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TITLE:

"Self Confidence and Mathematics achievement. A Study on second year college of education students"

BY

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In partial fulfilment of the requirements of the degree of MSc in Science Education

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CHAPTER 1

1. INTRODUCTION

In an increasingly technological society, knowledge of Mathematics is critical to the persuade of many occupational fields. Not only is Mathematics necessary in the scientific and technical fields, it is increasingly important in business, the social sciences and humanities. "In spite of the importance of Mathematics, many intellectually capable students avoid taking Mathematics course in high school and college. Consequently, they restrict the range of careers from which they may choose to those that do not require quantitative skills." Betz (1978:441)

A large number of students that enrol for mathematics at high school and colleges perform badly. Strauss, van der Linde and Plekker in the annual publication of 1996, Education and Manpower Development reported that out of 40506 who wrote Mathematics in Gauteng only 23 866 passed. Their poor performances have been attributed to; poor teacher qualification and problems in students cognitive level domain.

Despite all these, many other students fail to perform as well in mathematics as they are capable and again do not attain the mathematics knowledge that would expand the range of career options available to them.

Mathematics avoidance and poor mathematics achievements are attributed to the negative attitude towards Mathematics. Several attempts have been made to improve students attainment in Mathematics by improving their cognitive level. Improvement in teachers' qualification has not produced the expected improvements in students' attainment in Mathematics. The picture is still bleak as students that enrol for Mathematics at colleges, high schools and university are far outnumbered by the students in social sciences and humanities.

I believe that an improvement in the affective level domain towards Mathematics could improve their attainment in Mathematics. There are several studies which have successfully determined the relationship between Mathematics achievement and attitude towards Mathematics. A positive correlation between mathematics achievement and attitude towards mathematics was recorded. (See the literature review chapter 2).

Whilst there are several treatment programs currently in operation which occur in individual or group counselling settings and include general anxiety management techniques, modification of irrational beliefs or negative attitudes towards Mathematics, and development of more positive concepts and attitudes, there is little done to determine a teaching strategy which could raise students confidence in mathematics.

Mathematics avoidance and poor mathematics achievements are attributed to the negative attitude towards mathematics. These attitudes, according to Cheung (1988) begin developing as soon as children are exposed to the subject (Mathematics), but become more noticeable between the ages 11 to 13.

This study which is aiming at developing a teaching strategy that could change the students' attitude towards mathematics assumed from Cheung's finding that the subjects chosen for the study have already developed some attitude towards mathematics. Their ages range from 18 to 36.

It is intended in this study, that the intervention program designed to alleviate the negative effect of mathematics anxiety should deal with affective and cognitive aspects of mathematics anxiety. To alleviate these negative effects is difficult especially for students who have already completed elementary school years. Meece (1988) said that programs should be implemented during the elementary school years before children's

anxiety about mathematics becomes strongly established. As an attempt to overcome this problem the intervention was applied over a period of 5 months.

1.1 Aim of the study

One of the aims was to seek answers to the following questions:

(a) Does an increase in self-confidence lead to an increase in Mathematics achievements and
(b) Do cooperative learning strategies lead to increase in self confidence?

A second aim of the study is to attempt to raise the students confidence by employing cooperative learning task, with the belief that this will in turn reduce their Mathematics anxiety and increase their self-confidence in Mathematics and eventually improve their performance in Mathematics.

The specific objectives are to:

(a) quantity the extent of the correlation between self-confidence and Mathematics achievement
(b) utilise cooperative learning and teaching strategies as the predominant teaching method in the second year Mathematics class.
(c) find out if cooperative learning and teaching strategies lead to self-confidence or not.
(d) quantify the extent to which changes in self-confidence is accompanied by change in Mathematics achievement.

One question that came up during the study which I intend answering in another study is whether achievement influences attitude or is it attitude that influences achievement. This question if not answered might raise questions as to whether the cooperative

learning and teaching strategy does change students' attitudes towards mathematics or only enhance students' performance in mathematics.

Significance of the study

Although the results of this study may not be generalizable to all learners in all age-groups due to the nature of the sample they could still be of great use to the mathematics educators and curriculum developers with information regarding teaching and learning strategies.

1.2 Methods and procedures

Subjects

Subjects for the study were 17 second year mathematics students at the Transvaal College of Education in Gauteng Province. The class consisted of 6 females and 11 males. This group was chosen because of its convenience. It was previously taught by a traditional whole-class instruction and the study sought to find out if cooperative learning and teaching strategies lead to self-confidence or not.

1.3 Instruments

The following instrument were used.

1.3.1 Attitude scale

A Mathematics attitude scale, developed by Aiken and Dreger using "Linkert" scale procedures was applied before the cooperative learning and teaching strategies was used. The scale was again applied twice, a month after the first application and finally, two months thereafter. The Linkert type scale was chosen for its high reliability

coefficient compared to the Thurstone. Sax (1988) recorded coefficients for Linkert ranging from 0,80 to 0,95 and coefficient for Thurstone ranging from 0,65, to 0,85.

The instrument consisted of 20 items, 10 positive and 10 negative.

Examples of the items in the scale are:

1. I really like Mathematics (positive item)
2. It makes me nervous to even think about having to do a Mathematics problem. (negative)

The response alternative for positive items are weighted for 4 (strongly agree) to 0 (strongly disagree). The weight is reversed for alternatives to negative items. The person's score is the sum of the weighted alternatives endorsed by him/her. High score reflect positive attitude towards Mathematics. Items were rearranged in second and third applications.

1.3.2 Achievement tests

At the beginning of the study and after the application of the attitude scale, a test was given to the whole class. These tests were moderated by the head of department of Mathematics at the college. The tests were moderated to ensure its validity. The results of the achievement tests and attitude scale are recorded in table 3.1, 3.2 table and 3.3.

1.3.3 Student journals

At the beginning of each study, each student was given a journal to complete at the end of each lesson. In the journals they were expected to:

(a) state whether they have understood the lesson or not.

(b) state their difficulties during the lesson.

The purpose was to encourage self-evaluation and the evaluation of the cooperative task.

The choice of the student journals was motivated by Bandura (1977) who said that by making self-rewarding reactions conditional on attaining a certain level of behaviour, individuals create self-inducements to persist in their efforts until their performance match self-prescribed standards.

Some of the extracts of the students comments are in appendix ii.

1.3.4 Cooperative learning and teaching strategy

To raise the students self-confidence, a cooperative learning and teaching strategy as described in chapter 2 was applied to the whole class for five months. The proceedings in class were recorded.

1.3.5 Interviews

An open-ended interviews were conducted with the student who scored highest in the attitude scale and the one who scored lowest in the attitude scale. The purpose of the interview is to confirm their responses in their scale and also to get their opinions about the cooperative learning task, whether it raised their confidence or not. Transcripts of the interview are recorded in appendix i.

1.4 Data collection and analysis

Data was collected using the instrument such as the attitude scale, interview and journals.

Person product-moment correlations were calculated to examine the relationship between attitude towards mathematics and mathematics achievement.

Changes in achievements and changes in attitudes were computed for every student to determine whether a positive change in attitude was accompanied by an increase in mathematics achievement or not.

A qualitative analysis of the results obtained from interviews, journals and the recordings in class is also given. (see chapter 4).

