is related to mathematics success in the classroom. Conversely, student's achievement can influence a student's attitude as well. Thus, it is important for teachers to improve student work to make a positive change in their attitude toward mathematics (Ma & Xu, 2004).

Linn and Hyde (2009), pointed out that stronger affection with mathematics have greater upshot on mathematics partaking than those students who are showing higher cognition level. The learning of business mathematics depends upon attitude and affection level (Meyer & Koehler, 2010). Attitude is the most important determinant to create higher interest level of student for business mathematics. In the light of above literature, it is important for instructor of business mathematics to make classroom environment where students possessing positive attitude (Steinback & Gwizdala, 1995; Ayub et al, 2005). Lester et al (2000) and McCleod (2004) pointed out that teachers can easily predict students' performance and results of business mathematics by analyzing their affection level with this subject. Similarly, by observing and students comments about this subject, whether they like it or not, make easier for teachers, how to teach this subject and provide more learning for students.

The conceptions, attitudes, and expectations of students regarding Mathematics and Mathematics teaching have been considered to be very significant factors underlying their school experience and achievement (Shoenfeld, 2006). In general, the concepts students hold about Mathematics determine how they approach the subject. In many cases, students have been found to approach Mathematics as procedural and rule oriented. This prevents them from experiencing the richness of Mathematics and the many approaches that could be used to develop competence in the subject.

Positive attitude for business mathematics is very important. Positive attitude increases student learning of mathematics (Neale, 2009). Positive attitude associated with improved performance and achievements. Positive attitude regarding mathematics

will encourage business students to choose finance and quantitative subjects (Haladyna et al., 2008). Attitude is decisive variable for better performance and achievement in mathematics.

Some authorities regard attitude towards Mathematics as just a like or dislike for Mathematics, while others extend the meaning to embrace beliefs, ability, and usefulness of Mathematics. For Zan and Martino (2007), attitude towards Mathematics is just a positive or negative emotional disposition towards Mathematics. Neale (2005), however, defines attitude towards Mathematics as an aggregated measure of "a liking or disliking of Mathematics, a tendency to engage in or avoid Mathematical activities, a belief that one is good or bad at Mathematics, and a belief that Mathematics is useful or useless". Similarly, Hart (2005) considers attitude towards Mathematics from multidimensional perspectives and defined an individual's attitude towards Mathematics as a more complex phenomenon characterised by the emotions that he associates with Mathematics, his beliefs about Mathematics and how he behaves towards Mathematics. Attitude towards Mathematics includes the tendency to be fearful of and anxious about Mathematics.

Nicolaidou and Philippou (2003) mentioned that negative attitudes are the results of frequent and repeated failures or problems when dealing with mathematical tasks and these negative attitudes may become relatively permanent. According to them, there are a number of factors which can explain why attitudes toward mathematics become more negative with students such as the pressure to perform well, over demanding tasks, uninteresting lessons and less than positive attitudes on the part of the teachers.

Attitude towards Mathematics has cognitive, affective and behavioural components; and like any other kind of attitude, it can be formed through any of the three processes A student can develop positive attitude towards Mathematics because he or she learns to associate positive experiences or events with it. Also, positive reinforcement creates room for the formation of positive attitude for Mathematics. And by no means is students' observation of teachers and teachers' behaviour especially in relation to Mathematics among the least of the factors that influence their attitude towards Mathematics.

Attitude can also be gender related. There are many who hold the view that boys do better in Mathematics than girls. This belief tends to affect the attitude of girls towards Mathematics.

Farooq and Shah (2008), in a study of secondary school students in Pakistan found that there was no significant difference in confidence of male and female students towards Mathematics at secondary school level. They rather found that students' success in Mathematics depended on attitude towards the subject. Nonetheless, some studies have found gender difference in students' confidence in Mathematics. Compared to boys, girls lacked confidence, had debilitating causal attributed patterns, perceived Mathematics as a male domain and were anxious about Mathematics (Casey, Nuttal&Pezaris, 2001). In the study, girls were found to have lower self-confidence in Mathematics than boys.