CHAPTER 2

LITERATURE REVIEW

The definitions of the term "attitude" range widely, from the operationally bound to metatheorical. Despite the variation, most definitions agree upon one common characteristic: Attitude entails a predisposition to respond to social objects which in interaction with situational and other dispositional variables, guides and directs the individual's behaviour.

2 1 Definitions of attitude

Morwood (1982) regards an attitude as the tendency for a person to react positively or negatively to the total situation. The above definition regards attitudes as the mobilisation of the will of a person. To Morwood, attitudes are actively acquired and integrated through learning and experience.

Adams (1964) defines attitude as predisposition to react negatively or positively in some degree toward an object.

To Lehmann (1984) attitudes are descriptions of how people feel or typically behave rather than descriptions of what they know or can do. He defines attitudes as predisposition to respond overtly to social objects.

In this report the definition of attitude from the field of social psychology given below is used:

"A relatively enduring system of evaluative, affective reactions based upon and reflecting the evaluative concepts or beliefs which have been learned about the

characteristics of a social object or class of social objects." Shaw and Wright (1967:3)

"Affective" is used to mean the state in which one is goal-oriented and succeeds or failed, perceives that one is succeeding or failing, or anticipates that one will succeed or fail in goal striving and "evaluative" is used to mean some order of preferability - none preferability regarding the object. Shaw and Wright [1967:3]

There are various approaches to the study of attitudes. One way is to observe the behaviour of the examiner as attitudes are manifested in behaviour. The other approach which was used in this study is obtaining direct expressions of attitude.

Adams (1964) sited four reasons why people develop attitudes. he claimed that they acquire attitudes in order to:

1. understand the world around them,
2. protect their self-esteem
3. help themselves to adjust in a complex world and
4. help them to express their fundamental value.

The reasons furnished by Adams (1964) could be taken to mean that attitudes develop in people through a want of satisfaction or need and that a favourable attitude would be formed towards an object or person that satisfy that want.

In this study an attempt will be made to create a favourable environment for students with a hope that this will foster favourable attitudes toward mathematics.

2.1.1 The relationship between Attitudes and Mathematics achievement

Many studies have been done on the relationships between attitudes and achievement. Because of the quantity of research in this area, only a few of the studies after 1970 are reviewed.

Smith (1974) in his study "attitudes as predictors of mathematics achievement conducted on 45 freshmen Algebra 1 student at a predominatly white high school in a middle class central New Jersey community recorded a correlation coefficient of 0,292 and 0,537 between attitude and achievements when student classroom behaviour inventory and overt classroom inventory were used respectively.

Muhamad and Kalique (1991) in their study conducted on Senior Secondary Schools pupils in Mmabatho, reported a significant positive relationship between Mathematics achievement ($r = 0,49$ for girls and $r = 0,31$ for boys) and self confidence. In their second study conducted on first year University of Bophuthatswana students, a negative correlation (-0,55) between Mathematics and anxiety was reported. The result of their study supported a claim by Skemp (1977) that anxiety can reduce the efficiency of Mathematics thinking and that increase in motivation improves performance.

Betz (1978) reported a positive correlation of 0,22 and 0,34 between Mathematics anxiety and Mathematics achievement for 120 and 269 students at Ohio state university taking Mathematics 1 and Mathematics 2 respectively.

Cheung (1988) reported a correlation of 0,098 between Mathematics achievement and attitude towards Mathematics (Mathematics-Like).

A study by Zimmerman, Bandura and Martinez-Pons conducted in (1992) found that self motivation strongly correlates with academic attainment. A coefficient of 0,7 was

recorded. They reported that perceived efficancy to achieve motivates academic attainment both directly and indirectly by influencing personal goal setting.

Hackett and Bertz (1983) in their study to investigate the relationship of Mathematics self-efficacy expectations to the selection of Science based College majors, reported that students with stronger Mathematics self-efficacy expectation reported lower-levels of Mathematics anxiety, higher level of overall confidence and affectance motivation, and greater tendency to view Mathematics as useful.

Bloom (1976) concluded that 25 per cent of the variance in achievement could be attributed to pupils' attitudes towards science, their self-concept and classroom environment. This suggests that the feeling that students bring to the classroom, determine or influence their achievement. This study is an attempt to reduce variance in achievement by improving students' attitude towards mathematics by creating a favourable environment to learn in the classroom.

2.1.2 Self-confidence

Self-confidence or self-efficacy as Bandura (1977:193) calls it is "a conviction that one can successfully execute the behaviour required to produce the outcome".

People who are self-confident or have stronger self-efficacy tend to exert themselves in their tasks than those who lack self-confidence. "Efficacy expectations determine how much effort people will expend and how long they will persist in the face of obstacles and oversive experiences. The stronger the perceived self-efficacy the more active the effort". Bandura (1977:194). In this study cooperative learning task was used to try and raise the students self-confidence.

Blay (1994) in his study. "The new governments educational policy: implications for classroom practice" found that increase in self-confidence was accompanied by an

increase in Mathematics achievement. This study is an attempt to replicate Blay's study.

2.2 Method of instruction

The choice of method of instruction in the study was motivated by Skemp (1971) claim that if teaching method is democratic the pupils will show less aggressive action than when an undemocratic lesson is used. I hope that if their actions are less aggressive, the performance in class might improve and their self-confidence increase.

Sharon (1984) reported that a secondary analysis of data from several hundred studies on cooperative learning was performed by David Jonson and associates who concluded that cooperative learning in general yielded superior achievement academically compared to traditional whole-class or individualistic instruction.

Talmage, Pascarella and Ford (1984) reported achievement gain for students in a class where a teacher used cooperative goal structuring strategies with resultant changes in classroom learning environment. Vinacke (1974) reports that students feel more acceptable and more willing to take risks when they become members of groups than during individual decision making.

The cooperative learning task will have some of the characteristics below as given by Ford (1984):

(a) A group learning task will be defined for each small group of four to five students.

(b) The task will be divided into subtasks, each to be carried out by a member of the group.

(c) Completion of the total task will depend on each group member fulfilling his or her subtask.

(d) The teacher will serve in the capacity of a facilitator.

(e) Intergroup competition will not be built into the approach.

(f) Students will at all times be encouraged to use teaching and learning media to improve their self-concept and attitude towards Mathematics. Galbraith (1990) reported that students who used calculators displayed a better attitude towards Mathematics and especially better self-concept in Mathematics than students who were not using them.

2.3 Cooperative learning and teaching task versus mathematics achievement and attitude

Stevens (1995) reported that students who were subjected to a cooperative learning and teaching task indicated a significantly higher achievement in math computation, reading vocabulary, reading comprehension and language expression than their peers who were taught by traditional methods.

"Cooperative learning has been found to have a positive impact on many variables other than achievement, including intergroup relations, self-esteem, attitudes towards class and school and ability to work collaboratively with others" Stevens (1995:323).

The purpose of this study was also to determine whether the students success in mathematics and their attitude depend upon the method (cooperative task as described above) employed.

Although the main purpose of applying the cooperative learning task is to use it as a treatment to students' attitudes towards mathematics, an attempt was made to determine whether or not the use of a co-operative learning task as an instructional process does affect interpersonal relations among students, their liking for one another, their sense of being accepted and their desire to be a member of the class.

2.4 Summary

In this chapter the following aspects were discussed:

(a) Definitions of attitude.
(b) The relationships between attitude and mathematics achievement.
(c) Self-confidence.
(d) The cooperative learning and teaching task.
(e) The cooperative learning and teaching task versus Mathematics achievement and attitude towards mathematics.