Instructively, research on the relationship between student attitude and performance has also been inconclusive. Researches that have been conducted to determine the relationship between students' attitude towards Mathematics and achievement in Mathematics have yielded contradictory results. The findings have thus lacked consistency on the subject. Some studies have demonstrated a strong and significant relationship between Mathematics attitude and Mathematics achievement. (Minato &Yanase, 1984, Randhawa& Beamer, 1992, Schenkel, 2009)

In Schenkel's (2009) study of elementary school pupils, positive correlation between student attitude and student performance was found. Student beliefs and attitudes were found to have the potential to either facilitate or inhibit learning. In a comparative study of factors influencing Mathematics achievement, Burstein (2002) found that there is a direct link between students' attitudes towards Mathematics and student outcomes. Cheung (2008), in his study of 11-13 year olds, also discovered positive correlation between attitude and Mathematics achievement. The correlation showed that the more positive the attitude, the higher the level of achievement in the student.

Some research demonstrated that the correlation between attitude towards Mathematics and achievement in Mathematics was rather weak and could not be considered to be of practical significance (Vachon, 2004, Wolf&Blixt, 2001). In a meta – analysis of 113 primary studies involving elementary and secondary school children. Ma and Kishor (2007), found that attitude towards Mathematics and achievement in Mathematics was positively and reliably correlated but not strong.

The correlation was not statistically significant. Flowing from the preceding findings, studies in different cultural settings are eminent to realise the

influence of student attitude towards Mathematics on student learning outcomes in the subject.

Like all other kinds of attitude, a teacher's attitude towards Mathematics can be measured by the emotional response towards Mathematics (affective), beliefs about Mathematics (cognitive), as well as behaviour. Clarke, Thomas and Vidakovic (2009), postulate that attitudes and practices of teaching Mathematics are complexly affected by beliefs, emotions, social context and content knowledge. Studies confirm that emotional responses toward Mathematics that are found in teachers include like and dislike of Mathematics, anxiety associated with Mathematics and self – confidence in relation to Mathematics (Phillipou & Christou, 1998, Brady &Bowd, 2005, Henderson & Rodrigues, 2008).

These emotional factors have been found to have an impact on student performance. In their study of teachers' self-esteem connected to Mathematics, Henderson and Rodrigues (2008), found that approximately half of the participating pre-service teachers, some of whom were highly qualified, lacked self – esteem in relation to Mathematics. Burks, Heidenburg, Leoni and Ratliff (2009) stipulate that teachers' exhibition of self – confidence when teaching Mathematics motivates student achievement in Mathematics. The learner draws from the teacher's disposition to form his own attitude which may affect her learning outcomes.

Teachers' beliefs about Mathematics such as the usefulness of Mathematics, the way Mathematics should be learned, the difficulty or ease of Mathematics, as well as gender ability and beliefs also affect their attitude towards the subject and impact on students' performance. According to Philippou and Christou (2008), teachers' beliefs about the utility of Mathematics are often found to correlate with either a more positive or negative attitude towards the subject. It is believed that a teacher who sees no usefulness of Mathematics in the real world and believes that Mathematics should be learnt as a set of rules and algorithms will require his students to memorise procedures and rules without meaning. This is a negative outlook that will make his students develop a negative attitude towards the subject. Also, a teacher who believes that girls are poor in Mathematics is likely to impact negatively on girls in his class who will begin to believe that they cannot do Mathematics.

Another aspect of the teacher's attitude towards Mathematics is the teacher's behaviour in relation to Mathematics. Such Mathematics-related behaviour as

avoidance of Mathematics, pursuit of Mathematics and instructional behaviour in the classroom all affect student attitude and performance. Usually, the way that Mathematics is represented in the classroom and perceived by students, even when teachers believe they are presenting it in authentic and context dependent way stands to alienate many students from Mathematics. (Barton, 2000, Furinghelti & Pekhoren, 2002)

Ogunniyi, as cited in Yara, (2009), stipulates that students' positive attitude towards Mathematics is enhanced by the following teacher – related factors: teachers' enthusiasm, teachers' resourcefulness and helpful behaviour and teachers' thorough knowledge of the subject-matter and their making.

Mathematics quite interesting it is inferred that teachers can foster in students the positive attitudes about Mathematics that help to build confidence by: encouraging the belief that everyone can “do” Mathematics – emphasizing effort, not innate ability; modelling enthusiasm for teaching and learning Mathematics; addressing the learning styles of students by providing a variety of ways for students to gain an understanding of difficult concepts; helping students to appreciate the value of Mathematics in their lives; and choosing activities carefully (not too easy, not too hard), so that students can be both challenged and successful. (Ministry of Education, Ontario (2004)

From Hammouri's study of attitudinal and motivational variables and their relation to mathematics success he was able to draw conclusions similar to those of previous studies. He used the Third International Mathematics and Science Study (TIMSS) to look at 8th graders in Jordan. Jordanians have had shown poor performance in the area of mathematics. He states that attitude itself can affect level of energy input, perseverance (Carroll, 2013), time on tasks (Love & McVevey, 2001), standard of achievement. (Webster & Fisher, 2000) and engagement in an activity. (Middleton & Toluk, 2009)

While, Hammouri (2004), claimed that, one could say that the better a student's attitude toward mathematics may be, the more successful and the higher the performance level will be for that student.

The study of Hammouri (2004) reveals significant positive effects of attitude towards math on math's achievement and self-perception of math's importance; confidence in math's ability on math's achievement, attitude towards math, educational aspiration and self-perception of math's importance; educational aspiration on math's achievement and attitude towards

math's; and self – perception of math's importance on math's achievement.

In the study of Hannula (2002) on attitude in cognitive-emotional terms, he proves that while a student is engaged in a mathematical activity, there is a continuous unconscious evaluation of the situation with respect to personal goals. When students are evaluated, there are four areas to examine. The first is simply situational and no prior experience of the entity being evaluated. The second depends entirely on previous experience and is the kind that is typically seen on questionnaires. The third evaluation is when the situation is to a familiar to a degree, but the individual has no personal experience. The fourth is when an individual looks at ones whole life and the value of different goals in it. Hannula (2002) further stated that “these four evaluations produce attitude”.

Methodology

This investigation employed the experimental method of research. The experimental method is a systematic and scientific approach to research in which the researcher manipulates one or more variables, and controls and measures any change in other variables. (Blakstad, 2008)

The experimental method involves the deliberate manipulation of one variable, while trying to keep other variables constant. The variable which is being manipulated by the researcher is called the independent variable (input) and the dependent variable (throughput) is the change in behaviour measured by the researcher.

By changing one variable (the input) while measuring another (the throughput) while controlling all others, as far as possible, then the experiment will allow the researcher to draw conclusions with far more certainly than the non – experimental method. If the independent variable (input) is the only thing that is changed, then it must be responsible for any change in the independent variable (throughput).

Respondents

The study conducted utilized three groups of respondents consisting of 15 respondents per group. The respondents consisted of 15 BS – Cooperative Management students which represented the traditional method, while the 15 BS – Public Administration 1A students represented the TAI group and 15 BS – Public Administration students



represented the STAD group of the study.

Table 1. Frequency and Percentage Distribution of Respondents According to Group

Respondents'	Population	Respondents'	Percentage
BSPA 1A (STAD)	28	15	53.57
BSPA 1B (TAI)	34	15	44.12
BSCOOP 1A(TM)	33	15	45.45
Total	95	45	47.37

The subjects were distributed to three groups coded as BSPA 1A and BSPA 1B who constituted to the two experimental groups and the BSCOOP 1A as the control group. The subjects assigned to these three groups were separately taught Business Mathematics using the TAI and STAD cooperative learning strategies and the traditional method. After drawing the subjects for the three groups, the Achievement Test in Business Mathematics was administered as pre-test to determine their comparability prior to the conduct of the experiment.

Instruments of the Study

In order to collect the salient data for the study the following instruments were used:

Teacher-made Achievement Test in Business Mathematics. This is a 100 – item summative exam covering three topics in the subject.