CHAPTER 3

TEACHING FOR SELF-CONFIDENCE AND DATA COLLECTION

In this chapter a detailed picture of how the cooperative learning and teaching strategy was applied in class from June to October is outlined. The cooperative learning and teaching strategy was applied with an aim of raising the students' confidence in mathematics with a belief that this will in turn lead to a better performance in mathematics.

Aiken and Dreger (1961) in the study on 115 students in three mathematics classes to determine whether mathematics attitude scores predict gains in scores from the initial to the final administration of the mathematics achievement test when training is intervened, reported positive partial correlation cofficients between mathematics attitude scale scores and retest scores on the mathematics pretest, partialling out the effect of initial scores on the latter. The cofficients were 0,33 for males and 0, 34 for females.

At the end of the chapter, recordings of data collected from the attitude scales and achievement test is also given. Data collected from the interviews and journals is given in appendix 1 and appendix 3 respectively. Due to the large number and size of journals only extracts are recorded in the appendix.

3.1 Teaching for self-confidence

The class was taught by the cooperative learning and teaching strategy for 5 months. Due to the fix college programme, the reseacher could only see the students at most 3 times a week. The reseacher spent an hour with the students in the days that they were available.

WEEK 1

DAY 1 (1996/06/03)

Students were requested to group themselves into four groups. The idea was to form groups of students who understood each other well. Each member in the group gave a biography of him/herself to the other members in the group. Each group then delegated a member to report to the whole class. The teacher then visited each group and gave his biography to them. The idea was to make students feel at ease with each other and with the teacher.

A revised Math attitude scale developed by Aiken and Dreger (1961) using Likert scaling procedure was then given to the students. The directions were read to them and it was impressed on them that the questionnaire was not intended to test them but to help the students to monitor their own ideas and their emotional state about mathematics and its teaching throughout the year. It was also intended to provide the reseacher with information to enable him to choose a suitable teaching method for the class.

The researcher then informed the students that:

(i) There will be no competition in class and within the groups.
(ii) The success or progress of the group will be measured by the progress of each member in the group.
(iii) Members in each group should strive to assist one another.
(iv) No individual should dominate in the group.
(v) Each group is accountable to the whole class.

In addition the teacher requested the students to suggest what could be done in class to promote teaching and learning. The students suggested that:

1. The teacher should always record questions and difficulties from the students. Work on the problems and report to students the following day.

2. Each member in the group should be allowed to respond to another students questions. The teacher should not be the one who always respond.

3. Students should be allowed to work together when classwork is given.

The teacher ensured the class that their requests will be asceeded to.

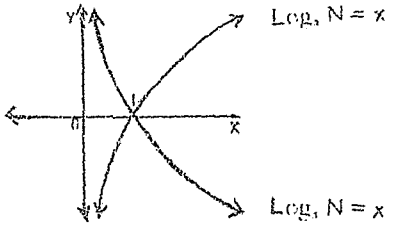
DAY 2(96/06/04)

This day, each student was given a journal to complete at the end of each lesson. The teacher explained to the students the purpose of completing the journals. Thereafter, the teacher introduced a lesson on logarithms.

TEACHING: LOGARITHMS

A definition of a logarithmic function $\log_a N = x$ if $N = a^x$ was given to the students. The students were requested to resume their groups and engage in a discussion on the above definition. To facilitate the discussion the teacher gave the students the following three questions:

1. Why is N restricted to positive numbers?
2. For which values of a is $\log_a N = x$ well defined?
3. Give the values of a in each of the graphs of $\log_a N$.



Each group was then requested to report on their responses through their leader.

Group responses

Below are the group responses for question 1:

Group 1	There is no way $a^x = N$ can be negative for every $x \in R$ and $a > 0$.
Group 2	According to the definition there is no log of a negative number.
Group 3	Same as group 1
Group 4	$\text{Log}_a N = x \Rightarrow a^x = N$. If N is negative then a^x is negative, but this will contradict the definition of exponents. Hence N is positive.

Below are their responses for question 2:

Group 1: $\text{Log}_a N = x \Rightarrow a^x = N$. It is well defined for all positive values of a.

Group 2: $a > 0$

Group 3: $a > 0$

Group 4: $a \geq 0$

Below are their responses for question 3:

All four groups gave the same answers

$\log N = x$ (1) $a > 1$

$\log N = x$ (2) $a < 1$

The teacher recorded the responses of the four groups and studied them for the next lesson.

DAY 3 (96/06/07)

At the beginning of the lesson the teacher congratulated the groups for the responses submitted the previous lesson. The teacher then confirmed the correctness of their responses for question 1 and 3. Instead of telling them that their responses were incorrect for question 2 the teacher asked them to check what will happen to $\log_a N = x$ if $x = 1$. The student were requested to work in their groups.

After arguments in each group, the leader gave the following responses:

Group 1: "Yes sir, we think that our answer is not completely correct for if $a = 1$ then $a^x = N$ becomes $1^x = N$ and N is always 1 for all

values of $x \in R$. This is not a log function any longer".

The teacher: If it is not a logarithmic function any longer what function is it?

Group 1: "It is a straight line, sir".

The other three groups concured with group 1.

For the rest of the lesson, the teacher gave classwork on graphs of logarithmic functions and an exercise of identifying logarithmic functions from other functions. The students completed the journals and the teacher took them.

WEEK 2

DAY 1 (96/06/10)

The lessons for this day were on writing as a single log, changing logarithms to exponents and then exponents to logarithms.

After teaching, a number of problems on the above topics were given to each group. The teacher moved around the groups to check on their responses. In the instance were any of the group failed to solve the problem, a group that got it correct was asked to write the solution on the board and then discuss their response with the rest of the class. The teacher gave clues to the groups in the instances were none of the groups could solve it. Were the groups completely failed to solve the problem a solution was given to the whole class.

The students were requested to complete the journals and hand them in to the teacher. The filling of journals took $\pm$ 10 minutes.

DAY 2 (96/06/13)

From the journals of the student it became clear to the teacher that the lesson presented on the 6th June was understood. A new lesson on logarithmic inequalities was introduced to the class.

To initiate a discussion the teacher asked the following question to the groups.

Which statement is correct and why?

$\log_a N < x \Rightarrow a^x < N$ (1)

$\log_a N < x \Rightarrow N < a^x$ (2)

All four groups said that $\log_a N < x$ implies that $a^x < N$.
They all failed to give reasons for their responses.

Instead of giving them the answers, the teacher engaged them in a further discussion by requesting them to look at the graphs of

$\log_3 x > 2$ and $\log_{1/3} x > 2$.

All groups managed to plot the graphs of both

$\log_3 x > 2$ and $\log_{1/3} x > 2$

and also drew the following conclusions, which were correct.

$\text{Log}_3 > 2$ for $x > 9$ and $\log_{1/3} > 2$ for $x > {}^1/_9$

To link their answers to the initial question asked, which was to determine the correct statement between

$$\log_a N < x \Rightarrow a^x < N \text{ and } \log_a N < x \Rightarrow N < a^x,$$

the teacher indicated to the groups that $\log_3 x$ increases as x increseas and $\log_{1/3} x$ increases as x discreases.