Table 2. Table of Specifications of the Achievement Test in Business Mathematics

Topics Covered	R	U	A	AN	E	C	Total	%		
Chapter 1										
1. Rounding of Numbers		5	21-25	55	1-5	55	6-10	50	50%	
2. Ratio and Proportion		10	41-50	11-15	16-20					
3. Percentage					26-40					
Chapter 2										
1. Simple Interest		10	56-65	10	66-75	5	51-55	5	96-100	50%
2. Ordinary and Exact Interest		20	76-95							
3. Approximate and Exact Time										
4. Interest on time deposits										
5. Simple discount promissory note										
Total		45		20	30	5	100	100%		

Procedure

Permission to conduct the study and to administer the research instruments was sought from the concerned authorities of the campus. After permission was granted by the dean of College of Arts and Sciences,

the researcher personally administered the research instruments to the subjects. after which he likewise retrieved the same. The experiment had a duration of four weeks.

The subjects were given a pre – test to determine their entry behavior in terms of Mathematics achievement and attitude. After checking the pre – test administered to the subjects, two groups were formed for the experiment. The grouping was done on the basis of the subjects’ ratings in Business Mathematics during the first term period. The subjects were distributed to the two groups using the lottery technique.

The researcher personally taught Business Mathematics to the two groups of subjects during the morning session. Group 1, called Experimental Group was taught using cooperative learning (TAI) from 1:00 – 2:00 (MWF); and (STAD) 2:00 – 3:00 (MWF) while the Control Group, using the traditional method was at 1: 00 – 2:30 (Tth). The procedure in conducting the experiment is presented below as adopted from Cudia (1997) as cited by Duco (2012).

Experimental Groups (Team Assisted Individual and Student Team Achievement Division)

1. The researcher presented the lesson to the whole group in one or two class periods.
2. Team study followed for one or two class periods. Students who had already mastered the material helped slower team mates with it. Drill was stressed although could engage in discussion and questioning. For a group of four students, only two copies of the work sheets and answer sheets were given to each team to encourage interaction and support. Students were allowed to work alone, if they prefer or in pairs or threes. If the team could not finished the activity, it will be given as an assignment. Students did not only check answer sheets but also explained their work with their pair. The teacher moved around the room to monitor the teams’ activities and provided additional assistance when necessary.
3. Class quizzes were frequently given to see if students have learned the materials while in the group. Students returned to their assigned seats or moved their desks apart for quizzes.
4. Recognition was given to teams for high-average scores or improvement scores in the form of praises, rewards and high grades. Individuals were recognized for good performance to maintain motivation but a balance between individual reward and team accomplishment was maintained.
5. All team members took turns in acting as team leader. This process provided opportunity for other



group members to lead and be developed in terms of individual accountability.

Control Group (Traditional Method)

The control group was taught Business Mathematics using the traditional method. Each class session started with motivation, consisting of the discussion of the importance of the subject matter to real-life situations. Review of the past lesson was done to diagnose whatever difficulties were encountered in the previous lesson. Homework was checked wherein difficult items were given emphasis. Review of past lesson served as springboard for the day’s lesson.

1. The presentation of the subject matter followed the sequence of objectives formulated. It was so arranged such that each objective was attained fully. Enough examples/illustrations were presented to the class for clearer view on how to apply the concepts in solving the exercise given. Questions were entertained by the researcher.
2. After the subject matter was presented and generalizations were formulated by the students, practice exercises were given for the students to apply the new concepts learned. This was done to gauge whether learning took place in the classroom. The same exercises were given to the control group as in the experimental groups although the subjects were to work on their own exercises independently without the assistance of any member of the class.
3. Just like what was done in the experimental group, recognition in the form of praises and rewards was likewise given to the control group for their high scores and good performance.

To ensure the validity of the result of the experiment, aside from the equating variables, the following extraneous variables were taken into consideration:

1. **Teacher Factor.** To avoid the influence of teacher factor which may affect the subjects’ achievement in Business Mathematics, the researcher personally handled the two groups of subjects. This was done to ensure that the result of the experiment was truly the effect of the treatment employed by the researcher, not teacher factor.
2. **Schedule of Classes.** Previous studies revealed that schedule of Business Mathematics classes affected students’ performance. Hence, the researcher scheduled the two classes during the morning session.
3. **Attendance.** The attendance of students was strictly checked and students who incurred absences were motivated to attend their classes regularly.

Likewise, the students belonging to the population where the samples were drawn were part of the experiment. This was done so that the experimental setting will not be artificial and that the samples would not feel that they were participants in the experiment.

Ethical Considerations

The proposed data collection procedure and data collection tools were reviewed and approved for this study. Ethical requirements were meticulously followed to ensure that approval is guaranteed.

Results

This part presents the data gathered through the research instrument including the interpretation and analysis of data. The tabular presentation of data and corresponding discussion follow the sequence of the problems posted.

Table 3. *Level of Attitude toward Mathematics of the Three Groups of Samples before being Separately Taught Using the Three Methods of Teaching*

<i>Group</i>	<i>Mean</i>	<i>Level</i>
Experimental Group 1 (Team Assisted Individualization)	116.40	Negative
Experimental Group 2 (Student Team Achievement Division)	115.07	Negative
Control Group (Traditional Method)	116.00	Negative
Overall Mean	115.82	Negative

Table 4. *Level of Attitude toward Mathematics of the Three Groups of Samples after Being Separately Taught Using the Three Methods of Teaching*

<i>Group</i>	<i>Weighted Mean</i>	<i>Level</i>
Experimental Group 1 (Team Assisted Individualization)	145.47	Positive
Experimental Group 2 (Student Team Achievement Division)	149.47	Positive
Control Group (Traditional Method)	130.07	Positive
Overall Weighted Mean	141.67	Positive

Table 5. Summary of F-test Results on the Three Groups of Samples' Pre-test Weighted Mean Scores in the Attitude Scale in Business Mathematics (n=45)

Groups	Mean	Computed F-Value	p-Value	Remarks
Experimental Group 1 (TAI)	116.40			
Experimental Group 2 (STAD)	115.07	0.0875	0.9164	Not Significant
Control Group	116.00			

Table 6. Summary of t-test Results on the Pre-test and Post-test Mean Scores in the Attitude Scale in Mathematics of the Experimental Group Utilizing Team Assisted Individualization (n=15)

Experimental Group 1 (TAI)	Mean	Computed t-Value	p-Value	Remarks
Pretest	116.40			
Posttest	145.47	16.6639	0.0000	Very Significant

Table 7. Summary of t-test Results on the Pre-test and Post-test Mean Scores in the Attitude Scale Test in Mathematics of the Experimental Group Utilizing Student Team Achievement Division (n=15)

Experimental Group 2 (STAD)	Mean	Computed t-Value	p-Value	Remarks
Pretest	115.07			
Posttest	149.47	11.7251	0.0000	Very Significant

Table 8. Summary of t-test Results on the Pre-test and Post-test Mean Scores in the Attitude Scale in Mathematics of the Control Group Utilizing Traditional Method (n=15)

Control Group	Mean	Computed t-Value	p-Value	Remarks
Pretest	116.00			
Posttest	130.07	5.4423	0.0000	Very Significant

Table 9. Summary of F-test Results on the Three Groups of Samples' Post-test Mean Scores in the Attitude Scale in Mathematics (n=45)

Groups	Mean	Computed F-Value	p-Value	Remarks
Experimental Group 1 (TAI)	145.47			
Experimental Group 2 (STAD)	149.47	76.4688	0.0000	Very Significant
Control Group	130.07			

Discussion

As reflected in the table, the three groups of samples display a negative attitude as indicated by the overall mean of 115.82. It could also be noted that the three groups of samples registered mean scores ranging from 115.07 to 116.40 all fall under the category of negative attitude toward Mathematics.