When the teacher indicated to the groups that

$$x > 9 \Rightarrow x > 3^2 \Rightarrow \log_3 x > 2 \text{ and}$$

$$x < {}^1/_9 \Rightarrow x < ({}^1/_3)^2 \Rightarrow \log {}^1/_3 x < _ \text{ but } \Rightarrow \log_{1/3} x > 2,$$

a student from group 2 immediately responded by saying "Sir am I wrong to say that when the base is less than 1 then the logarithmic function is decreasing and that we must reverse the inequality sign when we write the logarithmic function as an exponent"? The teacher did not respond but asked the opinion of the other groups. The other groups agreed that the inequality must be reversed when the base of the log is less than 1. It was interesting to realise that the student through the discussion were more confident to solve problems. The teacher congradulated the whole class and then gave them the problems below to discuss and hand in the written solutions the following day.

Problems

for which values of x is

(a) $\log_3(x + 1) + \log_3(x - 1) < 1$?

(b) $\log_3(x + 1) + \log_3 (x-1) > 1$?

(c) $\log (3x + 2) + \log (x + 1) > -2$?

End of the period.

DAY 3 (96/06/14)

Teacher was seeing the students for the last time this semester due to midyear exam. The period was as a result reserved for helping the students with problems that they might have encountered in all the work done to date.

The teacher could not engage the student into a lot of discussions as he had to answer a lot of questions before the end of the lesson. Leaving most question unanswered, the teacher believed, might have affect students' confidence in the examination.

WEEK 3

DAY (96/08/13)

Today, the 13th August 1996 was their first day at the college after they were engaged with teaching practice at their home schools.

The teacher greeted the students and allowed them to greet each other. The teacher reminded them that they should work in groups. They should be free to debate their answers but should at all times submit an answer agreed upon by all the members in the group.

TEACHING: SEQUENCE AND SERIES

The teacher asked the students a few questions on sequences and series. The students were asked to define and differentiate between the sequence and the series and between geometric sequence and arithmetic sequence.

As all the groups demonstrated that they were not having difficulties in defining the sequences and series as well as differentiating between geometric and arithmetic

sequences, the teacher together with the class agreed that they will concentrate on solving problems on geometric and arithmetic sequences.

Below are some of the problems solved:

Problem 1

If $x + 2$; $3x - 1$; $4x - 3$ are the first three terms of an arithmetic sequence, determine.

(a) x and then write down the numerical values of the first three terms.
(b) the nth term of the sequence.

The above problem was discussed by each group for about 25 minutes and each leader from each group wrote their answers on the chalkboard.

Below are the responses from each group:

Group 1

$(3x - 1) - (x + 2) = (4x - 3) - (3x - 1)$
$2x - 3 = x - 2$
$x = 1$

The first three numbers are 3;2;1

The nth term is

$T_n = a + (n-1)d$
$= 3 + (n-1)(-1)$
$= 4 - n$

Group 2

$(x + 2) - (3x - 1) = (3x - 1) - (4x - 3)$

$-2x + 3 = -x + 2$

$x = 1$

The first three members are 3;2;1

The nth term is

$T_n = a + (n - 1)\,d$

$= 3 + (n - 1)1$

$= 2 + n$

Group 3

$(x + 2) - (3x - 1) = (3x - 1) - (4x - 3)$

$-2x + 3 = x + 2$

$x = 1$

The first three numbers are 3;2;1

The nth term is

$T_n = a + (n - 1)\,d$

$= 3 + (n - 1) - 1$

$= 4 - n$

Group 4

The response for group 4 was the same as that of group 1.

The teacher made the students aware of the different methods used by the groups to determine the value of x. The teacher asked the students to discuss and determine which of the answers given by the four groups were correct.

After long arguments the students agreed that the answers given by group 1 and group 4 were correct. They reported that group 2 and group 3 used wrong methods to calculate the constant difference, d.

A member from group 1 pointed out to the class that group 3 was inconsistent in calculating d. He further said that their inconsistency made them to believe that their answers were correct. He said that although the values of x and the numerical values of the three terms were the same as those obtained by group 1 and group 4, their method was incorrect.

The student from group 3 said that the answers given by group 2 were also completely wrong.

The teacher confirmed the correctness of their responses and left the class as it was already end of the period. The student requested that the filling of journals be reserved for the end of the chapter as they are prepared to comment verbally during the lessons. The teacher agreed with the students as this was a sign that they were now free and confident to express themselves.

Day 2 (96/08/15)

At the beginning of the period the teacher wrote problem 2 below on the chalkboard and requested each group to engage in a discussion for 25 minutes and then report to the whole class.

Problem 2

The 6^{th} term of an arithmetic sequence is x while the 11^{th} term is y. Find the first 2 terms.

The responses from group 1, group 2 and group 4 were the same and correct. Group 3 failed to solve the problem. Their responses are given below:

Group 1, group 2 and group 4

$T_6 = a + 5d = x$ (1)

$T_{11} = a + 10d = y$ (2)

To determine T_1 and T_2

$T_1 = a$ and $T_2 = a + d$

(2 - 1): $5d = y - x$. $\therefore d = \frac{y - x}{5}$

From (1) or (2) $a = 2x - y$.

$\therefore T_1 = 2x - y$ and $T_2 = \frac{9x}{5} - \frac{4y}{5}$

Group 3

$T_6 = a + 5d$ (1)

$T_{11} = a + 10d$ (2)

The teacher enquired from group 3 why they failed to compete the problem.

Their leader responded by saying that during their discussion they concluded that information on problem 2 was incomplete. They failed to realise that x and y represented the values of the 6^{th} and 11^{th} terms respectively. They thought that they

had to determine the values of x and y first. The group however, accepted the solution given by the other 3 groups.

The teacher used the remaining 5 minutes of the period to introduce a section on arithmetic means.

WEEK 4

DAY 1 (96/08/20)

TEACHING: ARITHMETIC MEANS

During this day the teacher continued with the discussion on arithmetic means. When satisfied that they have grasped the concepts, the teacher gave them a problem below to solve in groups:

Problem 3

Determine the arithmetic mean of 7 and 11.

All the 4 groups had no difficulty in finding that the arithmetic mean of 7 and 11 is 9 determined as

$$\frac{7+11}{2} = 9$$

It was only after the teacher had asked them to inspect their answer and try to determine the relationship between their answer and the given numbers i.e 7 and 11 that the students realized that the 3 numbers 7, 9 and 11 form an arithmetic sequence. They also realized that the arithmetic mean i.e 9 could be determine by the formula for determining the constant difference, d as follows:

$x - 7 = 11 - x$

$\therefore x = 9$ where x is the arithmetic mean of 7 and 11.

A number of problems were given to the class to solve. The teacher realized that the students understood the section on arithmetic means. The remainder of the period was used to answer questions from the whole class on the previous work done on sequences and series.

DAY 2 96/08/22

The teacher gave a list of equations for geometric sequences; i.e the equations for, the nth term of the geometric sequence, equation for sum of the nth terms of the geometric sequence and the equation of a geometric mean. The teacher then asked each group if they understood the meaning of these equations. The groups assured the teacher that they understood the equations. The above discussions took $\pm$ 25 minutes. The remaining part of the period and the second period were devoted to practical problems. Below are some of the problems treated.

Problem 4

The general term of the geometric sequence is $Tn = a\,r^{n-1}$, explain what happens if

(i) $r > 0$

(ii) $r < 0$

All the group discussed the problem and gave the answers below (which are correct):

(i) If $r > 0$, then the terms will all have the same sign.

(ii) If $r < 0$, the terms will be alternatively positive and negative.

A member from group 4 immediately asked the teacher to explain what will happen if $r = 0$. Instead of giving the answer to the student, the teacher asked the other groups to respond to the student's question.

The response that came from group 1 was met with a deafening laughter from other students. The student from group 1 said that if $r = 0$, there will be no sequence. Below are the quoted version of the student's response: "Sir, if $r = 0$, $T_n = ar^{n-1}$ will be zero for all n. Sir, I mean that the first term will be zero, the second term zero and so forth. Is that a sequence? I mean, sir ... there won't a common ratio because zero divide by zero cannot be determined. But, Sir we said that $r = 0$, why can't we find zero from the quotient of two consecutive term? No ... r cannot be zero".

A member from group 2 said that he agreed with the explanation given by the above student. He said that he has never seen such a thing in any of the textbooks.

The teacher, realising that the students did not remember that r^{n-1} defines an exponential function which is well defined for $r > 0$, requested the whole class to look at the definition of the exponential function. It did not take them long to realise that r^{n-1} cannot be zero because r^{n-1} cannot be determined when $r = 0$.

There was a lot of excitement in class. They were happy that they have "discovered" something in Mathematics.

Problem 5

Determine $\sum_{n=1}^{10} 3.2^{n-2}$

Except for group 3, the other groups wrote out

$$\sum_{n=1}^{10} 3.2^{n-2} = 3.2^{-1} + 3.2^{0} + 3.2^{1} + \ldots + 3.2^{8}$$

$$= {}^{3}/_{2} + 3 + 6 + 12 + 24 + 48 + 96 + 192 + 384 + 768$$

$$= 1\,534{,}5$$

Group 3 determined $a = {}^{3}/_{2}$ and $r = 2$ and then S_{10} by using

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

The teacher adviced the other 3 groups to use the equation as it might be difficult to determine the sum for a large n. The group accepted my advice with thanks.

WEEK 5

DAY 1: 96/08/27

This day we looked at the sum of an infinite convergent progressions. The teacher derived the formula to determine the sum of the infinite convergent progression

$$S_\infty = \frac{a}{1 - r}$$

To initiate the discussion, the teacher requested the students to determine conditions for which

$$S_\infty = \sum_{n=1}^{\infty} ar^{n-1} \text{ can be determined.}$$

The following were their responses:

Group 1 said that S can be determined only if it is convergent.

Group 2 responded by saying that the sum of an infinite progression can be determine if the progression has a limit.

For group 3 and group 4 the determination of an infinite sequence depends on the nature of r. Group 3 said that for an infinite sequence to exist, r must be a proper fraction. On the other hand group 4 said that the absolute value of r must be less than 1. i.e /r/<1.

The teacher congratulated them for their efforts.
When the teacher informed the groups that they were all correct, they spontaneously asked why? The teacher requested the groups to look at the four responses and check if one does not imply the other. The student assured the teacher that they will come with the responses the following day.

The teacher gave the class some problems to solve at home and encourage them to come with solutions the following day.

WEEK 6

DAY 1 96/09/03

The students were very excited as they have realised from the homework that / r / < 1 implies that r is a proper fraction and that if S_∞ has a limit it means that S_∞ is convergent, and hence, S_∞ can be determined.

At it was our last day together before the test on the 4th September, the whole period was devoted to the revision of the previous work. The purpose was to raise the students confidence in the test.

In the last 30 minutes of the period the students were requested to complete the confidence scale.

The teacher wished them good luck in the test and also wished them a success in Mathematics during the remaining 2 weeks before the exam. This was also our last meeting as the other lecturer had to take over.

3.2 Data collection

The results of the attitude scales and achievement tests applied during the period from 3rd June to 27th August are recorded in tables 3.1, 3.2. A correlation between attitude and Mathematical achievement is computed in each case and recorded in these tables.

3.1 Correlation between self-confidence (S_1) and mathematics achievement (A_1) (Pre- instructions)

STUDENT	S_1 %	A_1 %	Correlation coefficient (r_1)
945143	56	30	
950023	73	18	
950050	93	80	
950028	86	61	
950055	78	64	
950064	71	75	
950087	73	75	
950084	75	50	
951966	65	66	
952017	90	40	
952604	52	45	
952637	75	69	
952250	89	70	0,34
952296	69	48	
952649	60	40	
952649	86	37	
952654	52	27	

3.2 Correlation between self-confidence (S_2) and mathematics achievement (A_2) (Post-instruction: First semester)

STUDENT	S_2 %	A_2 %	Correlation coefficient (r_2)
945143	73	20	
950023	73	17	
950050	100	60	
950028	89	71	
950055	75	94	
950064	76	80	
950087	81	70	
950084	85	40	0,33
951966	95	71	
952017	90	57	
952604	83	40	
952637	73	46	
952250	83	20	
952296	81	46	
952645	90	40	
952649	86	37	
952654	52	23	

3.3 **Correlation between self-confidence (S_3) and mathematics achievement (A_3) (Post-instruction: Second semester)**

STUDENT	S_3	A_3	Correlation coefficient (r_3)
945143	98	36	
950023	76	43	
950050	100	91	
950028	85	71	
950055	81	93	
950064	75	80	
950087	81	72	
950084	96	80	
951966	95	48	0,58
952017	91	23	
952604	78	52	
952637	78	48	
952250	83	55	
952296	79	46	
952649	90	63	
952649	89	64	
952654	75	43	

An analysis of these results is given in chapter 4.

3.4 Summary

In this chapter the following aspect discussed.

(a) Description of how the cooperative learning and teaching task was applied in class. The students responses and the fascilitative role played by the teacher.

(b) How data was obtained for the study.

CHAPTER 4

RESULTS AND DISCUSSIONS

In this chapter an attempt is made to determine from the results recorded in chapter 3, the results of the interview and the journals if there is a correlation between Mathematics achievement and attitude towards Mathematics or not. It will also be determined if change in attitude is accompanied by the change in Mathematics achievement.

The analysis will also attempt to determine the following:

- The effect of the co-operative learning and teaching task on Mathematics achievement.
- The effect of the co-operative learning and teaching task on attitude towards Mathematics.

4.1 Correlation between mathematics achievement and attitude towards mathematics

The subjects chosen for the study seem to have positive attitude towards mathematics. The pre-instruction scores on the attitude scale which are recorded in table 3.1 indicates that. The pre-instruction scores range from 52 to 93.

The pre-instruction results, further, indicates that 8 students out of 17 scored less that 45 % in the achievement test. A closer look at the pre-instruction results indicate that almost all student who scored less than 60 % in the scale obtained less than 50 % in the achievement test. Only 2 students out of 14 who recorded more than 60 on the scale obtained less than 50 % in the achievement test. A correlation coefficient of 0,34 was recorded.

The post instruction results failed to show a clear pattern. There are students who registered high positive values in the scale but failed the achievement test. For example student no. 945143 registered 98 in the scale but only managed 36% in the achievement test.

Persons product moment correlations computed between pupils attitude towards mathematics and mathematics achievement which are recorded in table 4.1 indicate that there is a correlation between attitude towards Mathematics and mathematics achievement.

Table 4.1 Persons product moment correlation computed between pupils attitude towards mathematics and mathematics achievement.