This could mean that in general, the samples strongly agree that mathematics will not be important in their work; that getting a teacher that will take them seriously in mathematics is a problem; that mathematics is hard for them and they don't expect to use mathematics when they get out of school; and that taking mathematics subject is a waste of time. Further, they also strongly agree that mathematics is their worse subject; and that they are not good in mathematics.

On the other hand, the samples strongly disagree that mathematics teachers have made them feel that they have the ability to go on in mathematics; that they can do good grades in mathematics; and that they can use mathematics in many ways as an adult. Moreover, they strongly disagree that their mathematics teachers have encouraged them to study more mathematics, and that mathematics is a worthwhile and necessary subject.

The negative attitude of the samples toward mathematics could be attributed to the learning environment existing in different colleges and universities which includes mathematics teachers who do not possess the needed love and care for students and their workplace aside from the fact that these students are coming from different secondary schools with different experiences with their peers and mathematics teachers.

According to Jacob as cited by Olonan (2010), attitude of students is the product of lifelong interaction, prediction, and environmental experiences. They seem to develop either positive or negative attitude through the process of absorption; they react to the things they

see and hear and imitate their parents, teachers as well as their peers.

Further, Nicolaidou and Philippou (2003) mentioned that negative attitudes are the results of frequent and repeated failures or problems when dealing with mathematical tasks and these negative attitudes may become relatively permanent. According to them, there are a number of factors which can explain why attitudes toward mathematics become more negative with students such as the pressure to perform well, over demanding tasks, uninteresting lessons and less than positive attitudes on the part of the teachers.

It could be observed from table 4 that the three groups of samples had remarkable increase in their post-test mean rating in the attitude scale in Mathematics as supported by the overall mean of 141.67 as compared to the initial overall mean of 115.82. In the case of the experimental group taught using the STAD, there is also an increase from 115.07 to 149.47; the experimental group taught TAI had an increase from 116.40 to 145.47; and the control group likewise registered an increase from 116.00 to 130.07.

A closer analysis of data would indicate that the experimental group taught by cooperative learning strategy STAD registered the highest increase of 34.40; followed by the experimental group taught by cooperative learning strategy TAI with an increase of 29.07; and last is the control group taught using the traditional method with an increase of 14.07. It could be noted that it is not only in the experimental groups that the attitude of the samples changed from negative to positive but also the samples in the control group.

These findings could mean that the three teaching strategies/methods utilized in this investigation contributed to the change in the attitude toward Mathematics of the samples from negative to positive attitude. The findings of the study find support in the studies of Duco (2012) and Asuncion (2014) stating that the post-test mean scores in the attitude scale of the groups of samples in their studies increased remarkably as compared to their pre-test mean scores.

In the case of the experimental groups where cooperative learning strategies were applied, the finding could be attributed to the theory of acceptance that has led the samples to become powerful helping agents among them. The feeling of being accepted and important has perhaps raised their peer support for higher achievement and positive attitude toward the subject.

According to Johnson and Holubec (2002),

cooperative learning experiences promote more positive attitudes toward the instructional learning experience. Further, Brady and Tsay (2010) avers that the warm classroom climate existing because of the utilization of cooperative learning strategies expresses friendship, and provides the students the opportunity to strive to understand different ways of explaining concepts and different perspectives on solving problems thus becoming more willing to take on tough tasks because they expect to succeed and their attitude toward the subject becomes more positive.

On the other hand, the change in the attitude of the samples in the control group could be ascribed to the positive attitude of their teacher in the traditional methods of teaching. After being exposed to the traditional method, the analysis of data shows that the samples now strongly agree that mathematics teachers have made them feel that they have the ability to go on in mathematics; that they can do good grades in mathematics; and that they can use mathematics in many ways as an adult. Moreover, they strongly agree that their mathematics teachers have encouraged them to study more mathematics, and that mathematics is a worthwhile and necessary subject.

According to Yara (2009) attitudes are formed as a result of some kind of learning experiences students go through. This is mimicry, which also has a part to play in the teaching and learning situation. In this respect, the learner draws from his teachers' disposition to form his own attitude, which may likely affect his learning outcomes. Likewise, teachers with positive attitude toward Mathematics were inclined to produce students with positive attitude.