	Correlations	Average achievement in the test
Pre-instruction	0,34	52,6 %
Post-instruction (First semester)	0,33	48 %
Post-instruction (Second semester)	0,58	59,29 %

The correlation of 0,34 was computed in the pre-instruction. The subsequent values of 0,33 and 0,58 were computed in the post-instruction (first semester) and post-instruction (second semester) respectively. These values indicate a significant positive correlation between mathematics. These values are close to the values recorded by other researchers. Kalique (1991): 0,31 for boys and 0,49 for girls; Betz (1978): 0,34 and Bandura, Zimmerman and Martinez-Pons (1992): 0,7).

4.2 Change in attitude versus change in achievement

The previous section indicated that there was a positive correlation between attitude towards Mathematics and Mathematics achievements. In this section a relationship between change is attitude and change in achievement is determined.

An analysis of change in attitude and change in achievement in Mathematics recorded in table 4.2 below was made.

Table 4.2 Changes in attitude and changes in achievement

	Attitude Scale Results			Changes in Attitude			Achievement Results			Changes in achievement		
STUDENT	S_1	S_2	S_3	S_2-S_1	S_3-S_2	S_3-S_1	A_1	A_2	A_3	A_2-A_1	A_3-A_2	A_3-A_1
945143	56	73	98	+17	+25	+42	30	20	36	-10	+16	+6
950023	73	73	76	0	+3	+3	18	17	43	-1	+26	+25
950050	93	100	100	+7	0	+7	80	60	91	-20	+31	+11
950028	86	89	85	+3	-4	-1	61	71	71	+10	0	+10
950055	78	75	81	-3	+6	+3	64	94	93	+30	-1	+29
950064	71	76	75	+5	-1	+4	75	80	80	+5	0	+5
950087	73	81	81	+8	0	+8	75	70	72	-5	+2	-3
950084	75	85	96	+10	+11	+21	50	40	80	-10	+40	+30
951966	65	95	95	+30	0	+30	66	71	48	+5	-23	-18
952017	90	90	91	0	+1	+1	40	57	23	+17	-34	-17
952604	52	83	78	+31	-5	+26	45	40	52	-5	+12	+7
952637	75	73	78	-2	+5	+3	69	46	48	-23	+2	-21
952650	89	83	83	-6	0	-6	70	20	55	-50	+35	-15
952296	69	81	79	+12	-2	+10	48	46	46	+2	0	+2
952648	60	90	90	+30	0	+30	40	40	63	+23	+23	+23
952649	86	86	89	0	+3	+3	37	37	64	+27	+27	+27
952654	52	52	75	0	+23	+23	27	23	43	+20	+20	+16

The results in table 4.2 show that the change in achievement A_3-A_1 ranged from -21 to +30 whilst the change is attitude S_3-S_1 ranged from -6 to +42 at the end of the study. Out of the 17 students, 15 recorded a positive change in attitude and only on students recorded a negative change in attitude.

Four categories of students can be identified from table 4.2. The four categories identified are given in table 4.3 below:

Category 1: Students who registered a positive change in attitude, +S and a positive change in achievement, +A. A total of 11 students fell in this category which is denoted as (+S, +A).

Category 2: Students who registered a positive change in attitude, +S and a negative change in achievement, -A. This category which is denoted by (+S; -A) has 4 students.

Category 3: Students who recorded a negative change in attitude, -S and a positive change in achievement, +A. Only 1 student fell in this category denoted by, (-S, +A).

Category 4: Students who recorded a negative change in attitude, -S and a negative change in achievement -A. There was again only one student in this category denoted by (-S;A).

Table 4.3 below gives a summary of the categories and the number of students in each category.

Table 4.3 summary of the categories.

Category	Number of students
(+S; +A)	11
(+S, -A)	4
(-S; +A)	1
(-S; -A)	1

The majority of students 64,7 % of the class fell in category 1. We can conclude from the number of students in category (+S, +4) that a positive change in attitude is more likely to be accompanied by a positive change in achievement. Most students who fell in this category performed reasonably well in the tests.

Category (+S, -A) had 4 students, that is, 23,5 % of the class. Although the students in this category recorded a negative change in achievement their performance in general was satisfactory.

Only one student recorded a negative change in attitude and a negative change in achievement. We can therefore not conclude that a negative change in attitude produces negative change in achievement in this study.

Although in section 4.1, it was found that students with negative attitude perform in general weaker than students who recorded a positive attitude in the scale the study failed to give an answer to the question: Do students who record a negative change in attitude experience a decline in their performance in mathematics? The study show that a positive change in attitude is more likely to be accompanied by an improved achievement in mathematics.

4.3 Cooperative learning and teaching task versus change in achievement

The cooperative learning and teaching task seems to have led to a positive change in achievement in mathematics. This is evident from table 4.2. Out of 17 students, 12 i.e. 71 % recorded a positive change in achievement whilst only 5 recorded a negative change in achievement. The range of change is -21 to +30. Three students out of the five that recorded negative achievement generally performed well in the 3 achievement tests written.

It should be noted that after first three weeks of the application of the cooperative learning and teaching task, 7 student recorded a position change in achievement, 8 recorded a negative change and 2 recorded no change. But at the end of the study 12 students recorded a positive change and 5 negative change.

I believe that a large number of students might have registered a positive change if the cooperative learning and teaching task was applied for a much longer period, as student needed sufficient time to adjust to a new method of teaching.

4.4 Cooperative learning and teaching task versus change in attitude towards mathematics (self-confidence)

The major question that the study saught to answer was: Does cooperative learning and teaching strategy result in a positive change in attitude towards mathematics or not? To answer this question, students journals, results of table 4.2, students comments in class, and the transcripts of the interview (appendix-1) were studied and analysed.

4.4.1 Results from table 4.2

The results in table 4.2 indicated that all registered a positive change in attitude. 10 students registered a posi change in attitude after being taught for 3 weeks by the cooperative and learning task, 4 registered no change and 3 registered a negative change. At the end of the study i.e. after 3 months of the application of the method, 11 students recorded a positive change and only 3 recorded a negative change of -1, -23 and -34. The highest positive value of the change in attitude recorded is +40.

It can therefore be concluded from these results that the cooperative learning and teaching strategy led to a positive change in attitude for a majority of students towards mathematics.

4.4.2 Results from the journals

Although the use of journals in this study was to afford students to state whether or not they have understood the lesson, state the difficulties encountered during the lesson and give suggestion to the teacher, it also served to indicate whether the students' attitudes towards Mathematics were changing positively or not.

It was found that the comments in the journals of most students indicated that the students were positive about the cooperative and learning task and that their attitudes towards mathematics were positive.

Below are some of the students comments extracted from their journals:

Student number 95001F said "group teaching was very much helpful and I think it should be introduced to our schools ...". I have gained a lot and wish to keep on doing more ...." These were the sentiments passed by student no. 945143. Student number 952637 suggested that the method should be introduced to all pupils.

The students' comments tends to support the results in table 4.2 which indicates that there was a positive change in attitude of students towards mathematics.

Although the students' attitudes towards mathematics improved, I believe that if the cooperative learning and teaching task was applied for a longer period the results could have been much better.

There were some concerns from the students about the cooperative learning and teaching task. Most of their concerns were addressed during the study. Some of their concerns were:

1. The method did not offer the teacher an opportunity to exercise his/her authority in class. (Student number 950084 appendix -)
2. The group should be retained for a longer period. 5-6 months were suggested. (Student number 950017).
3. Other members in the group do not participate (Student number 952354).

4.4.3 Results from the interviews

To confirm the students responses in the scale and also to get their opinions about the cooperative learning and teaching task, a student who scored the highest in the scale (student no. 950050) and the student who scored the lowest (student no. 952650) were interviewed.

Table 4.3. Summary of the interviews

Student	Number	Sex	Change in achievement	Change in attitude	Responses		
					Q1	Q2	Q3
	952650	Female	-15	-6	Yes	Yes	Yes
	950050	Male	+11	+7	Yes	Yes	Yes

Both students answered yes on the three questions asked. The questions were:

Question 1

Are you happy about the teaching strategy that was used by the Teacher in class from June to September?

Question 2

Are you confident that you will pass mathematics examination at the end of the year?

Question 3

Do you think that your confidence to handle mathematics problems has improved or not during the past 5 months?

Discussion of the results

The responses given by the two students on the three questions asked indicated that their confidence to handle mathematics problems has increased during the five months that they were taught by the co-operative task. When asked whether they were confident or not to handle mathematics problems, student number 950050 said that he was more confident even to handle more difficult problems. Student number 950050 said "The way things were going this year has made me feel more and more confident. I can tackle the examination any time!!

It should be noted that although number 952650 registered negative change in attitude he always recorded high positive values in the attitude scale. The lowest and final being 83.

The results of the interview were in line with the results of the attitude scale. It could therefore be concluded that the co-operative task did result in a positive attitude towards mathematics.

4.4.4 Results from the recordings in class

From the record of proceedings in class the following changes that took place in the classroom could be identified.

- The group leaders were always confident in presenting their answers. Especially towards the end of the study. They could confidently argue for the answers that they have presented.

- The groups could solve most of the problems given to them without the assistance of the teacher.

- Intergroup and intragroup discussions were fruitful and resulted in the participation by most students.

- The students were free to ask questions. They could communicate freely with the lecturer. This became clear when they requested the teacher to allow them to comment verbally in addition to using the journals.

- The four above points could be interpreted as an indication that the students were becoming more confident to handle mathematics problems. It could be concluded that the co-operative task as applied in the study raised students' confidence to participate in the discussions, solve problems and give comments on the day to day proceedings in the mathematics class.

From the results of the interviews, journals, table 4.2 and the proceedings in class, it could be concluded that the co-operative task resulted in a positive change in attitude of most of the students towards mathematics.

CHAPTER 5

5. CONCLUSIONS AND IMPLICATIONS

The present study investigated learners' attitudes towards mathematics in the Soshanguve area. It also investigated whether cooperative learning strategies helped learners positively increase their attitudes, i.e. favourably, towards mathematics.

The findings indicated that mathematics achievement was significantly and positively related to pupils mathematics related attitudes. Improving students' attitudes towards mathematics could result in an increment in students' achievement in mathematics.

The findings of this study suggested that the cooperative and learning task does assist in promoting favourable attitudes towards mathematics among the students. They further suggest that if teachers of mathematics wish to promote favourable attitudes towards mathematics among pupils, they should organise group discussions relevant to the topics and stimulate students to ask inquiry-oriented questions.

However, the results of this study do not help us to conclude that favourable attitudes towards mathematics produced gains in achievement or whether increments in achievement fostered favourable mathematics -related attitudes: probably it is a two - way relationship.

5.1 LIMITATIONS OF THE STUDY

The findings of this study, have limitations due to the small size of the sample. Replication is necessary using a larger sample to determine the consistency of the pattern.

The low achievements in mathematics could not only be attributed to the students' attitudes towards mathematics. Other factors such as mathematics anxiety might have affected students' performance. Betz. (1978) and Sherman and Fennema (1977) found in their studies that mathematics achievement is related to mathematics anxiety.

The correlations reported in this study between mathematics attitudes and mathematics achievement although positive were not high. The weak associations could be a function of the attention paid by the teacher to the cognitive objectives in other to produce better results in the examinations. The teacher, although was aiming at dealing with the affective objectives, he was under constant pressure to complete the syllabus in time. The attitudinal objectives which are non-examinable were often neglected.

5.2 SUGGESTIONS FOR FURTHER RESEARCH AND PRACTICAL APPLICATIONS

Based on the findings of this study, the following suggestions are offered to researchers and practising teachers of mathematics in the secondary and college classes:

1. To develop favourable attitudes towards m thematics among pupils, the classroom, learning environment should be low in anxiety, where students can enjoy the activities in small groups and share their findings with peers and teachers.

2. The results of this study should be replicated in primary, secondary and college mathematics classes using larger samples and coverings all provinces in the country including private schools. The results could have major implications for curriculum developers.

3. It would be interesting to explore whether a relationship exists between students' attitudes towards Mathematics and achievement in other subjects such as Biology, Geography and English in colleges.

4. Curriculum developers could use the findings to develop teaching strategies that will promote favourable attitudes of students towards mathematics and also handle the cognitive objectives.

Finally, it should be noted that this study provides an attempt to elucidate the prevalence and effect of mathematics attitudes and also provides a treatment method in the form of a cooperative learning and teaching strategy. Further studies are needed to develop an appropriate methods of treatment for negative attitude towards mathematics.

BIBLIOGRAPHY

Adams G.S. (1964). Measurement and Evaluation in Education, psychology and guidance. Rinehart and Winston, London.

Aiken L.R and Dreger R.M. (1961). The effect of attitudes on performance in mathematics. Journal of educational psychology 52, 19-24.

Asger M. (1990) Relationship between science -related attitudes and science achievement. Education today 44 (2) 29-33

Bandura A (1977. Self-Efficacy: Towards a unifying Theory of Behavioural change. Psychological Review. 84(2) 191-215.

Bertz N.E. and Hacket G (1983). The Relationship of Mathematics Self-Efficacy Expectations to the Selection of Science-Based College Majors. Journal of Vocational Behaviour. 23, 329-345

Blay J.E. (1994) The New Governments Educational Policy: Implications for classroom Practice. In conference proceedings; South African Association for Academic Development 1994 Conference; University of Natal Durban; 30 November - 2 December pp. 115-124.

Bloom B.S. (1976) Human characteristics and school learning. New York. Mc Graw-Hill

Cheung K.C. (1988). Outcome of schooling:; Mathematics achievement and attitudes towards mathematics learning in Hong Kong. Educational studies in Mathematics, 19, 209-219

Ford S. Talmage H and Pascarella E.T. (1984) The influence of co-operate learning strategies on Teacher Practice, Student Perceptions of the Learning Environment and Academic Achievement. American Educational Research Journal 21(1), 163-179.

Galbraith P.L. and Chant D. (1990). Factors shaping community attitudes to School Mathematics: Implications for future Curriculum change. Educational Studies in Mathematics. 21(1), 299-318.

Khalique C.M. and Maqsud M. (1991) Relationship of some Socio-Personal Factors to Mathematics Achievement of Secondary School and University Students in Bophuthatswana. Educational Studies in Mathematics, 22, 377-390.

Lehmann, I.J. (1984). Measurement and Evaluation in Education and psychology third edition Holt, Rinehart and Winston , London.

Meece J.L. and Wigfield (1988) Math Anxiety in Elementary and Secondary School students. Journal of Educational Psychology 80(2), 210-216.