The pre-test mean scores registered in the attitude scale by the three groups of samples are 116.40, 115.07, and 116.00 for the TAI, STAD and control groups, respectively. The mean differences of the three groups of sample were treated which yielded F-value 0.0875 with corresponding *p*-value of 0.9164 which is higher than the level of significance of 0.05. Hence, the null hypothesis is accepted on this regard. Therefore, there are no significant differences in the pretest mean scores in the attitude scale in Mathematics of the three groups of samples.

This finding could mean that the three groups of samples registered almost equal entry behavior in terms of attitude indicates that they are properly grouped and comparable at the start of the experiment. Again, this reflects that the study is compliant of one of the requirements for experimental research that for any experimental study conduct, the experimental and

control groups must be on the same level in terms of the equating variables such as achievement and attitude in the case of this experiment.

Data in table reveal that the experimental group taught by cooperative learning strategy TAI registered a mean difference of 37.00 in their attitude toward Mathematics. This mean difference when treated using dependent t-test yielded t-value of 14.6639 with corresponding *p*-value of 0.0000 which is much lesser than the level of significance of 0.05. This resulted to the rejection of the null hypothesis. Therefore, there is a significant difference in the pre-test and post-test mean scores in the attitude scale in Mathematics of the experimental group taught using TAI.

This could mean that the cooperative learning strategy Team Assisted Individualization is an effective strategy in improving the samples' attitude toward Mathematics. This could be due to activities undertaken by the students when they were taught using the TAI. Students were allowed to work in heterogeneous teams and each member of the team was given a material to work on at his own pace and later own compare his work with another team mate and check their work using an answer sheet provided by the teacher. During the course of checking, team members are free to share their ideas about the assigned tasks and explain their own work to the team mates. This scenario clearly indicates that they experience different roles such as just being a members, a leader, or a facilitator especially during the discussion of how answers are arrived at, feeling that they are part and parcel of the teaching- learning process. This contributed much in the change of the samples' attitude from negative at the start of the experiment to positive after their exposure to the experimental treatment, the cooperative learning strategy TAI.

According to Yara (2009) attitude as a concept is concerned with an individual's way of thinking, acting and behaving. It has very serious implications for the learner, the teacher, the immediate social group with which the individual learner relates, and the entire school system.

It could be gleaned from the table that the experimental group taught by cooperative learning strategy STAD registered a mean difference 34.40 in their attitude toward Mathematics. This mean difference when treated using dependent t-test yielded t-value of 11.7251 with corresponding *p*-value of 0.0000 which is much lesser than the level of significance of 0.05. This led to the rejection of the

null hypothesis. Therefore, there is a significant difference in the pre-test and post-test mean scores in the attitude scale in Mathematics of the experimental group taught by STAD.

This could mean that the cooperative learning strategy STAD is effective in changing the samples' attitude from negative to positive. This could be credited to procedure undertaken utilized by the teacher in teaching Business Mathematics through this strategy. The formation of small group to work on an assigned task with common goal in mind to accomplish the task completely and correctly created a climate of acceptance and good working relationship between and among the members of the group. Further, the reward system utilized in this strategy made them feel more confident that they can use mathematics in their real life and making them feel that mathematics is an interesting subject.

According to Anderson (2007) teachers can reinforce the idea that mathematics is an interesting subject by providing activities in which students take different roles in the discussion of mathematical concepts and procedure that lead to solutions of real life problems.

Further, Rai (2007) contends that STAD is one of the many strategies in cooperative learning which helps promote collaboration and self-regulating skills. The reason for the selection of STAD is good interaction among students which could lead to positive attitude toward the subject, better self-esteem, increased interpersonal skills. STAD also adds an extra source of learning within the groups because some high achievers act the role of a tutor, which could result to high achievement and improved attitude toward a particular subject.