Morwood G.E. (1982). A teacher's Perception of his Professional Role - A Developmental study. Submitted in the fulfilment of requirements for the degree of master of education in the Department of education Rhode university.

Sharon, S. (198 ł) Co-operative and competitive behaviour.

Shaw M.E. and Wright J.M. Scales for the Measurement of Attitudes. London. McGraw-Hill Book Company.

Skemp R.R. (1971) The psychology of learning mathematics. Harmondsworth. Penguin books

Smith, G.C. (1974) Attitudes as predictors of mathematics achievement. A dissertation submitted in the partial fulfilment of the requirements of the degree of Doctor of Education in teacher colleges, Columbia University

Stevens R.J. and Slaves R.E. (1995) The co-operative elementary school: Effects on students' achievement, attitude and social relations. American Educational Research Journals 32(2), 321-351.

Strauss J.P., van der Linde H.J., Plekker S.J. and Strauss J.W.W. (1996) Education and Manpower Development, No. 17, 12.

Vinacke, W.E. (1974) The psychology of thinking New York Mc Graw-Hall.

Zimmermann B.J. and Bandura A (1992). Self-Motivation for Academic Attainment: The Role of Self-Efficacy Beliefs and Personal Goal Setting American Educational Research Journal, 29(3), 663-676.

INTERVIEW

At the end of the study the student who scored lowest in the attitudes scale and the students who scored highest where interviewed.

Below are the transcripts of the two interviews:

AN INTERVIEW BETWEEN RESEARCHER (RES) AND STUDENT/ SCORING LOWEST IN ATTITUDE SCALE (952650)

RES. Are you happy about the teaching strategy that was used by the teacher in class from June to September?

952650: YES

RES: Please, tell me more about how you feel about the teaching strategy used.

952650 Sir, at first I was not so happy about the method because it was a new thing to me, but later on --- I mean after sometimes I started to enjoy it.

RES: Are you confident that you will pass mathematics examination at the end of the year?

952650: I did not prepare well in the test --- but I am very sure I am very sure that I shall pass at the end of the year. The way things are --- I mean the way we help each other in class will help me to pass?

RES: Do you think that your confidence to handle mathematics problems has improved or not in the past 5 months.

952650: I am more confident now. I am in a position to solve more difficult problems.

AN INTERVIEW BETWEEN RESEARCHER (RES) AND STUDENT SCORING HIGHEST IN ATTITUDE SCALE (950050)

RES: Are you happy about the teaching strategy that was used by the teacher in class from June to October.

950050: Yes, --- but at first some members in our group did not want to listen. After you have helped us I started to enjoy the method.

RES: Are you confident that you will pass mathematics examination at the end of the year?

950050: Cork sure! Sir, the way we have worked this year was good. Sir I promise you--- you will see.

RES: Do you think that your confident to handle mathematics problems has improved or not in the past 5 months.

950050: The way things were going this year has made me feel more and more confident. I can tackle the examination any time.

APPENDIX II

SUGGESTIONS

Continue to do the good job. Sometimes he is coughing 950023

COMMENTS

He is using a good introduction which makes students to pay attention, his introduction is always having a link with what he is going to teach 950354

SUGGESTIONS

A GROUP OF PUPILS SHOULD BE RETAINED FOR AT LEAST 5-6 MONTHS AND MEMBERS ROTATE TO OTHER GROUPS SO AS TO AVOID COMPLICITY 945143

SUGGESTIONS

I THINK I WILL CONSULT HIM FOR IN CASE I DIDN'T UNDERSTAND DURING THIS TOPIC 945147

SUGGESTIONS

I like mixed it lot and wish to keep on doing more examples & problems if possible. 945143

COMMENTS

A FOLLOW UP SHOULD BE DONE, TO SEE WHETHER THE STUDENTS ARE DOING THEIR HOMEWORK OR NOT. THIS WILL HELP THEM TO MASTER IMPORTANT OR ALL ASPECTS AND ALSO ENABLE THEM TO ATTEMPT EVEN CHALLENGING PROBLEMS. 950087

COMMENTS

GROUP TEACHING WAS VERY MUCH NEEDED AND I THINK IT SHOULD BE INTRODUCED TO OUR SCHOOLS TO SUPPLEMENT THOSE WHO ARE STRUGGLING AND TO ENCOURAGE THOSE WHO ARE A BIT BEHIND IN MATHEMATICS 950111

COMMENTS

THE INTRODUCTION WAS FAIRLY INTRODUCED AND I WAS SATISFIED. I HAVE SEEN & UNDERSTOOD WHERE I WAS NOT CLEAR. I KNOW THE LECTURER WON'T BE ANGRY OVER ME FOR CONSULTING HIM REGULARLY. 945143

SUGGESTIONS

Group is not always okay, because others are not taking part, they just let others to do the work. 952354

SUGGESTIONS

STUDENTS COULD STILL BE TREATED LIKE BIG PUPILS WHEN COMING TO TASKS OR ASSIGNMENTS GIVEN TO THEM. THIS WILL MAKE THEM TO KNOW VERY WELL THAT TEACHERS ARE THE AUTHORITY IN THEIR SUBJECTS. 950894

APPENDIX III

OPINIONNAIRE

SURNAME:_____ INITIALS:_____

Please write your name in the space provided. Each of the statements on this opinionnaire expresses a feeling which a particular person has towards Mathematics. You are to express on a five point scale, the extent of agreement own personal feeling.

The five points are :-

Strongly Disagree	(SD)
Disagree	(D)
Undecided	(U)
Agree	(A)
Strongly Agree	(SA)

You are to encircle the letter(s) which best indicates how closely you agree or disagree with the feeling expressed in each statement AS IT CONCERNS YOU

		Office Use
1	I am always under terrible strain in a Math class. SD D U A SA	
2	I do not like Mathematics, and it scares me to have to take it. SD D U A SA	
3	Mathematics is very interesting to me, and I enjoy Math courses. SD D U A SA	
4	Mathematics is fascinating and fun. SD D U A SA	
5	Mathematics makes me feel secure, and at the same time it is stimulating. SD D U A SA	
6	My mind goes blank, and i am unable to think clearly when working Math. SD D U A SA	
7	I feel a sense of insecurity when attempting Mathematics. SD D U A SA	
8	Mathematics makes me feel uncomfortable, restless, irritable and impatient. SD D U A SA	
9	The feel that I have toward Mathematics is a good one. SD D U A SA	

Office Use

10 Mathematics makes me feel as though I am lost in a jungle of numbers and can't find my way.

SD	D	U	A	SA

11 Mathematics is something which I enjoy a great deal.

SD	D	U	A	SA

12 When I hear the word Math, I have a feeling of dislike

SD	D	U	A	SA

13 I approach Math with a feeling of hesitation, resulting from a fear of not being able to do Math.

SD	D	U	A	SA

14 I really like Mathematics.

SD	D	U	A	SA

15 Mathematics is a course in school which I always enjoyed studying.

SD	D	U	A	SA

16 It makes me nervous to even think about having to do math problem.

SD	D	U	A	SA

17 I have never liked Math, and it is my most dreaded subject.

SD	D	U	A	SA

18 I am happier in a Math class than in any other class.

SD	D	U	A	SA

19 I feel at ease in Mathematics, and I love it very much.

SD	D	U	A	SA

20 I feel a definite positive reaction to Mathematics, it is enjoyable.

SD	D	U	A	SA

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