As reflected in table 14, the control group taught by the traditional method recorded a mean difference of 14.07 which when treated using dependent t-test yielded t-value of 5.4423 with corresponding *p*-value of 0.0000 which is much lesser than the level of significance of 0.05. This led to the rejection of the null hypothesis. Therefore, there is a significant difference in the pre-test and post-test mean scores in the attitude scale in Mathematics of the control group taught by traditional method.

This could mean that even the traditional method could make a great change in the samples' attitude toward mathematics from positive to negative as evidenced by the data registered in tables 4 and 6. Findings of the study could be attributed to fact that in the traditional method, each class session started with motivation



which consists of the discussion of the importance of the subject matter to real-life situations, followed by the presentation of the subject matter guided by the sequence of the lesson objectives. After which, generalizations were formulated by students based on their experiences in the practice exercises. It is worth mentioning that even in the control group praises and rewards were given to recognize successful completion of the task, high scores and good performance. These procedures has perhaps raised their aspirations for higher achievement and positive attitude toward the subject.

According to McCleod (2002), attitude toward mathematics is related to the mathematics success in the classroom. Further, Hart (2005) avers that students can develop positive attitude toward mathematics because he learns to associate positive experiences or event with it. Also, positive reinforcement just like praises and rewards create room for the formation of positive attitude toward mathematics.

It could be observed in the table that the post-test mean scores registered by the three groups of samples are 145.47, 149.47, and 130.07 for the TAI, STAD and control groups, respectively. The mean differences of the three groups of sample were treated statistically and yielded F-value of 76.4688 with corresponding *p*-value of 0.0000 which is very much lower than the level of significance of 0.05. Hence, the null hypothesis is rejected on this regard. Therefore, there are significant differences in the post-test mean scores in the attitude scale in Mathematics of the three groups of samples.

This could mean that the cooperative learning strategies TAI and STAD are more effective than the traditional method of teaching in enhancing the attitude toward Mathematics of the samples as evidenced by the higher posttest mean scores of the two experimental groups as compared to the control group.

The finding is supportive of the finding of Regudon (2003) that the samples taught using the cooperative learning strategies registered better improvements with regards to their attitude toward mathematics as compared to those samples taught using the traditional method.

The significant improvement in the attitude toward Mathematics of the samples in the two experimental groups could be attributed to the mechanism utilized in the cooperative learning strategies such as peer tutoring, participation and the motivating effect of

cooperation among the members of the group.

This is supported by Scott and Johnson (1980) as cited in Regudon (2003) that the positive effects of cooperative learning on students' achievement and attitude toward mathematics were influence by several mechanisms. The first mechanism is peer tutoring which is found to evoke the following behaviors: increase knowledge due to sharing resources, low anxiety, high satisfaction with the learning environment, and trust in other people. They further observed that these behaviors induce positive attitudes toward mathematics activities. The students feel confident in the next session because they know that they are inclined to participate actively in the learning process.

The second mechanism, known as participation hypothesis works within heterogeneous ability cooperative groups. Heterogeneity of achievement levels maximizes positive peer tutoring and serves as an aid to classroom management.

The third mechanism is the motivating effect of cooperation among the groups. This could have influenced the change in the attitude of the samples. This could be credited to the reward structure of cooperative learning strategy. Peers are motivated to help their teammates on tasks, resulting in the development of favorable attitudes and better achievement in a particular subject.

Conclusion

The three groups of samples had a good achievement in Business Mathematics and negative attitude toward Mathematics before they are exposed separately to the three methods of teaching. The three groups of samples had a very good achievement in Business Mathematics and positive attitude toward Mathematics after they are exposed separately to the three methods of teaching. There are no significant differences in the pre-test mean scores in the achievement test in Business Mathematics and attitude scale in Mathematics of the three groups of samples. This implies that the three groups are comparable at the start of the experiment. There are significant differences in the pre-test and post-test mean scores in the achievement test in Business Mathematics and attitude scale Mathematics of the two experimental groups and the control group implying that the three methods of teaching are effective. There are significant differences in the post-test mean scores in the achievement test in Business Mathematics and attitude

scale in Mathematics of the three groups of samples indicating that the cooperative learning strategies TAI and STAD are more effective than the traditional method of teaching.

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